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Analysis of the Role of Artificial Intelligence in Improving the Efficiency of Control Systems in Digital-Based MSMEs in Bandung City

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Abstract: The development of artificial intelligence (AI) technology has opened new opportunities for digital-based Micro, Small, and Medium Enterprises (MSMEs) in improving the efficiency of management control systems. This study aims to analyze the role of AI in improving the efficiency of control systems in digital-based MSMEs in Bandung City. The method used is descriptive qualitative with a case study approach. Data were collected through in-depth interviews with 7 informants consisting of 5 digital MSME actors and 2 supporting informants from government and academic elements. Data analysis used the Miles & Huberman model through the stages of data reduction, data presentation, and conclusion drawing. The results show that AI contributes significantly to increasing the efficiency of management control in three main dimensions: predictive-based planning, automated operational implementation, and real-time data-based evaluation. Measurably, the adoption of AI can reduce raw material waste by up to 40%, cut administrative costs from IDR 6 million to IDR 2 million per month, and contribute to an average turnover growth of 28% higher than MSMEs that do not use AI. On the other hand, obstacles were found in the form of low digital literacy, dependence on internet infrastructure, and the risk of over-reliance. This study concludes that AI has shifted the paradigm of MSME management control from a manual and reactive approach to a proactive, accurate, and data-driven system.

Keyword: Artificial Intelligence, Control Systems, Digital MSMEs, Operational Efficiency, Digital Transformation.

INTRODUCTION

Indonesia's digital economy has experienced remarkable acceleration over the past decade. The Micro, Small, and Medium Enterprises (MSMEs) sector is one of the entities most impacted and benefited from this wave of digitalization. According to official data, MSMEs contribute more than 60% to the national Gross Domestic Product (GDP) and employ approximately 97% of Indonesia's workforce. With increasingl., 2025) Amidst

increasingly fierce competition, MSMEs are required to compete not only in terms of products but also in terms of management systems. Limited human resources, capital, and infrastructure are classic challenges that increasingly urgently need to be addressed through adaptive and affordable technological approaches for small and medium-sized businesses.

Bandung City was selected as the research setting not only because it has a large number of digital MSMEs, with approximately 187,355 business units, but also because it possesses distinctive characteristics that differentiate it from many other Indonesian cities. Bandung is widely recognized as one of Indonesia's leading creative economy and digital innovation hubs, supported by a strong entrepreneurial culture, a high concentration of technology-based startups, leading universities, innovation centers, and active collaboration among government, academia, industry, and business communities. These characteristics have accelerated the adoption of digital technologies among MSMEs, particularly in the creative, fashion, culinary, and digital service sectors. Compared with many other cities, Bandung demonstrates a more mature digital business ecosystem where MSMEs are more likely to integrate e-commerce platforms, cloud-based applications, digital payment systems, and Artificial Intelligence (AI)-supported business tools into their daily operations. This unique ecosystem makes Bandung an appropriate empirical context for investigating how AI supports management control systems in digital MSMEs, as the interaction between technological innovation and managerial practices is more observable than in regions with lower levels of digital transformation (Hapiz et al., 2025).

Businesses in this city have progressively utilized various digital platforms, from e-commerce and social media to cloud-based management applications. However, most MSMEs still face fundamental problems with their management control systems, namely the inability to monitor operations in real time, inaccurate financial records, and decision-making that relies on intuition rather than structured data. This condition drives the urgent need for technological solutions that can systematically address management control challenges (Hapiz et al., 2025). These conditions indicate the need for technological solutions capable of supporting more effective planning, implementation, and evaluation processes within MSMEs.

Artificial Intelligence (AI) has increasingly been adopted in business environments due to its capability to process large volumes of data, identify patterns, generate predictions, and support managerial decision-making. Previous studies suggest that AI applications in MSMEs may contribute to operational efficiency, marketing optimization, customer relationship management, and resource allocation (Amira & Nasution, 2023; Santosa, 2026). Nevertheless, existing evidence remains largely concentrated on business performance outcomes and digital transformation benefits, while limited attention has been given to understanding how AI influences the internal mechanisms of management control systems within MSMEs. Therefore, claims regarding the transformational impact of AI on management processes require further empirical examination, particularly through field-based investigations involving actual MSME practitioners.

Artificial intelligence (AI) is emerging as a transformative technology that has the potential to address these needs. In the context of MSME businesses, AI encompasses a wide range of applications, from customer service chatbots and machine learning-based stock prediction systems to bookkeeping automation and data-driven marketing analytics. Unlike conventional information technology systems, which are passive and require manual input, AI is capable of automatically processing data, recognizing patterns, and providing decision-making recommendations independently. This capability makes AI a potential instrument for strengthening management control systems, which fundamentally encompass three main functions: planning, executing, and evaluating (Anthony & Govindarajan, 2007). The

integration of AI into these three functions has the potential to fundamentally change the way MSMEs manage their businesses.

The concept of management control systems (*Management Control Systems/MCS*) has long been a central study in management science (Baird et al., 2019). Introduced the Levers of Control Framework, which explains that effective management control consists of four complementary systems: belief systems, boundary systems, diagnostic control systems, and interactive control systems. While prior studies have discussed AI adoption and MSME performance separately, limited research has examined how AI interacts with specific management control dimensions, particularly diagnostic and interactive controls that are directly related to monitoring, feedback, and managerial decision-making processes. Understanding this relationship is important because digital technologies may not only improve operational efficiency but also reshape organizational control mechanisms (Maimuna et al., 2024).

Various previous studies have examined partial aspects of the relationship between AI and MSMEs (Amira & Nasution, 2023). Found that AI contributes positively to business efficiency, increased sales, and the competitiveness of MSMEs, but still face infrastructure and technological literacy constraints (Santosa, 2026). A systematic literature review identified that the application of AI in MSMEs encompasses business efficiency, marketing optimization, and resource management. However, three important gaps remain. First, most previous studies focus on business performance and technology adoption outcomes rather than examining management control functions. Second, existing studies predominantly employ survey or literature review approaches, providing limited qualitative evidence regarding how AI is utilized in day-to-day managerial control activities. Third, empirical studies at the city level, particularly within Bandung's digital MSME ecosystem, remain scarce. Consequently, there is insufficient understanding of how AI affects planning, operational implementation, evaluation processes, and managerial control practices in resource-constrained MSMEs.

Based on these gaps, this study offers a specific contribution by integrating Artificial Intelligence and Management Control Systems perspectives to explain how AI supports planning, implementation, and evaluation functions within digital MSMEs. Unlike previous studies that primarily assess business outcomes, this research focuses on the internal control processes through which AI contributes to managerial effectiveness. Furthermore, this study provides contextual evidence from digital MSMEs in Bandung through an in-depth qualitative case study approach involving direct experiences of MSME owners, consultants, and academics.

Based on the background described above, this study aims to analyze in depth the role of AI in improving the efficiency of management control systems in digital-based MSMEs in Bandung City. Specifically, this study will answer the following questions: (1) What is the role of AI in improving the efficiency of the management planning function of MSMEs? (2) What is the role of AI in improving the efficiency of the operational implementation function of MSMEs? (3) What is the role of AI in improving the efficiency of the management evaluation function of MSMEs? and (4) What are the obstacles faced by MSMEs in implementing AI for management control? The answers to these questions are expected to provide theoretical contributions to the development of MCS studies in the digital era, as well as practical contributions for MSME actors, business consultants, and policy makers in Bandung City and Indonesia more broadly.

METHOD

This research uses a qualitative approach with a case study design (*case study*). The qualitative method was chosen because this study aims to deeply understand the phenomenon

of AI adoption in digital MSME management control systems, which cannot be adequately explained through numbers or statistics alone. According to (Agustianti et al., 2022), qualitative method is a research method based on the philosophy of postpositivism, used to examine the condition of natural objects, where the researcher is the key instrument, data collection techniques are carried out by triangulation, and research results emphasize meaning rather than generalization. The case study design was chosen because it allows researchers to explore phenomena holistically in a specific real-world context, namely digital MSMEs in Bandung City. To enhance methodological rigor, this study adopted a multiple-source case study strategy in which data were collected from MSME owners, practitioners, consultants, and academics involved in digital business management. The focus was not on statistical representativeness but on obtaining rich information capable of explaining how AI is utilized within management control processes in real business settings. Data analysis uses the Miles & Huberman interactive model which includes three stages: data reduction, data presentation, and conclusion drawing/verification.

Bandung City was selected as the research setting because it represents one of Indonesia's most active digital MSME ecosystems. The city has a large concentration of technology-oriented MSMEs, extensive utilization of digital platforms, and strong support from local government programs promoting digital transformation. These characteristics make Bandung an appropriate context for examining the implementation of AI within MSME management control systems.

The research subjects consisted of 7 informants selected using the technique *purposive sampling*, namely the selection of informants based on research considerations and objectives. Informants are divided into two categories: (1) 5 main informants who are digital-based MSME actors in Bandung City who have adopted at least one AI-based technology in their business operations, including the fields of online fashion, digital culinary, digital marketing agency, handicraft marketplace, and application-based laundry services; and (2) 2 supporting informants consisting of an MSME consultant from the Bandung City Cooperative and MSME Office and an academic from Pasundan University who has expertise in the field of digital management and transformation. The inclusion criteria for main informants include having been operating for at least 2 years, having a minimum monthly turnover of IDR 10 million, and actively using AI-based platforms or applications in daily business activities. The number of informants was determined based on the principle of information saturation. Data collection was continued until no substantially new themes, categories, or insights emerged from subsequent interviews. Saturation was considered achieved after the seventh informant because the responses repeatedly confirmed similar patterns regarding the role of AI in planning, operational implementation, evaluation functions, and implementation barriers. Therefore, additional interviews were not expected to generate significant new analytical findings.

Data collection was conducted using three complementary techniques. First, in-depth interviews (*in-depth interview*) semi-structured interviews conducted during March-April 2026 with a duration of 60-90 minutes per informant, using a validated interview guide. Second, non-participant observation of the informants' digital operational activities through the platforms and applications they use. Third, a documentation study of operational records, simple financial reports, and screenshots of the AI application interface used by the informants. The interview guide was developed based on the dimensions of Management Control Systems proposed by Anthony & V.Govindarajan (2005) and the Levers of Control Framework developed by Baird et al., (2019). The interview questions explored the use of AI in planning, implementation, monitoring, evaluation, and managerial decision-making processes. Data validity was guaranteed through source triangulation (comparing data from various informants), technical triangulation (comparing data from interviews, observations,

and documentation), and members checking where the analysis results were reconfirmed with the informants to ensure the accuracy of the researcher's interpretation.

The data analysis process followed several coding stages. First, interview transcripts, observation notes, and supporting documents were subjected to open coding to identify meaningful statements related to AI adoption and management control practices. Second, similar codes were grouped through axial coding to generate broader categories such as planning efficiency, operational efficiency, evaluation effectiveness, and implementation barriers. Third, selective coding was conducted to develop overarching themes explaining the relationship between AI adoption and management control system effectiveness. Throughout the analysis process, an audit trail was maintained in the form of coding records, analytical memos, category development notes, and documentation logs to ensure transparency and traceability of the research findings.

To improve the transparency of the analysis, the coding process can be illustrated through one example. During an interview, one MSME owner stated, "Before using AI, I estimated inventory manually, but now the system automatically predicts product demand based on previous sales data." In the open coding stage, this statement was initially coded into several key concepts, including manual inventory estimation, AI-based demand prediction, and improved planning accuracy. These related codes were subsequently grouped during the axial coding stage into the broader category of planning efficiency, as they all reflected the role of AI in supporting planning activities. Finally, during the selective coding stage, this category was integrated into the overarching theme that Artificial Intelligence enhances the effectiveness of Management Control Systems by improving managerial planning and decision-making. The same analytical procedure was consistently applied to all interview transcripts, enabling the researchers to systematically identify relationships among categories and develop comprehensive themes that explain how AI contributes to planning, operational implementation, evaluation, and management control practices within digital MSMEs.

To improve data credibility, numerical information reported by informants, such as reductions in operational costs, error rates, or productivity improvements, was not treated as statistical evidence but as supporting qualitative evidence. Whenever possible, these claims were cross-checked against business documents, operational records, screenshots, or other supporting documentation provided by the informants during the research process.

RESULT AND DISCUSSION

Research Informant Profile

This research involved seven informants who were selected randomly *purposive* based on the relevance of their roles and experiences to the research focus. The selected informants represented different types of digital MSMEs and supporting stakeholders to provide variation in experiences regarding AI adoption. This diversity enabled the researcher to compare managerial practices across different business sectors and strengthen the credibility of the findings through cross-case comparison. The complete profiles of all informants are presented in Table 1 below.

Table 1. Profile of Research Informants

No	Name	Role	Business/Agency	AI Platform/Tools
1	Rizky Fauzan	Owner	RizkyWear (Online Fashion)	Shopee Ads AI, ChatGPT, Jurnal.id
2	Goddess Kusuma	Owner	Dewi's Kitchen (Culinary)	GrabFood AI, Moka POS, BukuWarung
3	Andi Pratama	Operations Manager	Kreasi Digital ID (Agency)	Jasper, Notion AI, Meta Ads AI
4	Siti Rahayu	Owner	Rahayu Craft (Handicraft)	ChatGPT, Canva AI, BukuKas
5	Hendra Wijaya	Owner	Clean Laundry (App-based)	WhatsApp Chatbot AI, Order Management System
6	Budi Santoso	MSME Consultant	Bandung City Cooperatives & MSMEs Service	—
7	Mega Lestari, SE, MM	Lecturers & Researchers	Pasundan University, Bandung	—

Source: Interview Data (2026)

Condition of MSME Management Control Before AI Adoption

All key informants consistently described similar management control conditions prior to adopting AI: manual, unstructured, and heavily reliant on owner intuition. A recurring theme emerging from all interviews was the absence of integrated management information systems prior to AI adoption. Although the specific operational challenges varied across sectors, all MSMEs experienced limitations in planning accuracy, operational monitoring, and evaluation processes. This consistency across multiple cases strengthens the credibility of the identified pattern. Rizky Fauzan (Informant 1) stated: *"Previously, things were very manual and disorganized. Stock was recorded in notebooks, financial reports were made in Excel, which often had input errors, and decision-making was largely based on intuition."* Dewi Kusuma (Informant 2) added that *raw material recording is done in a diary, often causing missed orders or sudden stockouts*. Hendra Wijaya (Informant 5) stated a similar situation: *orders received via WhatsApp are usually recorded on a whiteboard, customer names are often incorrectly recorded or pick-up and drop-off schedules are forgotten, and admin staff must be on standby 24/7, which is inefficient*. Siti Rahayu (Informant 4) even said *that business and personal finances are still mixed up because there is no system to separate the two*.

Table 2. Management Control Conditions Before AI Adoption

No	Informant	Listing Conditions	Evaluation Conditions	Planning Conditions
1	Rizky Fauzan	Notebook & Excel manual	End of the month, often wrong	Intuition-based
2	Goddess Kusuma	Diary, weekly recap	Unstructured	Manual estimation
3	Andi Pratama	Spreadsheet per employee	After the project is completed	Personal capacity
4	Siti Rahayu	Separate books per platform	Not routine	Based on experience
5	Hendra Wijaya	Whiteboard, 24-hour manual	There is no system	No forecasting

Source: Interview Data, processed (2026)

Results: The Role of AI in Planning Functions

Interview findings indicate that AI has shifted the planning function from an intuition-based approach to data-driven, predictive planning. The efficiency indicators reported in this study, including reductions in waste, administrative errors, and operational costs, were derived from information provided by informants and supported, where available, by business records, sales reports, inventory reports, accounting applications, and platform analytics reviewed during the documentation process. These figures are presented as qualitative evidence illustrating perceived organizational improvements rather than as statistically tested measurements. Rizky Fauzan stated: *"In planning, AI helps predict stock and product trends that will sell."* Dewi Kusuma (Informant 2) revealed that *the AI system in Moka POS is able to automatically predict daily raw material requirements, thus reducing*

material waste by almost 40%. Siti Rahayu (Informant 4) stated: *"In planning, AI helps me determine which products to produce more of based on sales trends."* From an academic perspective, Mega Lestari (Informant 7) confirmed: *"In planning, AI enables forecasting based on historical data that is far more accurate than human intuition."*

Table 3. Impact of AI on the Planning Function of MSMEs

No	Informant	AI Tools Used	Impact on Planning	Measurable Efficiency
1	Rizky Fauzan	Shopee Analytics AI, Jurnal.id	Accurate product stock & trend predictions	Save 4.5 million/month, input error ↓90%
2	Goddess Kusuma	Moka POS, GrabFood AI	Automatic daily raw material prediction	Material wastage ↓40%, material cost ↓from 60% to 45% of turnover
3	Andi Pratama	Meta Ads AI, Notion AI	Data-driven project capacity planning	Productivity ↑60%, HR costs ↓25%
4	Siti Rahayu	Tokopedia Ads AI, BukuKas	Product demand prediction per season	Turnover ↑35%, advertising costs ↓50%
5	Hendra Wijaya	AI management system	Daily machine capacity prediction	Fuel costs ↓30%/month

Source: Interview Data, processed (2026)

The efficiency indicators reported in this table are based on information provided by informants and supported, where available, by business records, platform analytics, inventory reports, and accounting documentation reviewed during the research process. The figures are presented as qualitative supporting evidence rather than statistically tested measurements.

Results: The Role of AI in Operational Execution Functions

In the implementation function, AI-based automation was the most directly impacted by all informants. Evidence obtained from interviews, observations, and supporting documents consistently indicated improvements in operational efficiency after AI adoption. However, the numerical values reported in Table 4 should be interpreted as business performance indicators reported by informants rather than objective statistical outcomes generated by the research itself. The purpose of presenting these figures is to provide contextual illustrations of the magnitude of operational changes experienced by the participating MSMEs. Hendra Wijaya (Informant 5) stated: *"The chatbot is the one that primarily answers customer questions 24/7, confirms orders, sends automatic laundry status notifications, and processes payments."* As a result, repeat orders increased by around 50% and revenue tripled compared to before implementation. Andi Pratama (Informant 3) said: *"Previously, creating a single copywriting content could take 2–3 hours, but now with AI, the initial draft is finished in 30 minutes, just need to be edited."* Siti Rahayu (Informant 4) stated that daily administration time was reduced from 3-4 hours to just 1-1.5 hours, thus increasing production capacity without adding employees. Complaints about content quality at Kreasi Digital ID (Informant 3) dropped from an average of 5 times per month to almost zero after the implementation of the AI quality control system.

Table 4. Impact of AI on Operational Execution Functions

No	Informant	Forms of AI Automation	Impact of Implementation
1	Rizky Fauzan	Automated CS templates, Shopee AI ads	Admin: 2 employees → 1, save Rp. 4.5 million/month
2	Goddess Kusuma	Restock notification, multi-platform management	Missed orders = 0, margin up
3	Andi Pratama	Notion AI task tracker, Jasper copywriting	Content time: 3 hours → 30 minutes, complaints → 0
4	Siti Rahayu	Multi-platform automated order queue	Daily admin: 4 hours → 1.5 hours
5	Hendra Wijaya	24/7 chatbot, AI shuttle routing	Admin: 6 million/month → 2 million/month, repeat orders ↑50%

Source: Interview Data, processed (2026)

Note: Operational performance indicators presented in this table were obtained from interview data and supporting business documents. These figures are intended to illustrate organizational changes perceived by informants and should not be interpreted as results of statistical testing.

Results: The Role of AI in Financial Evaluation and Control Functions

In the evaluation function, AI enables real-time performance monitoring, *real-time* which was previously impossible to do manually. The findings suggest that AI contributes to faster access to business information, more timely reporting, and improved monitoring capabilities. Several informants supported these claims by showing transaction dashboards, accounting applications, inventory records, and financial summaries generated by AI-enabled systems. These documentary materials were used to corroborate interview statements and enhance data trustworthiness. Rizky Fauzan (Informant 1) stated: *"Now stock is monitored in real-time, financial reports are automatically issued every month, and I can see sales trends per week."* Dewi Kusuma (Informant 2) revealed an important finding from the analytics system: *"I can see which platform is the most profitable. I didn't know that Shopee Food actually had the highest margin, that was discovered after using the analytics system."* Hendra Wijaya (Informant 5) added: *"Financial reconciliation that used to take a whole day is now completed in 30 minutes."* Budi Santoso as a consultant (Informant 6) confirmed from macro data: *MSMEs that adopted at least one AI tool based on management control experienced an average turnover growth of 28% higher than those that still used manual.* The consultant's statement regarding higher turnover growth should be interpreted as an expert assessment based on his experience assisting MSMEs rather than as a formal statistical comparison conducted within this research.

Table 5. Impact of AI on Financial Evaluation and Control Functions

No	Informant	AI Evaluation System	Changes Before → After
1	Rizky Fauzan	Jurnal.id AI, Shopee dashboard	Manual monthly report → daily automatic, error ↓90%
2	Goddess Kusuma	GrabFood analytics, BukuWarung	Material expenditure: 60% → 45–48% of turnover
3	Andi Pratama	AI accounting software per project	Loss detection: after completion → during running
4	Siti Rahayu	BukuKas AI analytics	Business & personal finances neatly separated, efficient advertising ↑
5	Hendra Wijaya	Digital transaction dashboard	Reconciliation: 1 day → 30 minutes, cash loss = 0

Note: Financial evaluation indicators reported in this table are derived from informant accounts and supporting documentation reviewed during the study. The indicators serve as

contextual evidence of perceived improvements following AI adoption rather than statistically validated performance measures.

Results: AI Implementation Barriers

Despite the tangible benefits, all informants also revealed concrete obstacles. An important finding is that implementation barriers were not uniform across all cases. Human resource adaptation issues were more prominent among owner-managed MSMEs with older employees, whereas data security concerns were more evident in digital service businesses handling client information. These findings indicate that AI implementation challenges may vary depending on organizational characteristics and business sector conditions. Rizky Fauzan stated: *"The initial challenge was human resource adaptation. It was a bit difficult to teach more senior employees to use the new system. It took about two months."* Overall, the results demonstrate that the effectiveness of AI adoption is influenced not only by technological capability but also by organizational readiness, employee competence, data quality, and supporting infrastructure. These contextual factors emerged repeatedly across interviews and represent important conditions for successful AI-enabled management control systems. Dewi Kusuma admitted: *"Internet connection is sometimes a big problem, if the network goes down the system goes haywire and has to go back to manual."* Andi Pratama highlighted the data security risks: *"There are concerns about the security of client data entering third-party AI systems."* Mega Lestari (Informant 7) from an academic perspective warned: *"Over-reliance on systems managers who rely too much on AI can lose their manual analytical capabilities,"* as well as the risk of garbage in garbage out if the input data is inaccurate.

Table 6. Summary of AI Implementation Constraints in Bandung Digital MSMEs

No	Types of Constraints	Informants who experienced	Information
1	Human resource literacy & adaptation	Rizky, Dewi, Siti	It takes 1–2 months to adapt, especially for senior employees.
2	Internet dependence	Dewi, Hendra, Andi	Operations paralyzed when connection is interrupted
3	Over-reliance & competency degradation	Andi, Hendra, Mega Lestari	Manual capacity will weaken if AI continues to be relied upon
4	Data security	Andi Pratama	Client data goes into a third-party AI system
5	Data input consistency	Siti Rahayu	Analytics are inaccurate if input is inconsistent
6	Initial investment costs	Hendra Wijaya	System setup Rp. 15 million, BEP ±8 months

Source: Interview Data, processed (2026)

DISCUSSION

1. AI as a Catalyst for the Transformation of Planning Functions in MCS

The research findings confirm that AI adoption has shifted the planning paradigm of MSMEs from a reactive-intuitive approach to data-driven predictive planning. Beyond the observable efficiency improvements, the findings suggest that AI influences planning effectiveness by increasing information-processing capability. From the Resource-Based View (RBV), AI can be understood as a strategic organizational resource that enhances managerial access to timely and relevant information. This capability reduces information asymmetry and uncertainty, enabling MSME owners to make planning decisions based on evidence rather than intuition alone. Consequently, the contribution of AI is not limited to automation but extends to improving the quality of managerial judgment within the planning process. This shift aligns with the MCS framework proposed by (Strauss & Zecher, 2013),

where the effectiveness of the planning function is determined by the quality, speed, and accuracy of the information available to decision-makers. AI addresses all three dimensions simultaneously at an increasingly affordable cost, something previously only accessible to large companies with expensive ERP systems. (Amira & Nasution, 2023) also found that AI contributes significantly to improving the efficiency of MSME resource planning through fast and accurate historical data processing.

Furthermore, the use of AI in planning at the digital MSME level in Bandung is not only limited to planning physical resources such as inventory and raw materials but also include planning marketing strategies based on consumer data. Andi Pratama from Kreasi Digital ID explicitly stated that Meta Ads AI enables his team to design much more precise campaigns because it can analyze millions of consumer interaction points in a short time. The findings also indicate sectoral differences in the utilization of AI for planning. In culinary businesses, AI was primarily used for inventory and raw material forecasting, while in digital agencies it was utilized for project capacity planning and marketing optimization. Handicraft businesses relied on AI to identify seasonal demand patterns. These variations demonstrate that AI adoption is shaped by operational characteristics and managerial priorities within each business sector. This represents what is meant by (Suarantalla, 2025) This is referred to as the transition of MSMEs from data-poor to data-driven decision-making, where every planning decision has a verifiable empirical basis. This shift theoretically strengthens the diagnostic control systems dimension within the framework. (Baird et al., 2019), especially the ability to set more measurable targets and systematically monitor their achievement.

The most important implication of these findings is that AI has democratized access to advanced planning capabilities previously reserved for large corporations. From a Dynamic Capability perspective, AI strengthens the ability of MSMEs to sense market changes, seize business opportunities, and reconfigure organizational resources more rapidly. Therefore, the planning benefits observed in this study should not be interpreted merely as technological outcomes but as indicators of enhanced organizational adaptability in increasingly dynamic business environments. MSMEs can now *demand forecasting*, market trend analysis, and business scenario simulations at a very affordable cost through a subscription-based cloud platform. However, the accuracy of AI output is highly dependent on the quality and consistency of the input data, a principle Mega Lestari (Informant 7) calls "garbage in, garbage out." This situation emphasizes that the adoption of AI in MSME planning must be accompanied by increased discipline in data collection and digital literacy, so that AI's predictive analytical potential can be fully optimized. (Le Dinh et al., 2025) In their study of MSMEs in various developing countries, they confirmed that internal data quality is a major determining factor in the success of AI adoption for business planning.

The findings also suggest that AI indirectly contributes to the strengthening of belief systems by improving the communication of organizational goals through data-driven performance targets and transparent planning processes. Employees become more aware of organizational priorities because performance expectations are increasingly supported by objective information rather than subjective managerial judgments. This condition may contribute to greater organizational alignment and strategic consistency within MSMEs.

2. AI as a Driver of Operational Efficiency

In terms of implementation, the research findings indicate that AI-based automation is the most immediate benefit felt by all key informants and provides the most measurable financial impact. The operational efficiency generated by AI appears to result from the reduction of repetitive administrative activities that previously consumed significant managerial attention. Automation allows business owners and employees to redirect their efforts toward higher-value activities such as customer relationship development, innovation, and strategic decision-making. This finding supports the argument that AI functions as an

enabler of organizational productivity rather than merely a labor-saving technology. Documented operational cost savings are substantial: Bersih Laundry successfully reduced administrative costs from IDR 6 million to IDR 2 million per month, RizkyWear reduced the number of administrative employees from two to one, saving IDR 4.5 million per month, and Kreasi Digital ID recorded a 25% reduction in human resource costs without reducing production capacity. These findings strengthen the argument.(Verdiana & Fachir, 2023) that the integration of AI in MSME management strategies can significantly optimize the allocation of operational resources through intelligent and adaptive automation mechanisms, while freeing up human resources to focus on higher value-added work.

Customer service automation through *chat but* AI-based systems are the most prominent manifestation of operational transformation in the MSMEs studied. The findings further suggest that AI contributes to strengthening both diagnostic and interactive control mechanisms. Diagnostic controls are enhanced through automated monitoring and reporting, while interactive controls are strengthened because managers receive faster feedback regarding customer behavior, operational bottlenecks, and service performance. This continuous feedback cycle enables more responsive managerial interventions. Hendra Wijaya from Bersih Laundry demonstrated that an AI chatbot can handle the entire customer service cycle, from order receipt and confirmation to status updates to payment processing, 24/7, without human intervention. As a result, repeat orders increased by 50% and revenue tripled. This represents the transformation of interactive control systems within the framework of(Baird et al., 2019), where the system not only monitors performance but actively responds and adapts to operational conditions automatically. (Trifia et al., 2024) confirming that AI-based automation consistently improves the response speed and consistency of digital MSME services in Indonesia, which ultimately has a positive impact on customer satisfaction and loyalty.

While the operational benefits of AI are clear, research findings also reveal that successful implementation is not automatic. An important insight emerging from the interviews is that technological sophistication alone does not guarantee successful implementation. MSMEs with higher levels of digital literacy and stronger organizational readiness appeared to derive greater benefits from AI adoption. Conversely, businesses with limited employee competencies or weak digital infrastructure experienced longer adaptation periods and greater implementation challenges. This finding suggests that organizational readiness acts as an important moderating factor influencing the effectiveness of AI adoption. Andi Pratama of Kreasi Digital ID emphasized that reliance on AI carries its own risks: when *tools* When a system experiences a disruption or algorithm change, the entire team must adapt quickly, which can significantly disrupt operations. Hendra Wijaya added that when the system goes down, operations must suddenly revert to manual procedures. This situation reflects the findings.(Rahayu & Veri, 2025) that the success of a digital-based management information system in MSMEs is largely determined by the readiness of human resources and the availability of adequate backup procedures, not solely by the sophistication of the technology adopted.

Beyond operational efficiency, AI also contributes to strengthening boundary systems by establishing clearer operational controls and reducing the likelihood of procedural deviations. Automated workflows, digital approval mechanisms, and AI-supported monitoring systems create operational boundaries that guide employee behavior and ensure compliance with organizational procedures. This function is particularly important for MSMEs that previously relied heavily on informal control mechanisms and manual supervision.

3. AI as an Instrument to Strengthen Financial Evaluation and Control

The AI-based evaluation function discovered in this study demonstrates the most fundamental transformation in the digital MSME management control paradigm. The primary mechanism underlying this transformation is the ability of AI systems to convert large volumes of operational data into actionable managerial information. Prior to AI adoption, business data often remained fragmented and underutilized. AI-enabled systems integrate, analyze, and visualize information in a manner that supports continuous monitoring and faster decision-making. As a result, evaluation activities evolve from retrospective assessments into proactive management processes. Prior to AI adoption, performance evaluations were conducted periodically and retrospectively. Informants only learned about their financial condition and business performance after a manual recap process was completed, which took days. After AI adoption, evaluation shifted to a more hands-on approach *real-time* and proactive. Rizky Fauzan stated frankly: "Previously, I only knew my profit or loss after the end of the month, but now I can find out anytime." Andi Pratama of Kreasi Digital ID revealed that the AI system is now able to detect potentially loss-making projects while they are still underway, not after completion. This finding directly confirms the effectiveness of diagnostic control systems within the framework.(Baird et al., 2019) which is strengthened by AI technology, as also evidenced by (Zhao et al., 2022) that AI-based accounting systems significantly improve the accuracy and speed of financial reporting in MSMEs.

An evaluation dimension that is no less important is the ability of AI to reveal *insight* Businesses previously hidden behind raw data too complex to analyze manually. These findings extend previous studies by demonstrating that AI not only improves reporting efficiency but also enhances organizational learning. Through continuous access to performance feedback, managers become more capable of identifying trends, recognizing emerging risks, and adjusting business strategies accordingly. This process reflects the essence of interactive control systems, where learning and adaptation become integral components of management control. Dewi Kusuma of Dapur Dewi revealed that it was the AI analytics system that first demonstrated that Shopee Food was the platform with the highest margins among all the platforms she uses crucial information she never knew during years of manual operations. Similar findings were seen by Siti Rahayu of Rahayu Craft, who only realized the efficiency of her advertising spending after the AI system automatically compared returns on investment per platform. Budi Santoso of the Bandung City Cooperatives Office confirmed that, based on an evaluation of 50 fostered MSMEs, those adopting AI experienced an average 28% higher turnover growth.(Hapiz et al., 2025) previously identified weaknesses in evaluation systems as a major obstacle to the growth of Indonesian MSMEs, and the findings of this study confirm AI as a relevant and accessible solution.

Overall, the transformation of the evaluation function through AI in digital MSMEs in Bandung City not only improves the technical efficiency of reporting but also fundamentally changes the way MSMEs understand and manage their businesses. Nevertheless, the findings also indicate potential risks associated with excessive reliance on AI-generated outputs. Several informants expressed concerns regarding declining manual analytical capabilities, dependence on external platforms, and vulnerability to inaccurate input data. These concerns suggest that AI should be positioned as a decision-support tool rather than a substitute for managerial judgment. Effective management control continues to require human oversight, contextual understanding, and strategic interpretation. When evaluation is *realtime* and automatically, managerial decision making no longer waits for periodic reports that are outdated when received. Interactive control capacity within the framework (Baird et al., 2019) that is, the organization's ability to learn and adapt based on feedback increases

dramatically because the feedback cycle becomes much shorter and more accurate. (Santosa, 2026) in their systematic literature review confirmed that the efficiency dimension of financial evaluation and control is the area where AI has the most consistent and measurable impact on digital MSMEs, and the findings of this study provide empirical field evidence that strengthens this conclusion. Wicaksono et al., (2024) adding that the effectiveness of AI in this context is highly dependent on the ability of business actors to provide contextual considerations to the output produced by the AI system, so that the final decision still reflects a deep understanding of the specific business conditions. Theoretically, this study contributes to the Management Control Systems literature by showing that the benefits of AI adoption are realized not merely through technological automation, but through its ability to improve planning accuracy, operational efficiency, and evaluation effectiveness. These improvements strengthen management control practices and ultimately contribute to better organizational performance. Consequently, this study enriches the growing body of literature on digital transformation by providing empirical evidence on how AI supports managerial control processes within MSMEs.

Taken together, the findings indicate that AI adoption has implications across all dimensions of the Levers of Control framework. While the strongest effects were observed in diagnostic and interactive controls, evidence also suggests contributions to belief systems through improved strategic communication and to boundary systems through enhanced monitoring and compliance mechanisms. This broader perspective highlights the transformative role of AI in modern management control systems within MSMEs.

The findings should be interpreted within the specific context of digital MSMEs operating in Bandung City. Therefore, the results are intended to provide analytical and theoretical insights rather than statistical generalizations applicable to all MSMEs in Indonesia. Differences in technological readiness, organizational capacity, and regional conditions may influence the extent to which similar outcomes can be achieved in other contexts.

4. Managerial Implications

The findings of this study provide several practical implications for MSME owners, policymakers, and technology providers. For MSME owners, AI adoption should be viewed as a strategic investment that supports planning accuracy, operational efficiency, and managerial control effectiveness. However, the benefits of AI can only be maximized when accompanied by improvements in employee digital literacy, data quality management, and organizational readiness.

For policymakers, the findings highlight the importance of strengthening digital transformation programs through practical AI training, affordable technology access, and improvements in digital infrastructure. Government agencies responsible for MSME development should also encourage collaborations between MSMEs, universities, and technology providers to accelerate knowledge transfer and innovation adoption.

For technology providers, the results suggest a growing demand for AI solutions specifically designed for MSMEs. User-friendly interfaces, affordable pricing models, and localized support services may increase adoption rates and reduce implementation barriers among smaller businesses.

CONCLUSION

This study contributes to the Management Control Systems (MCS) literature by providing empirical evidence that Artificial Intelligence (AI) functions not only as an operational automation technology but also as a strategic management control mechanism that strengthens managerial planning, operational implementation, and evaluation within digital MSMEs. By integrating the perspectives of Artificial Intelligence and the

Management Control Systems framework, particularly the Levers of Control, this research extends previous studies that primarily examined AI from the perspective of business performance, productivity, or digital transformation. The findings demonstrate that AI reshapes management control processes by improving information quality, enabling real-time monitoring, supporting evidence-based decision-making, and facilitating organizational learning in resource-constrained MSMEs. This contribution broadens the theoretical understanding of how AI can be embedded within management control practices, especially in the context of developing economies and digitally transforming MSMEs.

Furthermore, this study provides contextual evidence from Bandung City, whose distinctive digital business ecosystem offers valuable insights into the interaction between technological innovation and managerial control practices. The findings indicate that the effectiveness of AI implementation depends not only on technological capability but also on organizational readiness, digital literacy, and the ability of managers to integrate AI-generated insights into strategic decision-making. Consequently, this research advances the growing body of knowledge on AI-enabled management control by emphasizing the complementary relationship between intelligent technologies and human managerial judgment rather than viewing AI solely as a replacement for managerial functions.

The practical implications suggest that successful AI implementation requires an integrated approach combining technological adoption, human resource development, and institutional support. Therefore, MSME owners, policymakers, and supporting institutions should focus not only on expanding AI accessibility but also on strengthening digital competencies and governance mechanisms that ensure AI is used responsibly and effectively.

Despite these contributions, this study has several limitations. The findings are based on a qualitative case study involving a limited number of digital MSMEs in Bandung City and are intended to provide analytical rather than statistical generalization. Future research is encouraged to examine different geographical contexts, include larger and more diverse samples, and employ mixed-methods or quantitative approaches to validate and extend the proposed relationship between AI adoption, management control effectiveness, and organizational performance. In addition, future studies may further explore the role of belief systems and boundary systems within the Levers of Control framework to develop a more comprehensive understanding of AI-enabled management control in MSMEs.

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