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Digital Transformation Strategies for Effective Business Management in SMEs: A SmartPLS Approach

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ABSTRACT

Small and Medium Enterprises (SMEs) in Tangerang, Indonesia, significantly contribute to economic development but face barriers in adopting digital technologies, such as limited resources, lack of digital skills, and organizational resistance. Digital transformation, encompassing **cloud computing**, **digital marketing**, **automation**, and **data analytics**, is increasingly recognized as essential for business growth and efficiency. **The primary objective** of this study is to examine the impact of digital transformation strategies on operational efficiency, customer engagement, and overall performance in SMEs. Using a **quantitative research approach**, Partial Least Squares Structural Equation Modeling (SmartPLS) was applied to analyze data from 150 SMEs in Tangerang. The research measured the relationship between digital transformation strategies and key performance indicators. **The results indicate** that **cloud computing** and **data analytics** significantly improve operational efficiency by streamlining processes and enabling data-driven decision-making. Meanwhile, **digital marketing** and **automation** enhance customer engagement and market competitiveness, with SMEs showing stronger customer relationships and improved market positions. **This study highlights** the importance of adopting digital transformation to enhance SME business management and achieve sustainable growth. It offers practical insights for managers and policymakers and encourages future research on the long-term effects of digital transformation on SME resilience and innovation.

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1. INTRODUCTION

Small and Medium Enterprises (SMEs) play a pivotal role in driving economic growth, generating employment, and fostering innovation, particularly in emerging markets such as Indonesia [1]. SMEs contribute significantly to national GDP and job creation; however, they often encounter unique challenges in scaling their operations and remaining competitive in an increasingly digitalized global environment [2]. In recent years, digital transformation has become a critical strategy for SMEs to streamline operations, enhance customer engagement, and adapt to dynamic market demands. Digital transformation enables businesses to integrate

advanced technologies into their processes, providing a pathway to improved productivity, reduced costs, and stronger customer relationships [3].

Despite its importance, many SMEs face significant barriers in adopting digital technologies, such as limited financial resources, inadequate technical expertise, and organizational resistance to change. These challenges hinder their ability to leverage digital transformation effectively, leaving them at a competitive disadvantage compared to larger enterprises. Tangerang, a rapidly developing city in Indonesia, hosts a diverse range of SMEs operating in industries such as manufacturing, retail, and services [4]. While the potential benefits of digital transformation are well-recognized, SMEs in this region have been slow to adopt digital technologies due to financial constraints, limited access to digital infrastructure, and a lack of tailored support from government and industry stakeholders. This slow adoption jeopardizes their ability to compete with larger enterprises that have already embraced advanced digital tools and strategies, further widening the digital divide [5].

Moreover, the COVID-19 pandemic has accelerated the global shift towards digitalization, intensifying the pressure on SMEs to modernize their operations. The pandemic highlighted the vulnerability of businesses reliant on traditional methods and underscored the need for resilience through digital transformation. For SMEs in Tangerang, digital technologies such as cloud computing, digital marketing, automation, and data analytics offer immense potential to overcome operational bottlenecks, improve customer engagement, and enhance market positioning [6]. However, realizing these benefits requires a clear understanding of the challenges and opportunities inherent in the digital transformation journey.

Given these challenges, it is crucial to explore how SMEs in Tangerang can successfully implement digital transformation strategies to enhance their business management practices and achieve sustainable growth [7]. The strategic adoption of digital tools can not only address internal inefficiencies but also enable SMEs to respond more effectively to external market demands. This study aims to investigate the impact of digital transformation strategies on business management effectiveness in SMEs located in Tangerang. Specifically, it examines the influence of strategies such as cloud computing, digital marketing, automation, and data analytics on key performance indicators, including operational efficiency, customer engagement, and business competitiveness [8]. By employing Partial Least Squares Structural Equation Modeling (SmartPLS), this research provides empirical evidence on the relationship between digital transformation and business performance in the SME sector. The findings aim to offer practical insights for policymakers, industry leaders, and SME managers seeking to navigate the complexities of digital transformation in an increasingly interconnected world [9].

Furthermore, this research contributes to the growing body of knowledge on digital transformation in SMEs by focusing on an emerging market context [10]. While much of the existing literature emphasizes developed economies with robust digital ecosystems, this study highlights the unique challenges faced by SMEs in developing markets such as Tangerang. By addressing these gaps, the research seeks to provide actionable recommendations for fostering digital adoption and driving sustainable growth in the SME sector [8].

2. LITERATURE REVIEW

2.1. Digital Transformation in SMEs

Digital transformation (DT) refers to the integration of digital technologies into all areas of business, fundamentally altering how businesses operate and deliver value to customers. For Small and Medium Enterprises (SMEs), DT extends beyond the adoption of new technologies to include a rethinking of business models, processes, and organizational culture. SMEs, particularly in developing countries like Indonesia, are increasingly recognizing the necessity of digitalization to enhance competitiveness, improve operational efficiency, and engage more effectively with customers [9].

SMEs in Indonesia, including those in Tangerang, face unique challenges in their digital transformation journey. Unlike large enterprises, which often have extensive financial and technical resources, SMEs typically encounter constraints such as limited budgets, lack of technical expertise, and resistance to change within their organizations [11]. Nonetheless, studies indicate that SMEs capable of successfully implementing DT achieve greater productivity, enhanced customer experiences, and improved decision-making capabilities through the adoption of digital tools [12].

2.2. Key Digital Transformation Strategies for SMEs

Several key digital transformation strategies have been identified as drivers for improving business management in SMEs. These strategies involve the adoption of technologies that streamline processes, enhance customer interactions, and optimize operations.

1. **Cloud Computing:** Cloud-based solutions provide SMEs with cost-effective access to advanced IT infrastructure, enabling scalability, data storage, and remote work capabilities. This approach helps SMEs reduce operational costs, enhance collaboration, and gain real-time insights into business performance [13]. In the context of Tangerang, cloud computing offers a practical way for SMEs to overcome resource limitations by accessing tools that would otherwise be financially prohibitive.
2. **Digital Marketing:** Digital marketing includes strategies such as social media marketing, email marketing, search engine optimization (SEO), and content marketing. These tools enable SMEs to reach broader audiences, enhance brand visibility, and engage with customers on a personalized level. For SMEs in competitive markets like Tangerang, digital marketing is crucial as consumer behavior increasingly depends on online interactions [14].
3. **Automation and Process Optimization:** Automation technologies, such as robotic process automation (RPA) and artificial intelligence (AI), allow SMEs to reduce repetitive tasks, minimize human error, and improve operational efficiency. This strategy frees up resources for strategic initiatives and enhances internal processes, including inventory management and customer service [15].
4. **Data Analytics:** The ability to analyze large datasets is a fundamental aspect of digital transformation. Data analytics provides SMEs with actionable insights for decision-making, trend prediction, and customer experience improvement. SMEs leveraging data analytics can gain competitive insights and fine-tune their strategies to align with market demands [16].

2.3. Business Management in SMEs

Effective business management is vital for the sustained success of SMEs. In the context of digital transformation, management practices must adapt to incorporate digital tools that improve operational efficiency, decision-making, and customer relationship management [17]. Traditional management practices, often reliant on manual processes, tend to be slow, error-prone, and less responsive to market dynamics. By integrating digital technologies, SMEs can enhance their agility, responsiveness, and overall management effectiveness [18].

Research demonstrates that SMEs integrating digital transformation into their management practices achieve better outcomes in terms of productivity, customer satisfaction, and market positioning. For example, adopting cloud computing and automation improves supply chain management and reduces inefficiencies, while digital marketing enhances customer engagement and loyalty [19].

2.4. The Role of SmartPLS in Digital Transformation Research

Partial Least Squares Structural Equation Modeling (SmartPLS) has emerged as a robust tool for analyzing complex models with multiple variables and relationships. SmartPLS is particularly suited for research in SMEs due to its ability to handle data that does not meet traditional SEM assumptions, such as normality or large sample sizes [20].

SmartPLS has been utilized in various studies to explore the impact of digital tools (e.g., cloud computing, digital marketing, automation) on business outcomes, including operational efficiency, customer satisfaction, and financial performance [21]. This method enables researchers to assess both direct and indirect effects, providing a comprehensive understanding of how DT influences SME performance.

In this study, SmartPLS will be employed to test the relationships between digital transformation strategies and business management outcomes in SMEs in Tangerang. This approach will contribute to the growing body of knowledge on the role of digital transformation in improving SME practices, particularly in emerging markets.

2.5. Research Gaps and Future Directions

Despite the expanding literature on digital transformation in SMEs, significant research gaps remain. Limited attention has been given to SMEs in Tangerang or other regions in Indonesia. While existing studies highlight the importance of DT, most have been conducted in developed economies with higher digital adoption rates. Further research is needed to explore the unique challenges and opportunities for SMEs in developing markets like Tangerang.

Existing studies often focus on individual digital transformation (DT) strategies, with limited exploration of how multiple strategies interact to influence overall business outcomes. The combined implementation of multiple DT strategies—such as cloud computing, digital marketing, automation, and data analytics—may create synergistic effects that amplify their impact on operational efficiency, customer engagement, and market competitiveness. For example, integrating automation with data analytics can enable real-time decision-making while streamlining processes, while combining digital marketing with cloud computing enhances customer outreach through scalable platforms and data-driven targeting. Understanding these interactions is crucial for SMEs to prioritize and integrate multiple strategies effectively, maximizing their benefits. Future research should examine these interactions, exploring how organizational factors such as culture and leadership mediate the success of combined strategies. Longitudinal studies could further provide insights into the long-term implications of these interactions on SME resilience, adaptability, and innovation, particularly in the context of rapidly evolving digital landscapes. Addressing these gaps would contribute to a more comprehensive understanding of how digital transformation can optimize business management practices.

3. RESEARCH METHOD

3.1. Research Design

This study adopts a quantitative research design to investigate the impact of digital transformation strategies on business management practices in Small and Medium Enterprises (SMEs) located in Tangerang, Indonesia. The quantitative approach was chosen for its ability to systematically measure relationships between variables, particularly the influence of digital transformation on key performance indicators such as operational efficiency, customer engagement, and market competitiveness. The research employs a cross-sectional design, collecting data at a single point in time to provide a snapshot of how digital transformation strategies are currently implemented within SMEs in the region.

3.2. Population and Sample

The study's population consists of SMEs in Tangerang, a rapidly growing urban area in Indonesia with diverse industries, including manufacturing, retail, and services. SMEs in this region face distinct challenges related to resource limitations and digital adoption, making it an ideal setting to investigate the impact of digital transformation.

A purposive sampling technique was employed to select 150 SMEs actively engaged in digital transformation initiatives, such as adopting cloud computing, digital marketing, automation, or data analytics. The selection criteria required SMEs to:

1. Be categorized as small or medium enterprises according to Indonesian government regulations.
2. Have implemented at least one digital transformation strategy within the past two years.

The sample size of 150 SMEs is deemed sufficient for reliable and valid results, enabling the use of Partial Least Squares Structural Equation Modeling (SmartPLS) for data analysis.

3.3. Data Collection

Data were collected using a structured survey questionnaire designed to measure the extent of digital transformation strategies employed by SMEs and their impact on business management. The questionnaire comprised the following sections:

1. **Demographic Information:** Basic information about the SME, such as size, industry sector, and years in operation.
2. **Digital Transformation Strategies:** Questions on the adoption of digital technologies, including cloud computing, digital marketing, automation, and data analytics. Respondents rated the level of implementation on a 5-point Likert scale, ranging from *Not Implemented* to *Fully Implemented*.
3. **Business Management Outcomes:** Items assessing the impact of digital transformation on key business performance indicators, such as operational efficiency, customer engagement, and market competitiveness. Respondents rated statements on a 5-point Likert scale, from *Strongly Disagree* to *Strongly Agree*.

4. **Control Variables:** Additional questions to capture factors that might influence the relationship between digital transformation and business outcomes, such as company size, management experience, and financial resources.

The survey was administered to key decision-makers, including business owners, CEOs, and IT managers, who were knowledgeable about their companies' digital transformation efforts and business performance. To ensure a diverse range of responses, the survey was distributed both online and in paper format. A pre-test was conducted with a small group of SMEs to ensure the reliability and validity of the questionnaire.

3.4. Conceptual Framework and Hypotheses Development

The conceptual framework of this study, as illustrated in Figure 1, depicts the relationships between the independent variables (digital transformation strategies) and the dependent variables (business management outcomes). The framework highlights four key independent variables—**Cloud Computing (CC)**, **Digital Marketing (DM)**, **Automation (AU)**, and **Data Analytics (DA)**—and their respective influence on three dependent variables—**Operational Efficiency (OE)**, **Customer Engagement (CE)**, and **Market Competitiveness (MC)**. Each construct is measured by multiple indicators, as shown in the figure.

The model hypothesizes that:

1. **Cloud Computing (CC)** positively impacts Operational Efficiency (OE), Customer Engagement (CE), and Market Competitiveness (MC).
2. **Digital Marketing (DM)** enhances OE, CE, and MC through improved customer outreach and personalization.
3. **Automation (AU)** contributes to higher OE, CE, and MC by optimizing internal processes and reducing errors.
4. **Data Analytics (DA)** supports OE, CE, and MC by enabling data-driven decision-making and insights.

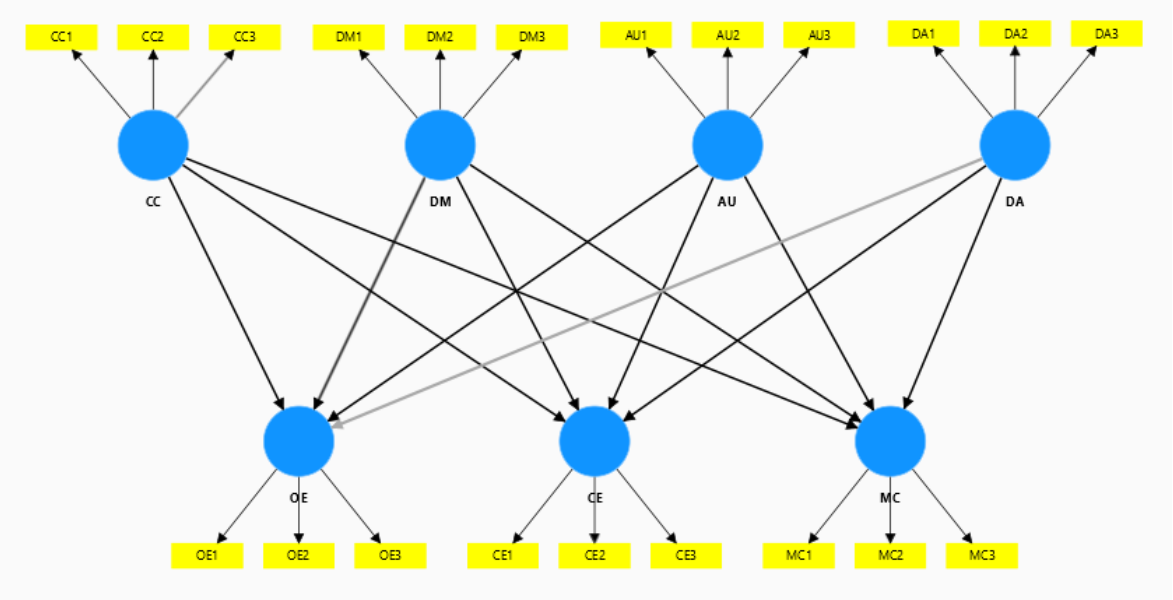

Figure 1. Conceptual Framework and Hypotheses Model

Figure 1 illustrates the conceptual framework and hypotheses tested in this study. The independent variables (Cloud Computing, Digital Marketing, Automation, and Data Analytics) are represented on the top layer and are connected to the dependent variables (Operational Efficiency, Customer Engagement, and Market Competitiveness) in the lower layer. Each construct is measured by its respective indicators (yellow nodes), providing a comprehensive model for analyzing the relationships between digital transformation strategies and business management outcomes. The arrows represent the hypothesized causal relationships, which were

tested using Partial Least Squares Structural Equation Modeling (SmartPLS). This framework offers a visual representation of the study's core objectives and forms the basis for empirical analysis.

3.5. Data Analysis

The collected data were analyzed using Partial Least Squares Structural Equation Modeling (SmartPLS), a robust statistical technique suitable for examining complex relationships among multiple variables. SmartPLS was selected for its ability to handle small sample sizes, non-normal data distributions, and models with multiple constructs. The analysis comprised the following steps:

1. **Model Specification:** The theoretical model includes digital transformation strategies (cloud computing, digital marketing, automation, and data analytics) as independent variables and business management outcomes (operational efficiency, customer engagement, and market competitiveness) as dependent variables. Control variables, such as company size and financial resources, were included to account for their potential influence.

2. **Measurement Model Assessment:** The reliability and validity of the measurement model were evaluated using:

   (a) *Convergent Validity:* Assessed using Average Variance Extracted (AVE).

   (b) *Discriminant Validity:* Evaluated using the Fornell-Larcker criterion and Heterotrait-Monotrait ratio (HTMT).

   (c) *Internal Consistency:* Measured through composite reliability scores.

3. **Structural Model Assessment:** The relationships between digital transformation strategies and business management outcomes were examined. Path coefficients were analyzed for their strength and significance, while R^2 values assessed the model's explanatory power. Effect size (f^2) and predictive relevance (Q^2) were also evaluated.

4. **Hypothesis Testing:** Hypotheses were tested using bootstrapping, a resampling technique, to estimate the significance of path coefficients. The significance level was set at $p < 0.05$, and confidence intervals were calculated to ensure robustness.

3.6. Ethical Considerations

This study adhered to ethical guidelines to ensure the integrity and confidentiality of collected data. Informed consent was obtained from all participants, who were assured that their participation was voluntary and their responses would remain confidential. The survey included a clear explanation of the research purpose and the potential benefits of the study for SMEs in Tangerang. Data were securely stored and used solely for research purposes.

3.7. Limitations

Although this study provides valuable insights into the impact of digital transformation strategies on SMEs, it has several limitations:

1. The cross-sectional design limits the ability to establish causality or observe long-term impacts. Future research could employ longitudinal designs to track digital transformation effects over time.

2. The focus on SMEs in Tangerang may limit the generalizability of findings to other regions or countries.

3. The study examines four key digital transformation strategies but does not account for other influential factors, such as organizational culture and external market forces.

4. RESULTS AND DISCUSSION

4.1. Results

This study examined the impact of four key digital transformation strategies on SMEs in Tangerang: cloud computing, digital marketing, automation, and data analytics. Data collected from 150 SME owners and managers revealed significant findings, as described below.

1. **Impact of Cloud Computing on Operational Efficiency**
   Cloud computing significantly enhances the operational efficiency of SMEs by streamlining business processes, reducing infrastructure costs, and improving collaboration across departments. By adopting cloud-based solutions, SMEs can access scalable and cost-effective infrastructure, enabling them to optimize resource allocation and focus on core business activities. This technology also facilitates real-time data access and sharing, ensuring better coordination and faster decision-making across teams. Additionally, cloud computing reduces the need for extensive on-premise IT infrastructure, lowering maintenance costs and minimizing downtime. Table 1 summarizes the relationship between the adoption of cloud computing and various operational efficiency metrics, providing empirical evidence of its transformative impact on SME performance.

Table 1. Impact of Cloud Computing on Operational Efficiency in SMEs

Operational Efficiency Metric	Mean Score (out of 5)	Standard Deviation
Process Streamlining	4.2	0.85
Cost Reduction	4.1	0.79
Collaboration Improvement	4.5	0.76

Table 1 shows that cloud computing positively impacts operational efficiency, with process streamlining (4.2), cost reduction (4.1), and collaboration improvement (4.5) receiving high mean scores. These results demonstrate the significant role of cloud computing in optimizing workflows and minimizing inefficiencies. By adopting cloud-based solutions, SMEs can replace traditional, on-premise systems with scalable infrastructure, reducing the need for substantial upfront investments in hardware and ongoing maintenance. This shift not only lowers operational costs but also allows SMEs to reallocate resources to more strategic initiatives. Additionally, the ability to streamline processes through cloud technologies ensures better coordination and faster communication across departments, critical for improving overall productivity and minimizing delays in day-to-day operations.

The high score for collaboration improvement (4.5) highlights the transformative potential of cloud platforms in enhancing teamwork and real-time communication. Tools such as virtual document sharing, online task management, and remote access enable SMEs to foster stronger collaboration, especially in dynamic and distributed work environments. These findings align with prior research emphasizing cloud computing as a driver of business agility and cost-effectiveness [22]. Furthermore, cloud adoption enhances data security and accessibility, enabling SMEs to centralize critical information while maintaining flexibility in accessing it from any location. For SMEs in resource-constrained regions like Tangerang, cloud computing provides a practical solution to overcome financial and technical barriers, paving the way for sustainable digital transformation and improved competitiveness in the marketplace.

2. **Role of Digital Marketing in Customer Engagement**
   Digital marketing emerged as a crucial strategy for enhancing customer engagement through social media platforms, search engine optimization (SEO), and targeted advertising. Table 2 summarizes its impact on customer engagement.

Table 2. Impact of Digital Marketing on Customer Engagement in SMEs

Customer Engagement Metric	Mean Score (out of 5)	Standard Deviation
Brand Visibility	4.6	0.72
Customer Loyalty	4.4	0.80
Customer Satisfaction	4.3	0.85

As shown in Table 2, digital marketing enhances customer engagement, with metrics such as brand visibility (4.6), customer loyalty (4.4), and customer satisfaction (4.3) all scoring above 4. These results underscore the critical role of digital marketing in helping SMEs reach a broader audience and build stronger connections with their customers. By leveraging tools such as social media platforms, email marketing, search engine optimization (SEO), and targeted advertising, SMEs can create highly personalized and impactful campaigns. These strategies not only improve the visibility of their brand but also foster a sense of trust and loyalty among customers. Enhanced brand visibility, as reflected in the high

mean score of 4.6, indicates that SMEs utilizing digital marketing are better positioned to establish a strong presence in competitive markets like Tangerang, where consumer behavior is increasingly shaped by online interactions.

Additionally, the improvement in customer loyalty (4.4) and satisfaction (4.3) highlights the ability of digital marketing to nurture long-term relationships and enhance customer experiences. Personalized content, timely communication, and data-driven marketing strategies enable SMEs to address customer needs more effectively, ensuring that customers feel valued and engaged. These findings align with prior research emphasizing the importance of digital marketing in fostering customer retention and driving repeat business [23]. For SMEs in Tangerang, digital marketing provides a cost-effective way to compete with larger enterprises by capitalizing on online platforms that allow targeted reach and measurable results. Moreover, as consumers increasingly rely on digital channels for purchasing decisions, the adoption of robust digital marketing strategies ensures that SMEs remain relevant, competitive, and connected in a rapidly evolving digital marketplace.

3. **Impact of Automation on Market Competitiveness**
Automation significantly improves market competitiveness by enhancing operational speed, service quality, and the ability to meet customer demands. Table 3 details the relationship between automation and market competitiveness.

Table 3. Impact of Automation on Market Competitiveness in SMEs

Market Competitiveness Metric	Mean Score (out of 5)	Standard Deviation
Operational Speed	4.3	0.75
Service Quality	4.5	0.70
Ability to Meet Demand	4.6	0.67

Table 3 indicates that automation positively impacts market competitiveness, with high mean scores for operational speed (4.3), service quality (4.5), and the ability to meet demand (4.6). These results highlight the transformative role of automation in streamlining business operations and reducing inefficiencies. By automating repetitive tasks such as inventory management, order processing, and customer service, SMEs can significantly improve their operational speed, allowing them to respond more quickly to market demands and customer needs. This enhanced responsiveness is critical in highly competitive markets, where delays and inefficiencies can result in lost opportunities. The improved service quality (4.5) reflects automation's ability to minimize human error and ensure consistency in service delivery, creating a more reliable and satisfactory customer experience.

Furthermore, the ability to meet demand (4.6) underscores the importance of automation in enabling SMEs to scale their operations efficiently. Automated systems provide real-time data and predictive analytics, empowering businesses to anticipate customer needs and manage resources more effectively. These findings align with previous studies that demonstrate how automation enhances both internal efficiency and external market responsiveness [24]. For SMEs in Tangerang, where resource constraints are common, automation offers a cost-effective solution to achieve higher productivity and maintain a competitive edge. By adopting automation technologies such as robotic process automation (RPA) and artificial intelligence (AI), SMEs can optimize their workflows, reduce costs, and strengthen their market positioning, ensuring long-term sustainability in an increasingly dynamic business environment.

4. **Role of Data Analytics in Business Decision-Making**
Data analytics emerged as a vital strategy for improving business decision-making, operational performance, and customer experience. Table 4 summarizes its impact.

Table 4. Impact of Data Analytics on Business Decision-Making in SMEs

Decision-Making Metric	Mean Score (out of 5)	Standard Deviation
Operational Optimization	4.4	0.73
Customer Insights	4.5	0.68
Strategic Planning	4.3	0.76

As shown in Table 4, data analytics enhances decision-making, with high scores for operational optimization (4.4), customer insights (4.5), and strategic planning (4.3). These findings demonstrate the critical role of data analytics in providing SMEs with actionable insights that drive efficiency and effectiveness. Operational optimization (4.4) reflects the ability of data analytics tools to streamline internal processes, minimize waste, and allocate resources more effectively. By analyzing real-time data, SMEs can identify inefficiencies and implement targeted improvements, ensuring smoother operations and reducing costs. This capability is particularly vital for SMEs in dynamic environments, where agility and precision are necessary to remain competitive.

The high score for customer insights (4.5) underscores the value of data analytics in understanding customer behavior, preferences, and trends. With access to these insights, SMEs can tailor their offerings to meet customer needs more effectively, enhancing satisfaction and loyalty. Strategic planning (4.3) highlights how data-driven decision-making supports long-term growth by enabling businesses to forecast market trends, anticipate challenges, and align their strategies with evolving industry dynamics. These findings align with existing literature that emphasizes the transformative potential of data analytics in improving business performance and achieving a competitive edge [25]. For SMEs in Tangerang, adopting data analytics provides a practical pathway to navigate resource constraints and market complexities, fostering informed decision-making and sustainable growth.

4.2. Discussion

The results of this study highlight the transformative potential of digital technologies for Small and Medium Enterprises (SMEs) in Tangerang. Digital transformation strategies such as cloud computing, digital marketing, automation, and data analytics each play a critical role in enhancing various dimensions of business management. These include improving operational efficiency, fostering deeper customer engagement, and strengthening market competitiveness. By integrating these technologies, SMEs can not only address existing operational inefficiencies but also create opportunities for sustainable growth in an increasingly digital economy. For instance, cloud computing provides SMEs with scalable and cost-effective infrastructure, enabling them to optimize resource allocation and streamline internal processes. Similarly, digital marketing empowers businesses to expand their reach, enhance brand visibility, and build stronger relationships with customers in a highly competitive marketplace.

These findings align with prior research, which underscores the necessity of digital transformation as a means for SMEs to adapt to evolving market demands and consumer behaviors. Automation technologies, such as robotic process automation (RPA) and artificial intelligence (AI), offer significant efficiency gains by minimizing repetitive tasks and reducing human error. This improved efficiency translates into faster service delivery, enhanced responsiveness, and higher customer satisfaction. Additionally, data analytics equips SMEs with the tools to make informed decisions by leveraging real-time insights into customer preferences, market trends, and internal operations. These capabilities not only enhance strategic planning but also enable SMEs to anticipate challenges and respond proactively to changes in the business environment.

Despite the evident benefits, the adoption of digital transformation strategies is not without challenges. SMEs in Tangerang face significant barriers, including limited financial resources, inadequate technical expertise, and resistance to organizational change. Addressing these challenges requires targeted interventions, such as training programs to enhance digital literacy, government policies that provide financial incentives for technology adoption, and collaborative initiatives with industry stakeholders. Such measures can help bridge the gap between potential and actual digital adoption, empowering SMEs to fully leverage the benefits of digital transformation. Overall, this study emphasizes the need for sustained investment in digital technologies and supportive ecosystems to ensure that SMEs in Tangerang remain competitive and resilient in an increasingly interconnected global marketplace.

5. MANAGERIAL IMPLICATIONS

The findings of this study provide several important managerial implications for SME decision-makers seeking to enhance their business management practices through digital transformation strategies.

5.1. Strategic Adoption of Digital Technologies

Managers should prioritize the adoption of digital technologies such as cloud computing, digital marketing, automation, and data analytics to enhance operational efficiency, customer engagement, and market

competitiveness. Implementing these technologies strategically allows SMEs to streamline processes, reduce costs, and enhance business agility in an increasingly digital economy.

5.2. Investment in Digital Infrastructure and Skills

To maximize the benefits of digital transformation, SME managers should allocate resources towards improving digital infrastructure and upskilling employees. Providing training on digital tools and fostering a culture of innovation can significantly enhance the effectiveness of technology adoption.

5.3. Enhancing Customer Engagement through Digital Marketing

Digital marketing strategies, such as social media engagement, search engine optimization (SEO), and personalized content marketing, should be leveraged to improve customer relationships and brand visibility. SMEs should focus on data-driven marketing decisions to ensure targeted outreach and higher conversion rates.

5.4. Leveraging Automation for Operational Efficiency

Automation technologies should be integrated into business operations to reduce repetitive tasks, improve service quality, and enhance overall productivity. Managers should assess which business processes can be automated to achieve greater efficiency while maintaining a balance with human oversight.

5.5. Utilization of Data Analytics for Decision-Making

The study highlights the role of data analytics in driving informed business decisions. Managers should implement data analytics tools to gain insights into customer preferences, market trends, and internal performance metrics, allowing for proactive strategic adjustments.

5.6. Overcoming Barriers to Digital Transformation

Despite the benefits, SMEs may face challenges such as financial constraints, lack of technical expertise, and resistance to change. Managers should seek partnerships with technology providers, explore government incentives for digital adoption, and foster an adaptive organizational culture to facilitate a smoother transition.

5.7. Long-Term Digital Transformation Planning

Managers should develop long-term digital transformation roadmaps that align with their business goals. This includes setting clear milestones, continuously evaluating digital strategy effectiveness, and remaining adaptable to emerging technological trends.

By incorporating these managerial implications, SMEs can enhance their digital transformation efforts, achieve sustainable growth, and maintain a competitive edge in the evolving business landscape.

6. CONCLUSION

This study investigated the impact of digital transformation strategies on business management outcomes in Small and Medium Enterprises (SMEs) in Tangerang, Indonesia. The findings highlight the significant positive effects of adopting four key digital transformation strategies—cloud computing, digital marketing, automation, and data analytics—on enhancing operational efficiency, customer engagement, and market competitiveness. Cloud computing improves operational processes and reduces costs, digital marketing enhances customer relationships and brand visibility, automation drives operational speed and service quality, and data analytics supports informed decision-making, optimizing both internal processes and customer experiences. These results underscore the importance of digital transformation as a strategic tool for SMEs to adapt to the rapidly changing business landscape. SMEs in Tangerang that embrace these strategies are better positioned to enhance internal efficiencies, deliver superior customer experiences, and gain a competitive advantage in the market. This finding aligns with the global trend that digital transformation is no longer an option but a necessity for business viability and growth.

However, this study has limitations that should be acknowledged. The cross-sectional design restricts the ability to assess the long-term impacts of digital transformation strategies, while the focus on SMEs in Tangerang may limit the generalizability of findings to other regions or industries with distinct market dynamics. Future research could address these limitations by adopting longitudinal designs to explore long-term effects, examining a broader range of industries and locations, and investigating additional contextual factors such as organizational culture and external market conditions. Despite these limitations, the findings provide

practical guidance for SMEs and policymakers to support digital transformation efforts. By prioritizing digital adoption and addressing implementation challenges, SMEs can ensure sustainable growth and maintain competitiveness in an increasingly digital economy.

7. DECLARATIONS

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7.2. Author Contributions

Conceptualization: AK; Methodology: AR; Software: AY; Validation: AR and ZN; Formal Analysis: AK and AY; Investigation: AK; Resources: ZN; Data Curation: AK and AR; Writing Original Draft Preparation: AK and AR; Writing Review and Editing: AK, AR, and AY; Visualization: AR; Supervision: ZN. All authors, AK, AY, AR, and ZN, have read and agreed to the published version of the manuscript.

7.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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7.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

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