

Strategies for SMEs in Managing Big Data for Personalization and Customer Service Enhancement

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Abstract. In the current digital era, big data has become an invaluable asset for various organizations, including Small and Medium Enterprises (SMEs). Big data refers to vast and complex datasets that cannot be managed or analyzed using traditional methods. This study aims to provide practical guidelines for SMEs on how they can efficiently and effectively manage big data for personalization and customer service enhancement. The research employs a literature review method with a qualitative approach, gathering data from Google Scholar covering the period from 2014 to 2024. The findings highlight how SMEs can leverage big data to improve personalization and customer service. Big data, characterized by its volume, velocity, and variety, offers significant opportunities for SMEs to understand customer preferences, enhance their experiences, and improve services. Despite facing challenges in terms of resources and skills, SMEs can overcome these hurdles by utilizing cloud-based technologies, affordable analytical tools, and skills training. Case studies such as Tinkr, Tokopedia, and Gojek illustrate how data analysis can enhance the relevance of product and service offerings, while challenges like data security and infrastructure limitations remain important issues to address.

Keywords: SMEs, Big Data, Personalization, Customer Service

1. Introduction

In the current digital era, big data has become an invaluable asset for various organizations, including Small and Medium Enterprises (SMEs). Big data refers to vast and complex datasets, often encompassing diverse types of information that cannot be managed or analyzed using traditional methods [1]. This data includes information on consumer behavior, product preferences, market trends, and other business-relevant aspects. In the context of SMEs, leveraging big data for personalization and customer service enhancement has become a key strategy to compete in an increasingly competitive market. SMEs can identify consumer behavior patterns, predict market trends, and optimize their product and service offerings by utilizing big data. This provides significant competitive advantages as SMEs can better align their strategies with changes in customer preferences and market conditions. However, to fully harness the potential of big data, SMEs need to understand the proper ways to collect, store, and analyze data to achieve the desired outcomes.

In Indonesia, SMEs play a crucial role in the national economy, contributing significantly to employment and gross domestic product (GDP). However, many SMEs face challenges in managing big data due to resource constraints, both in terms of technology and skills [2]. While large companies often have sophisticated data analysis infrastructures and teams, SMEs frequently have to rely on simpler and more affordable solutions. These constraints include limitations in hardware, software, and the lack of deep data analysis expertise. Therefore, it is essential for SMEs to adopt big data strategies that are appropriate for their scale and capacity. This includes selecting user-friendly and affordable analytical tools and providing training for staff to effectively utilize data. Implementing the right strategies can help SMEs overcome challenges and leverage big data to enhance their operational efficiency and market competitiveness.

Big data strategies for personalization involve collecting and analyzing customer data to gain deep insights into their preferences and behaviors [3]. With this information, SMEs can tailor their product and service offerings to better meet customer needs and desires. Effective personalization can enhance customer satisfaction, loyalty, and ultimately, sales. For example, SMEs can use data to make relevant product



recommendations or offer special promotions based on customers' purchase history. This approach makes customers feel valued and better served, enhancing their experience with the brand. Personalization also allows SMEs to optimize their marketing budgets by targeting promotions to the most relevant customer segments, thereby increasing the efficiency of marketing campaigns.

Improving customer service is another critical aspect of big data management. Big data can assist SMEs in monitoring and analyzing customer interactions with their services, enabling quick identification of issues and the development of more effective solutions [4]. SMEs can improve their responsiveness and customer service by leveraging data from customer feedback, transactions, and other communication channels. For instance, data analytics can reveal patterns in customer complaints or areas of service that need improvement, enabling SMEs to take appropriate actions to enhance service quality. With faster responses and more accurate solutions, SMEs can build stronger relationships with customers and increase their satisfaction levels.

However, implementing big data in SMEs is not without challenges. One of the main obstacles is the limitation of resources and technological infrastructure [5]. Many SMEs do not have the adequate hardware and software to manage big data. Additionally, data analysis skills are often lacking in small and medium-sized enterprises. These limitations can hinder SMEs' ability to fully exploit the potential of big data and may require a more strategic approach in terms of resource allocation and investment. Solutions such as cloud computing and more affordable web-based data analysis tools can help overcome some of these challenges, but they still require careful attention and management.

In terms of technology, some SMEs may be reluctant to adopt big data due to concerns about costs and implementation complexity. Therefore, this study will also examine successful examples of SMEs that have adopted big data strategies and share lessons that other companies can learn from. These case studies will provide insights into practical and effective ways to implement big data in SMEs' daily operations. Companies can identify appropriate strategies and avoid common mistakes in big data implementation by learning from the experiences and best practices of other successful SMEs.

It is also important to consider the aspects of data security and privacy in big data management. Collecting and storing customer data must be done in compliance with applicable data protection regulations to prevent personal information leaks and protect customer privacy. In an increasingly connected digital era, data protection is crucial to maintaining customer trust and avoiding the negative impacts of data breaches [6]. SMEs must ensure they have adequate policies and procedures in place to protect customer data and comply with relevant regulations.

Ultimately, this study aims to provide practical guidelines for SMEs on how they can efficiently and effectively manage big data for personalization and customer service enhancement. This research is expected to help SMEs fully exploit the potential of big data to improve customer satisfaction and competitiveness in the market by assessing various strategies, technologies, and challenges related to big data. This study aims to present a comprehensive and relevant literature review, contributing to the understanding of big data management among SMEs and helping them face challenges and leverage available opportunities.

1.1. Small and Medium Enterprises (SMEs)

Small and Medium Enterprises (SMEs) are a crucial category of businesses in Indonesia's economy, encompassing companies with varying scales of operation from very small to medium-sized. SMEs serve as the backbone of the national economy, providing employment for the majority of the workforce and significantly contributing to the Gross Domestic Product (GDP) [7]. This category is divided based on criteria such as the number of employees, annual turnover, and total assets, with Micro Enterprises typically having fewer than 10 employees and annual turnover below IDR 300 million, Small Enterprises with 10-50 employees and annual turnover between IDR 300 million and IDR 15 billion, and Medium Enterprises with 51-250 employees and annual turnover between IDR 15 billion and IDR 200 billion. SMEs often face challenges in accessing finance, technology, and markets, but they possess high flexibility and innovation, allowing them to adapt and thrive in a dynamic business environment [8].

1.2. Big Data

Big Data refers to vast, complex, and diverse datasets that are challenging to process and analyze using traditional methods due to their large volume and high velocity of growth [9]. This data comes from various sources, including digital transactions, social media, IoT sensors, and text data. Big Data is characterized by the "3Vs": Volume (large size of data), Velocity (speed of data flow), and Variety (diversity of data types). Managing and analyzing Big Data enables organizations to uncover valuable insights, identify patterns and trends, and make better, data-driven decisions. By leveraging advanced analytics technologies and machine

learning algorithms, Big Data can help improve operational efficiency, product innovation, and business strategies [10].

1.3. Personalization

Personalization is the process of tailoring products, services, or experiences based on individual customer preferences, behaviors, and needs to enhance relevance and satisfaction [11]. In a business context, personalization involves using customer data, such as purchase history, previous interactions, and expressed preferences, to present more relevant recommendations, special offers, or individually relevant content. The goal is to create more customized and engaging experiences, which can increase customer loyalty and drive deeper interactions. By utilizing advanced analytics and algorithms, personalization allows businesses to build stronger relationships with customers and meet their needs more effectively [12].

1.4. Customer Service

Customer service encompasses a series of activities and interactions conducted by a company to support, assist, and fulfill the needs and expectations of customers before, during, and after a transaction [13]. This service includes various aspects such as providing product information, handling complaints, processing returns or exchanges, and offering technical support. The primary goal of customer service is to ensure customer satisfaction, build positive relationships, and enhance customer loyalty through pleasant and responsive experiences [14]. Effective customer service plays a crucial role in creating a positive impression of the company, enhancing brand reputation, and contributing to customer retention and long-term business success.

2. Method

This study employs a literature review method with a qualitative approach to explore the strategies of SMEs in managing big data for personalization and customer service enhancement. A qualitative approach is chosen as it allows for an in-depth analysis of various aspects and dynamics in big data management, as well as a contextual understanding of the implementation and challenges faced by SMEs. Descriptive analysis is used to present and interpret the findings from the literature review. This method enables researchers to systematically describe and explain the findings from various relevant sources, providing a clear picture of the practices, strategies, and outcomes reported in the literature. Research data is sourced from Google Scholar, covering the period from 2014 to 2024. Initially, 41 potentially relevant articles were identified. However, after a rigorous selection process based on relevance, quality, and contribution to the research topic, only 24 articles met the criteria and were used as the basis for analysis. The selection process involved evaluating the methodology, research quality, and alignment with the focus of this study. By using carefully curated data, this research aims to present a comprehensive literature review and provide deep insights into big data management in the context of SMEs.

3. Result and Discussion

In the context of the development of information technology and digitalization, big data offers significant opportunities for Micro, Small, and Medium Enterprises (MSMEs) to enhance their personalization and customer service. MSMEs can implement various strategies to better understand and meet their customers' needs by analyzing large and complex datasets. This discussion will outline how MSMEs can effectively leverage big data, the challenges they face, and relevant case studies illustrating practical applications. Integrating big data into MSME operations can lead to better customer interactions, more tailored services, and ultimately, a stronger market position.

Personalization is a key benefit of big data. MSMEs can identify individual behavior patterns and preferences by analyzing customer data [15]. For example, a small e-commerce company like Tinkr, specializing in custom products, leverages customer data to generate personalized product recommendations based on purchase history and design preferences. This approach has significantly increased Tinkr's conversion rates and customer satisfaction. Tinkr can offer products aligned with customers' specific desires, enhancing the relevance of their offerings and increasing customer engagement by utilizing data insights. This high level of personalization satisfies customers, fosters long-term loyalty, and increases the likelihood of repeat business.

Customer service improvement can also be achieved through the analysis of interaction data and customer feedback [16]. A relevant example is Tokopedia, a leading e-commerce platform in Indonesia, which uses big data analytics to monitor and analyze customer complaints and feedback. This data enables Tokopedia to identify common issues, such as delivery delays or product quality problems, and implement appropriate

improvements. For instance, Tokopedia might use shipping data to address and rectify logistics delays, thereby enhancing overall customer satisfaction. Tokopedia can improve their service quality, leading to a more positive customer experience and better overall performance by effectively leveraging feedback data.

While big data offers many advantages, MSMEs often face significant challenges in its implementation. The primary challenge is resource limitations, both in terms of technology and skills [17]. Many MSMEs lack adequate hardware or skilled data analysis teams. For example, a small restaurant like Warung Sederhana might struggle to adopt advanced data analytics tools due to budget constraints. Therefore, it is crucial for MSMEs to seek solutions that match their scale and capacity, such as using more affordable cloud-based analytics tools. These solutions provide practical ways for small businesses to access powerful data analysis capabilities without incurring substantial costs.

To overcome resource limitations, MSMEs can leverage cloud-based technology. Cloud-based data analytics tools, such as Google Analytics and Microsoft Power BI, allow MSMEs to manage and analyze big data without requiring expensive infrastructure. For instance, MSMEs like OVO, a digital payment and finance application in Indonesia, use cloud solutions to analyze transaction data and user behavior. This enables OVO to better tailor service offerings and promotions, even without extensive IT infrastructure. Cloud-based tools provide an efficient and affordable way for MSMEs to harness the power of big data, helping them stay competitive and responsive to market demands [18].

Data analysis skills are also crucial for effectively utilizing big data. MSMEs need to train their employees to acquire the necessary skills to manage and analyze data. For example, a small textile company like Batik Danar Hadi provides training for their team in using data analytics tools. Batik Danar Hadi can better understand purchasing trends and customer preferences, which aids in designing new collections that meet market demands by enhancing employees' skills. Effective training empowers employees to leverage data insights, leading to better decision-making and improved business outcomes [19].

Gojek, as one of Indonesia's unicorns, offers a relevant example of using big data for personalization and customer service improvement. Gojek can provide personalized services such as tailored recommendations based on order history and user location by analyzing data from their app users. For instance, if a user frequently orders from a specific restaurant, Gojek can display special promotions from that restaurant. Additionally, Gojek utilizes data to monitor customer satisfaction and identify areas needing improvement, such as service wait times or issues in the user experience. Gojek's use of big data illustrates how data-driven insights can significantly enhance service personalization and operational efficiency.

Data security and privacy are critical aspects of managing big data. MSMEs must ensure they comply with data protection regulations to prevent leaks of personal information. An example is the e-commerce service Bukalapak, which faced challenges related to data security. To address this issue, Bukalapak implemented strict security systems and clear privacy policies to protect customer data. They also regularly conduct security audits to ensure customer data is safe from potential threats. Ensuring strong data protection measures is essential for maintaining customer trust and protecting sensitive information from unauthorized access [20].

Effective reporting and analytics systems can help MSMEs make better decisions [21]. These systems enable MSMEs to identify trends, patterns, and issues affecting their business performance. For example, the local fashion company Cotton On uses reporting systems to analyze sales data and stock levels. They can optimize inventory and plan more effective promotions, ensuring that popular products are available to customers and reducing the risk of overstocking by leveraging this data. Reporting and analytics systems allow MSMEs to make data-driven decisions that improve operational efficiency and business performance.

Implementing appropriate technology is crucial in managing big data. Technologies such as machine learning and predictive algorithms can help MSMEs gain deeper insights from data and make more informed decisions. This is evident in Indonesian fintech startups that use predictive algorithms to assess credit risk and offer loan products tailored to each customer's risk profile. They can reduce default rates and improve loan success by utilizing this technology. Leveraging advanced technology enables MSMEs to enhance their analytical capabilities and achieve more precise and effective business strategies [22].

MSMEs in the culinary industry can also utilize big data to enhance personalization and customer service. For instance, a small restaurant like Kafe Kopi Kita uses customer data to customize their menu and offers based on detected preferences through their loyalty program. The restaurant can offer special discounts on customers' favorite menu items or introduce new dishes that match their tastes, enhancing the customer experience and encouraging repeat visits by analyzing this data. Big data helps restaurants better tailor their offerings to customer preferences, resulting in increased satisfaction and customer loyalty [23].

Integrating big data into daily operations can boost efficiency and productivity for MSMEs. They can use data to plan production schedules, manage supply chains, and respond better to market demand. For example, a small manufacturing company might use data to optimize production schedules and reduce machine downtime.

They can improve operational efficiency and lower costs by adopting a data-driven approach. Data integration helps MSMEs streamline their processes and respond more effectively to changing market conditions, ultimately strengthening their competitive advantage [24].

The government also plays a crucial role in supporting MSMEs in managing big data. Policies and support programs, such as subsidies for information technology and skill training, can help MSMEs overcome challenges related to big data. For example, government programs that offer IT training and financial assistance for hardware purchases can aid MSMEs in implementing more effective big data solutions. Government support can bridge resource gaps and enable MSMEs to utilize big data technology more effectively, fostering innovation and growth in this sector.

Overall, big data offers significant potential for MSMEs to enhance their personalization and customer service. However, effective implementation requires a deep understanding of the technology, the challenges faced, and the solutions that can be adopted. By leveraging appropriate technology, training employees, and implementing effective reporting and analytics systems, MSMEs can harness the power of big data to gain a competitive edge. The discussed case studies demonstrate that despite the challenges, with the right strategies and technologies, MSMEs can significantly benefit from managing big data, improving customer satisfaction, and strengthening their market position.

Table 1. Key Findings from the Discussion on Product Differentiation, Customer Experience, and Loyalty in E-Commerce

No	Aspect	Key Finding
1	Use of Big Data for Personalization	MSMEs can enhance product relevance and customer experience by analyzing behavioral and preference data. Example: Tinkr uses data for product recommendations.
2	Customer Service Improvement	Data helps MSMEs monitor customer interactions, identify issues, and improve service. Example: Tokopedia uses feedback data to enhance processes and customer satisfaction.
3	Challenges in Implementation	MSMEs often face constraints in resources, technology, and skills in managing big data. Example: Small restaurants may lack adequate hardware.
4	Solutions for Resource Constraints	Cloud-based analytics tools offer affordable solutions, and employee training is crucial for effective big data use. Example: OVO utilizes cloud technology.
5	Employee Training and Skills	Improving employees' skills in data analysis is essential for leveraging big data effectively. Example: Batik Danar Hadi trains employees in data analysis tools.
6	Data Security and Privacy	Compliance with data protection regulations and implementing robust security measures are critical to protect customer information. Example: Bukalapak enforces data security policies.
7	Reporting and Analytics Systems	Effective reporting systems help MSMEs identify trends and patterns, enhancing operational efficiency. Example: Cotton On uses reporting systems for inventory management.
8	Technology Implementation	Technologies like machine learning can aid in data analysis and informed decision-making. Example: Fintech startups use predictive algorithms for credit assessment.
9	MSMEs Case Studies	Case studies such as Gojek show how big data can improve service personalization and customer response, providing practical insights on big data implementation.
10	Government Support	Government support in the form of technology subsidies and training can help MSMEs address big data challenges.
11	Research Limitations	The study may not cover all sectors or the latest developments, and the focus on a specific period limits scope. Further research is needed for broader and more current data.

4. Conclusion

This study highlights how Micro, Small, and Medium Enterprises (MSMEs) can leverage big data to enhance personalization and customer service. Big data, characterized by its large volume, velocity, and variety, offers significant opportunities for MSMEs to understand customer preferences, improve their experiences, and enhance services. The study demonstrates that although MSMEs face challenges regarding resources and skills, they can overcome these obstacles by utilizing cloud-based technology, affordable analytical tools, and skill training. Case studies such as Tinkr, Tokopedia, and Gojek illustrate how data analysis can enhance the relevance of product and service offerings, while challenges like data security and infrastructure limitations remain important issues to address.

The implications of this research are that MSMEs can gain significant competitive advantages by effectively adopting and managing big data. Using big data for personalization can help MSMEs increase customer satisfaction and loyalty, while customer service data analysis can improve responsiveness and operational efficiency. Implementing cloud-based technology and effective reporting systems provides more affordable and practical solutions for MSMEs with limited resources. These implications also emphasize the need for government policy support to provide the training, tools, and infrastructure needed for MSMEs to optimally leverage big data.

To optimise the use of big data, MSMEs are advised to: 1) Invest in Cloud Technology: Leverage affordable cloud-based analytics tools to manage and analyse data without the need for expensive IT infrastructure. 2) Employee Training: Organise training to upskill employees in the use of data analysis tools and data interpretation. 3) Security System Implementation: Ensure the security of customer data by complying with data protection regulations and implementing strict security practices. 4) Utilisation of Case Studies: Learn from case studies of MSMEs that have successfully implemented big data strategies to understand best practices and avoid common mistakes. 5) Government Support: Encourage the government to provide support in the form of technology subsidies and training to improve the big data capabilities of MSMEs.

This study has several limitations that need to be considered. First, the data used is from a literature review, which may not cover all the latest aspects of big data management for MSMEs. Second, the case studies discussed may not be fully representative of all sectors or types of MSMEs, so the results may not be universally applicable. Third, limitations in the access and quality of data available from academic publications may affect the depth of the analysis. Finally, this research focuses on the period from 2020 to 2024, so developments in technology and practices beyond this timeframe are not covered. Further research is recommended to involve more extensive and up-to-date empirical data across various MSME sectors to gain a more comprehensive understanding.

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