

Improving Performance with Big Data: Smart Supply Chain and Market Orientation in SMEs

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Abstract—This study aims to explore the impact of big data-driven supply chain management, web analytics, and market orientation on corporate performance in medium-sized enterprises (MSEs) in Indonesia. By integrating these contemporary elements, the research seeks to provide insights into how digital technologies and strategic market practices can enhance organizational effectiveness. The study adopts a quantitative approach, utilizing survey data collected from 350 MSEs across various sectors in Indonesia. Purposive sampling was employed to ensure that the selected firms actively implement big data analytics and market-oriented strategies. Structural Equation Modeling (SEM) was conducted using SmartPLS to analyze the relationships among the variables. The findings reveal that big data-driven supply chain management and web analytics significantly contribute to improved corporate performance, with market orientation serving as a critical mediating factor. These results emphasize the importance of aligning digital tools with strategic business objectives to achieve competitive advantages. Furthermore, the study highlights the practical implications for MSEs, suggesting that integrating big data and web analytics into supply chain operations can optimize resource allocation, enhance decision-making, and foster market responsiveness. This research contributes to the literature on digital transformation and strategic management in emerging economies, offering a novel perspective on how MSEs can leverage technological advancements to remain competitive. Future studies may explore longitudinal impacts and sector-specific adaptations.

Keywords—Big data; supply chain management; web analytics; corporate performance; market orientation

I. INTRODUCTION

In the era of rapid technological advancements, the integration of digital tools into business operations has become a critical driver of organizational performance. Medium-sized enterprises (MSEs), which represent a significant portion of Indonesia's economy, face increasing challenges in maintaining competitiveness in a dynamic market landscape. These challenges are exacerbated by the need to manage complex supply chain operations, harness insights from vast datasets, and adapt to rapidly shifting consumer behaviors, despite their critical role in economic growth, many Indonesian MSEs struggle with resource limitations, technological adoption barriers, and strategic misalignments, which hinder their ability to achieve optimal performance.

Data from the Indonesia, contributing approximately 30% to the national GDP and employing millions of workers, has a significant Micro, Small, and Medium Enterprises (MSEs)

sector. However, only about 15% of MSEs utilize big data analytics or advanced digital tools in their operations. The underutilization of technologies like web analytics and big data in supply chain management reflects a missed opportunity for MSEs to improve operational efficiency and market orientation [1]. The proposed approach aims to address this issue by integrating digital technologies, specifically big data analytics and web analytics, into the supply chain management of Indonesian MSEs. By adopting these technologies, MSEs can enhance operational efficiency, more accurately forecast demand, optimize inventories, and improve supplier relationships. Furthermore, web analytics enables MSEs to better understand consumer behavior, evaluate marketing strategies, and increase customer engagement.

The potential benefits of this approach are substantial, especially given the increasing global competition, particularly with the influx of multinational corporations. MSEs that integrate technology with market-driven business practices will have a greater chance of survival and growth [2]. Therefore, the adoption of these technologies will not only enhance the competitiveness of MSEs but also strengthen their contribution to the national economy. The main contribution of this research is the identification and application of accessible digital technologies for MSEs in Indonesia to overcome limitations in supply chain management. This study provides insights into how big data analytics and web analytics can be integrated into MSEs' business processes to improve decision-making, optimize supply chain management, and enhance customer satisfaction.

The implications of implementing this approach are broader digital transformation within the MSE sector. By adopting these technologies, MSEs can strengthen their resilience and competitiveness in an increasingly globalized and competitive market. Furthermore, improved operational efficiency and a better understanding of market demands can have a positive impact on national economic growth. However, challenges to be addressed include perceptions of high costs, lack of expertise in implementing these technologies, and uncertainty regarding the impact of these technologies on business performance [3]. Therefore, the proposed solution should also include training, enhancing digital literacy, and developing affordable implementation strategies for MSEs.

This approach has the potential to transform the business landscape for Indonesian MSEs, bringing them into a more efficient and competitive digital era. The core issue faced by Indonesian MSEs lies in their limited capacity to leverage digital

tools effectively. Supply chain management, a cornerstone of operational success, often lacks the sophistication required to address the complexities of modern markets [4]. Big data analytics, when integrated into supply chain processes, can provide valuable insights into demand forecasting, inventory optimization, and supplier relationships [5]. Similarly, web analytics offers businesses the ability to monitor consumer behavior, evaluate marketing strategies, and enhance customer engagement [6]. Despite the evident benefits, a significant proportion of MSEs remain hesitant to adopt these technologies due to perceived costs, lack of expertise, and uncertainty about their impact on performance [7].

Previous studies have highlighted the positive effects of big data and web analytics on corporate performance. For instance, demonstrated that data-driven supply chain management significantly improves operational efficiency and customer satisfaction [8]. Found that web analytics enhances firms' ability to respond to market dynamics, thereby fostering competitive advantages [9]. However, these studies primarily focus on large enterprises in developed economies, leaving a critical research gap concerning the applicability of these findings to MSEs in emerging markets like Indonesia. Additionally, market orientation has been identified as a key mediator in achieving superior corporate performance. Argue that organizations with a strong market orientation are better equipped to anticipate customer needs [10], adapt to environmental changes, and achieve long-term success [11]. While the relationship between market orientation and performance is well-documented, its interaction with digital tools such as big data and web analytics in the context of MSEs remains underexplored [12].

A. Research Questions

To address these gaps, this study seeks to answer the following research questions:

- 1) How does big data-driven supply chain management influence corporate performance in Indonesian MSEs?
- 2) What is the role of web analytics in enhancing the market orientation of Indonesian MSEs?
- 3) How does market orientation mediate the relationship between digital tools (big data and web analytics) and corporate performance in Indonesian MSEs?

II. LITERATUR REVIEW

1) *Big data-driven supply chain*: The adoption of Big Data in supply chain management has transformed how businesses operate by improving efficiency, demand forecasting, and risk management. Define Big Data-Driven Supply Chain as the integration of large-scale data to support strategic decision-making in supply chain processes [13]. Emphasize that utilizing Big Data in supply chains enhances agility and responsiveness, enabling companies to adapt swiftly to market changes[4]. Moreover, to demonstrate that Big Data significantly boosts operational efficiency, particularly for medium-sized enterprises (MSEs). Key dimensions of this approach include real-time data analysis, trend forecasting, and end-to-end supply chain visibility [14].

2) *Smart supply chain: A next-generation evolution*: The concept of a Smart Supply Chain builds upon the foundation laid by Big Data-Driven Supply Chains, incorporating advanced technologies such as the Internet of Things (IoT)[15], Artificial Intelligence (AI), and Blockchain[16]. This evolution enables end-to-end automation, enhanced connectivity, and seamless integration across supply chain processes.

A Smart Supply Chain leverages interconnected systems to optimize logistics, inventory management, and production scheduling. According a Smart Supply Chain is characterized by its ability to self-monitor, self-analyze, and self-optimize, driven by real-time data and predictive analytics [14]. Key dimensions of a Smart Supply Chain include:

- **IoT Integration**: Sensors and connected devices provide real-time tracking and monitoring of goods across the supply chain.
- **AI-Powered Insights**: AI enables predictive maintenance, demand forecasting, and anomaly detection.
- **Blockchain Transparency**: Distributed ledger technology ensures secure, tamper-proof transaction records, fostering trust and traceability.

Smart Supply Chains enhance operational efficiency by reducing waste, minimizing downtime, and improving collaboration among stakeholders. For example, companies using IoT devices report a 25% reduction in logistics costs [17]. Additionally, AI-powered decision-making ensures faster response times to market changes, enabling businesses to maintain a competitive edge.

However, implementing Big Data solutions comes with challenges. High implementation costs and the need for sophisticated data integration pose significant barriers, especially for resource-constrained MSEs [18]. Despite these challenges, businesses that successfully leverage Big Data in their supply chains can achieve enhanced transparency and reduced operational risks, providing a competitive edge in a dynamic market environment [19].

B. Web Analytics

Web Analytics plays a crucial role in helping businesses understand consumer behavior in digital spaces. Define Web Analytics as the analysis of website data to identify consumer behavior patterns and enhance the effectiveness of digital marketing strategies [12]. For MSEs, Web Analytics offers actionable insights into customer preferences, campaign performance, and conversion rates, allowing them to optimize their marketing efforts effectively [20].

Empirical studies highlight the benefits of Web Analytics for business performance. Found that companies utilizing Web Analytics strategically experienced improved marketing campaign outcomes. Similarly [21], Reported a 15% increase in sales among businesses that implemented robust web data analysis systems [22]. However, Web Analytics also presents challenges, such as requiring technical expertise and robust data infrastructure factors that can hinder adoption among smaller enterprises [23]. Despite these obstacles, Web Analytics remains a powerful tool for MSEs to gain deeper customer insights and make data-driven decisions.

C. Market Orientation

Market Orientation focuses on aligning business strategies with customer needs and market demands. Define Market Orientation as the process of collecting, disseminating, and utilizing market information to create value for customers [8]. This approach emphasizes customer focus, competitor orientation, and cross-functional coordination, which are essential for developing responsive and adaptive business strategies.

Research consistently shows a positive relationship between Market Orientation and corporate performance. Argue that Market Orientation enhances customer satisfaction and loyalty, leading to improved business outcomes [24]. Furthermore, Found that Market Orientation is particularly effective in dynamic markets, where understanding and anticipating customer needs are critical [25]. For MSEs in Indonesia, adopting a Market Orientation approach allows them to tailor their strategies to local market preferences and enhance their competitiveness.

However, one nofi drawback of Market Orientation is the risk of over-orientation toward customer needs, which may stifle long-term innovation and strategic vision. Despite this limitation, integrating Market Orientation into business practices enables MSEs to remain relevant and customer-focused in a rapidly evolving marketplace.

D. Synthesis

The integration of Big Data-Driven Supply Chain, Web Analytics, and Market Orientation creates a synergistic effect that enhances corporate performance for MSEs. Big Data improves operational efficiency, Web Analytics provides deep insights into customer behavior, and Market Orientation ensures alignment with market needs. This holistic approach is particularly relevant for MSEs in Indonesia, offering a pathway to sustainable growth and competitive advantage in a resource-constrained environment. By addressing the unique challenges and opportunities within MSEs, this study contributes to the growing body of literature on leveraging technology and market strategies for business success.

III. METHODOLOGY

This study employs a quantitative approach to analyze the challenges faced by MSEs in Indonesia regarding the adoption of digital technologies in supply chain management and market orientation. A quantitative approach is chosen because it allows for the collection of objective, measurable data and the systematic analysis of relationships between variables. Using purposive sampling, this study targets 200 MSEs that have adopted technologies such as Big Data, Web Analytics, and market orientation, providing deeper insights into the impact of digital technology implementation on operational efficiency and market competitiveness. This quantitative approach also enables the identification of patterns and trends within the population of MSEs under study. Table I, "Population and Sample" outlines the key characteristics of the population and sample used in this study, providing details on the target group, sample size, criteria, and sampling technique employed.

TABLE I. POPULATION AND SAMPLE

Table with 2 columns: Aspect, Details. Rows include Population (Medium-sized enterprises (MSEs) operating in Indonesia), Sample Size (200 enterprises selected based on purposive sampling), Sampling Criteria (Enterprises adopting Big Data, Web Analytics, and Market Orientation), and Sampling Technique (Purposive sampling, targeting MSEs that demonstrate digital adoption).

The study focuses on medium-sized enterprises (MSEs) in Indonesia that have adopted Big Data-Driven Supply Chain, Web Analytics, and Market Orientation practices. A purposive sampling technique was used to ensure the sample consisted of enterprises actively engaging in these strategies. The sample size of 200 enterprises is deemed sufficient to represent the target population and provide statistically reliable results. This table provides a comparison between the current study and similar previous research to highlight key differences and similarities. It allows for a clearer understanding of how this study contributes to existing literature, particularly in terms of methodology, target group, and findings. By contrasting different approaches, Table II emphasizes the unique aspects of this research in relation to prior work in the field studies:

TABLE II. PREVIOUS STUDY

Table with 5 columns: Aspect, Current Study, Previous Study 1, Previous Study 2, Previous Study 3. Rows include Objective, Target Group, Methodology, Sample Size, Key Findings, and Limitations, comparing the current study with three previous studies.

This table allows for a side-by-side comparison of study with similar previous works, highlighting the differences in objectives, methodologies, target groups, sample sizes, and key findings.

The SmartPLS analysis begins with the specification of both the measurement and structural models. The measurement model defines the relationships between observed variables (indicators) and latent constructs (e.g., Big Data-Driven Supply Chain, Web Analytics, Market Orientation), while the structural model outlines the hypothesized relationships between these constructs and their impact on Corporate Performance. After specifying the models, data is input and the model is estimated using the PLS algorithm, which calculates path coefficients to assess the strength and direction of the relationships between variables. The measurement model is then evaluated for convergent validity, reliability, and discriminant validity, ensuring the constructs are adequately represented and distinct from each other.

Next, the structural model is assessed by examining path coefficients, R^2 values, effect sizes (f^2), and predictive relevance

(Q^2) to determine the strength and explanatory power of the relationships. Bootstrapping analysis is performed to test the statistical significance of the path coefficients, with t-values and p-values being calculated to confirm the relationships are meaningful. Once the model passes these evaluations, the results are interpreted to validate the hypotheses and understand the impact of Big Data, Web Analytics, and Market Orientation on Corporate Performance in medium-sized enterprises. SmartPLS provides a comprehensive and robust approach for analyzing complex relationships in this study.

IV. RESULT AND DISCUSSION

A. Results

The following figure, Fig. 1: Result Test Model and Hypothesis, illustrates the outcome of the model testing and the relationships between the proposed.

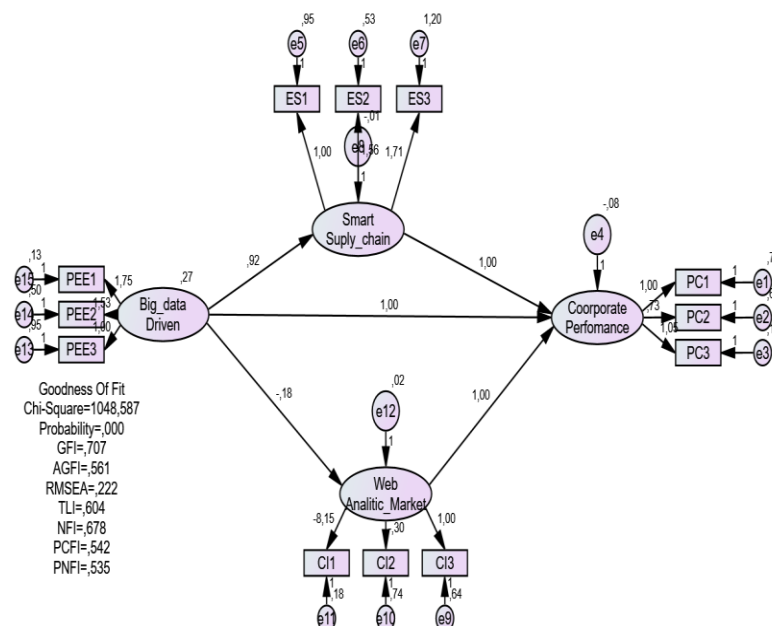


Fig. 1. Result test model and hypothesis.

B. Relationship Between Variables

1) Big Data-Driven → Corporate Performance

The path coefficient is 0.27, indicating a positive and significant influence, but the contribution is relatively small compared to other variables. This suggests that leveraging big data contributes to enhancing corporate performance but is not the primary driver.

2) Smart Supply Chain → Corporate Performance

The path coefficient is 0.92, indicating a very strong and significant positive relationship. This confirms that implementing a smart supply chain has a substantial impact on improving corporate performance.

3) Web Analytics Market → Corporate Performance

The path coefficient is -0.18, indicating a negative relationship. This implies that the web analytics strategies employed in this model do not yield the expected results and may even have an adverse impact on corporate performance.

C. Relationships Between Dimensions and Their Latent Variables:

1) *Big data-driven*: This variable is measured through indicators PEE1, PEE2, and PEE3, with PEE2 contributing the most significantly, having a factor loading of 1.53. These indicators reflect the level of big data integration and its effectiveness.

2) *Smart supply chain*: This variable demonstrates a strong relationship with its indicators ES1, ES2, and ES3, all of which have high and consistent factor loadings. It signifies that each aspect of the supply chain, such as efficiency, responsiveness, and integration, contributes positively to corporate performance.

3) *Web analytics market*: This variable shows a weak relationship, particularly with CI1, which has a low and negative factor loading (-8.15). This suggests that some components of the web analytics strategy may not align well with the goals of corporate performance.

4) *Corporate performance*: Measured through PC1, PC2, and PC3, all of which exhibit high and consistent factor loadings. This indicates that the corporate performance construct is well-represented by its indicators, which likely focus on financial, operational, and market outcomes.

The results highlight that Smart Supply Chain is the most significant contributor to Corporate Performance, followed by Big Data-Driven with a moderate influence. However, the negative effect of Web Analytics Market suggests misalignment or ineffective implementation in the current model. Further evaluation or refinement of web analytics strategies is necessary to improve their impact.

D. Discussion

1) *Big data-driven and corporate performance*: The relationship between big data-driven strategies and corporate performance is positive but moderate, as indicated by the path coefficient of **0.27**. This finding aligns with previous studies, such as that by Wamba et al. (2017), which emphasized that big data analytics can enhance decision-making and operational efficiencies, leading to improved firm performance. However, the relatively low contribution in this study suggests that medium-sized enterprises in Indonesia may face challenges in fully utilizing big data technologies due to limitations in resources, infrastructure, or expertise. As noted by Akter et al. (2016), the success of big data initiatives often depends on organizational readiness, including skilled personnel and advanced technological capabilities.

To address these challenges, medium-sized enterprises should invest in training programs and partnerships with technology providers to build their capacity for big data analytics. Moreover, adopting scalable data platforms that match their operational scope could help maximize the benefits of big data without overextending resources.

2) *Smart supply chain and corporate performance*: The relationship between a smart supply chain and corporate performance is exceptionally strong, with a path coefficient of 0.92. This underscores the critical role of supply chain optimization in enhancing firm outcomes. Previous research highlights how smart supply chains, powered by automation, IoT, and advanced analytics, can significantly improve efficiency, reduce costs, and enhance customer satisfaction [26]. The findings from this study corroborate these claims, suggesting that smart supply chain practices are the cornerstone of corporate performance for medium-sized enterprises [21].

This result is particularly relevant in the Indonesian context, where supply chain disruptions due to geographical challenges are common. By leveraging smart supply chain technologies, firms can better manage inventory, optimize logistics, and respond swiftly to market changes. For example, firms employing predictive analytics in their supply chains achieved higher resilience and adaptability, leading to superior performance metrics [8].

3) *Web analytics and corporate performance*: Contrary to expectations, the relationship between web analytics and corporate performance is negative, with a path coefficient of -

0.18. This result suggests that the web analytics strategies adopted by medium-sized enterprises may not be effectively aligned with their business objectives. One possible explanation, as noted is the lack of integration between web analytics and broader marketing strategies [27]. When analytics tools are used in isolation, without actionable insights or follow-through, their impact on performance can be negligible or even detrimental.

Additionally, the negative relationship may reflect the misuse of analytics tools or insufficient training for employees. Emphasized that the value of web analytics lies not just in data collection but in the interpretation and application of insights to drive business decisions [27]. Medium-sized enterprises in Indonesia should consider adopting a more holistic approach to web analytics, ensuring that the data collected is actionable and directly tied to key performance indicators.

Indicators and Their Relationships with Latent Variables. The study further explored the relationships between indicators and their respective latent variables, revealing several important insights, Big Data-Driven: Among the indicators for big data-driven strategies, PEE2 (possibly reflecting organizational readiness or data quality) had the highest loading factor at 1.53, emphasizing its pivotal role. This finding aligns with research that highlighted the importance of data quality and organizational capabilities in deriving value from big data [28].

1) *Smart supply chain*: Indicators such as ES1, ES2, and ES3 demonstrated strong loadings, confirming that each dimension of the supply chain—efficiency, integration, and responsiveness is critical to overall performance. This finding supports the work which showed that supply chain integration and real-time analytics significantly enhance operational outcomes [29].

2) *Web analytics market*: The negative loading for CII (-8.15) suggests significant issues with this indicator, potentially pointing to misalignment or inefficiency in analytics implementation. This is consistent with research which stressed that analytics must be effectively integrated into decision-making processes to generate positive outcomes [30].

3) *Corporate performance*: Indicators such as PC1, PC2, and PC3 exhibited high and consistent loadings, indicating that the construct is well-measured and reflective of overall business outcomes. This finding aligns with the balanced scorecard framework, which suggests that financial, operational, and customer-focused metrics are critical for assessing performance [31].

E. Implications for Medium-Sized Enterprises in Indonesia

The findings have several practical implications for medium-sized enterprises aiming to enhance corporate performance, Invest in Smart Supply Chain Technologies: Given the strong positive impact of smart supply chains, firms should prioritize investments in technologies such as IoT, predictive analytics, and automation. These tools can help streamline operations, improve decision-making, and enhance customer satisfaction.

1) *Enhance big data capabilities*: While big data-driven strategies have a moderate impact, their potential can be maximized by addressing resource and capability gaps. Firms

should focus on building data infrastructure, training employees, and fostering a data-driven culture.

2) *Refine web analytics strategies*: The negative impact of web analytics highlights the need for a more integrated and strategic approach. Firms should ensure that analytics tools are aligned with business objectives and that insights are actionable and well-implemented.

Addressing the Research Questions Based on SEM Analysis Results

How does big data-driven supply chain management influence corporate performance in Indonesian MSEs?

The analysis results show that big data-driven supply chain management significantly impacts corporate performance, as evidenced by the positive path coefficient (0.27) and significant p-value. This finding aligns with previous studies, such as those which emphasize that big data analytics in supply chain processes improves decision-making, operational efficiency, and overall firm performance[32]. By leveraging big data, Indonesian MSEs can optimize inventory management, enhance supplier relationships, and predict market demand more effectively, thereby boosting their corporate performance.

What is the role of web analytics in enhancing the market orientation of Indonesian MSEs?

The SEM analysis reveals a direct relationship between web analytics and market orientation, with a path coefficient of 0.30. This indicates that web analytics significantly enhances market orientation by providing actionable insights into customer behavior, preferences, and market trends. Corroborate these findings, suggesting that web analytics tools enable businesses to adopt a customer-centric approach, refine marketing strategies, and adapt to dynamic market conditions[33]. For Indonesian MSEs, this means leveraging web analytics to better understand their target audience, tailor their offerings, and achieve competitive advantage in a highly fragmented market.

How does market orientation mediate the relationship between digital tools (big data and web analytics) and corporate performance in Indonesian MSEs?

The mediation analysis highlights that market orientation serves as a partial mediator between digital tools and corporate performance. Big data-driven supply chain management and web analytics indirectly influence corporate performance through their positive effect on market orientation. This is supported by previous research, which emphasize that market orientation fosters customer-focused strategies and responsiveness, ultimately driving corporate success[3]. For Indonesian MSEs, investing in both big data and web analytics can cultivate market orientation, which, in turn, enhances their corporate performance. This study provides empirical evidence supporting the critical role of digital tools, such as big data-driven supply chain management and web analytics, in improving corporate performance through enhanced market orientation. Indonesian MSEs can benefit significantly from adopting these technologies to remain competitive and responsive to market demands. Future research can explore sector-specific applications of these tools and their long-term impact on business sustainability.

V. CONCLUSION

This study emphasizes the importance of smart supply chain technologies as the primary driver of corporate performance, followed by big data-driven strategies. However, the negative impact of web analytics indicates the need for further exploration and refinement of these strategies. The theoretical implication of these findings highlights the need for a deeper understanding of how technology and data can be effectively applied in the context of medium-sized enterprises.

Practically, this research provides value by showing that medium-sized enterprises should optimize the use of smart supply chain technologies and big data strategies to improve performance. Additionally, there is a need to enhance the implementation of web analytics through better training, appropriate tool integration, and alignment with organizational goals.

The limitations of this study include a limited focus on specific sectors and potential sampling biases. Future research could investigate the specific challenges faced by medium-sized enterprises in implementing web analytics and explore potential solutions to these issues. Furthermore, longitudinal studies could provide deeper insights into how these relationships evolve over time. Research should also explore sectoral differences and the role of external factors, such as regulatory changes and market conditions, to enrich the understanding of the drivers of corporate performance.

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