

Analyzing the Utilization of Data Analytics in Supply Chain Decision-Making among Small and Medium Enterprises in Lusaka, Zambia

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Abstract

Data analytics has become a crucial tool for businesses, allowing them to uncover valuable insights from large datasets and enhance their operational efficiency. For Small and Medium Enterprises (SMEs), which are the foundation of many economies, effective supply chain management is essential for staying competitive and sustainable. This study investigated the utilization of data analytics in supply chain decision-making among SMEs in manufacturing, agribusiness, and retail and wholesale trade in Lusaka, Zambia. Employing a quantitative research approach, this study collected and analyzed data from a representative sample of 220 SMEs in Lusaka. The findings revealed that several intertwined factors contribute significantly to the lack of big data analytics use in supply chain decision-making among SMEs in Lusaka with many SMEs acknowledging gaps in expertise and uneven distribution of skills. Additionally, the findings suggested a significant gap in data analytics knowledge and application within the company's supply chain management. Based on these findings the study recommends that SMEs invest in data infrastructure and prioritize data analytics training to enhance the utilization of data analytics in the supply chain. In the same vein, the study recommends that policymakers develop policies such as tax incentives, grants, and subsidies that encourage the adoption of data analytics among SMEs in Lusaka.

Keywords: Small and Medium Enterprises (SMEs), Supply Chain Management, Data Analytics, Big Data Analytics, Big Data.

Introduction

The evolution of supply chain management has become a critical determinant of organizational success. Traditional business practices often dominate organizational culture resulting in resistance to change and innovation among employees and management. However, with competition among businesses undergoing significant changes, the evolution of the digital age has ushered in a new era of data-driven decision-making, revolutionizing supply chains across different industries around the globe. Digital transformation and restructuring of SME's is of fundamental importance for supporting economic growth and expanding globalization but it is also important to establish strategic perceptions into the adoption of these modern tools (Telukdarie et al., 2022). Data analytics, in particular, has emerged as a powerful tool that enables organizations to extract

valuable insights from vast amounts of data and improve their operational efficiency. For small and medium enterprises (SMEs), which form the backbone of many economies, efficient supply chain decision-making is pivotal for competitiveness and sustainability.

Data is growing at an exponential rate nowadays, and much of it is relevant for making decisions and policies in the following areas: Organization and customer management; commodities and financial markets; macroeconomic growth; supply chain management; manufacturing; and service processes (Coleman et al., 2016; Alp, 2018). With such events, the term "Big Data" was coined to describe these enormous datasets, which traditional computing methods are ill-equipped to manage. Therefore, Big Data Analytics has become an essential tool for examining mountains of data in search of useful insights and trends (Mohamed, et al., 2018). To get insight from these interconnections, businesses need to be able to accept and integrate data from a wide variety of sources and formats (Alp, 2018).

According to Willetts, et al., (2020), Big Data is a comprehensive term that encompasses various technologies designed to capture, store, process, and analyze intricate datasets. These datasets are characterized by their substantial volume, velocity of high generation, and diverse formats. With the technological advancements across the entities of Supply Chain, data generation is also increasing at a fast rate. The data flow in the past years was documented in terms of physical documents until the use of Information Technology (IT) in Supply Chain. Now, majority of the information flow linked to the material flow is being documented in the form of digital structured data. As the scope of Supply Chain is currently worldwide, the volume of data collected from its numerous processes and the velocity at which it is being generated can be qualified as Big Data. In addition to this, entities such as marketing and sales are now relying on analysis of the unstructured data along with the structured data to gain better insights into customer needs and improve upon the cost aspects of Supply Chain processes. (Mohamed, et al., 2018).

SMEs make up a significant portion of the business environment, playing an essential role in the economics of nations throughout. These businesses are essential to the growth of both the domestic and international economy. In Zambia SMEs represent 97% of all businesses in the country (FSD Zambia, 2017), 70% of gross domestic product (GDP) and 88% of employment (Invest, 2017). SMEs have an important role in society as well, since they are often the primary employers of the most marginalized members of the labor market (Centre International Trade, 2015). SMEs are found in several sectors in Zambia, such as retail and wholesale trade, agribusiness, manufacturing, services, mining, tourism, and construction. They constitute the backbone of Zambia's business landscape, contributing significantly to its economic growth and development (Policy Monitoring Research Centre, 2021).

However, SMEs have an extremely limited adoption of Big Data Analytics, despite the fact that doing so might provide them with a strategic edge (Velthuisen, et al., 2018). This was also evident in a report by Dat (2018) which indicated that there is a gap in the literature about the adoption of analytics and big data in SME companies. Despite this, SMEs play crucial roles in the global economy, and SME supply chains are often cited as key

contributors to the smooth operation of the production and distribution processes in many sectors. In addition, supply chain management in SMEs has issues that are comparable to those in bigger businesses (demand management, inventory management, logistics, etc.), and these issues may be solved by using analytics (Dat, 2018). Examples of achieving significant gains were provided by Tan and Zhan (2017), for instance, shortening the time to market a product by more than 7 months and slashing development costs by 90%. Moreover, in today's complicated and competitive business environment, the success of enterprises in the SME sector relies heavily on the adoption of appropriate strategies such as data analytics in making decisions (Kot, et al., 2018).

This study focuses on Manufacturing, Agribusiness, and Retail and Wholesale Trade sectors which are key to Zambia's economy. There is currently just a tiny quantity of published research on the issue of SMEs and their usage of Big Data Analytics, as noted by Bouwman et al (2018).

Statement of the Problem

In today's data-driven business environment, companies all over the world are increasingly relying on big data analytics (BDA) to make informed decisions and provide them a competitive advantage (Shahid & Sheikh, 2021). BDA is becoming more popular in supply chain management on a global level. The global BDA market was valued at USD 49.03 billion in 2022 and is projected to grow at a compound annual growth rate (CAGR) of 26.7% from 2023 to 2030 (Grand View Research, 2023).

Despite BDA being viewed as a significant asset for decision-makers to obtain timely insights and generate high revenue, only 5% to 10% of African companies use it for decision-making, indicating that the continent remains behind compared to other parts of the world (African Development Bank, 2023).

The adoption of BDA in Zambia is still in the early stages of development, primarily due to obstacles such as restricted access to technology, a lack of digital skills, and limited resources among SMEs (UN Global Pulse, 2012). Despite these challenges, the Ministry of Technology and Science (2023) emphasizes Zambia's commitment to leveraging Artificial Intelligence, Machine Learning, Internet of Things, Blockchain Technologies, Robotics, and Big Data to transform businesses and processes. In addition, the government's establishment of data centers to support the growing industries creates an opportunity for SMEs to utilize the vast amount of daily data being collected. Therefore, conducting this study will provide a deeper understanding of the benefits, address existing challenges, and develop strategies for improved utilization of BDA among SMEs in Zambia.

A study carried out in South Africa by Seseni & Mbohwa, (2021) found that SMEs that use big data are more profitable, productive, and innovative. In a similar study, Ogbuokiri, et al. (2015) examined the extent to which Big Data can be harnessed for SME growth in Nigeria and Lutfi, et al. (2022) examined the influence of technological, organizational, and environmental factors on big data adoption in the Jordanian SMEs context. Existing research often examines different regions, making this study unique in its targeted

approach to Zambia's SMEs. This study fills a research gap by focusing specifically on SMEs in Zambia and their adoption of BDA in supply chain decision-making.

Research Objectives

- i. To assess the level of knowledge of data analytics by SMEs in supply chain decision-making.
- ii. To establish the utilization of data analytics by SMEs in supply chain decision-making.
- iii. To identify the challenges SMEs in Lusaka are facing in using data analytics in supply chain decision-making.

Literature Review

This section elucidates the empirical research relevant to addressing the research objectives.

Application of Big Data Analytics in Decision-Making

Big data analytics has become increasingly integral to decision-making processes across various domains, offering organizations powerful insights to inform strategic, operational, and tactical decisions. At its core, big data analytics enables the extraction, processing, and analysis of vast volumes of structured and unstructured data to derive actionable insights. In decision-making contexts, big data analytics facilitates evidence-based decision-making by providing stakeholders with timely and relevant information to address complex challenges and capitalize on opportunities (Udeh, et al., 2024). As businesses increasingly adopt big data-driven strategies, the balance between offering personalized services and safeguarding consumer rights is a delicate one, requiring both ethical considerations and regulatory compliance.

One of the key ways in which big data analytics is utilized in decision-making is through predictive analytics. By leveraging advanced statistical techniques and machine learning algorithms, organizations can analyze historical data to forecast future trends, outcomes, and events. For instance, in financial services, banks use predictive analytics to assess credit risk, detect fraudulent activities, and optimize investment strategies (Rozak, et al., 2022). Similarly, in healthcare, predictive analytics enables clinicians to anticipate patient outcomes, identify high-risk individuals, and personalize treatment plans (Suresh, 2016). Furthermore, big data analytics plays a crucial role in optimizing operational decision-making processes. For example, in supply chain management, organizations use big data analytics to enhance demand forecasting, optimize inventory management, and streamline logistics operations. By analyzing large datasets from various sources, including sales data, weather patterns, and social media sentiment, organizations can make data-driven decisions to improve efficiency, reduce costs, and enhance customer satisfaction (Wamba, et al., 2014). However, the degree to which businesses can fully capitalize on these opportunities often hinges on their ability to manage and interpret data effectively.

Organizations lacking in data literacy or infrastructure may struggle to realize the potential benefits of big data, risking suboptimal decision-making and missed opportunities. Furthermore, while big data offers cost savings and efficiency gains, it also requires substantial upfront investments in infrastructure and talent, making it accessible predominantly to larger organizations with the necessary resources.

Case studies provide compelling examples of the effectiveness of big data analytics in decision making. For instance, Walmart, a retail giant, leverages big data analytics to optimize its inventory management processes. By analyzing sales data in real-time and integrating it with external factors such as weather forecasts and seasonal trends, Walmart can accurately forecast demand, minimize stockouts, and optimize shelf replenishment (Davenport, 2014). Similarly, Netflix utilizes big data analytics to personalize its content recommendations for users based on their viewing history, preferences, and behavior patterns. This enables Netflix to enhance user engagement, retention, and satisfaction, ultimately driving business growth (Es, 2022). Overall, big data analytics empowers organizations to make informed, data-driven decisions across various domains, enabling them to gain a competitive edge, drive innovation, and achieve their strategic objectives. Through predictive analytics, operational optimization, and personalized insights, big data analytics revolutionizes decision-making processes, unlocking new opportunities for organizations to thrive in an increasingly data-driven world.

While big data analytics has undeniable potential to drive innovation, efficiency, and competitive advantage, its integration into business strategy must be approached with a nuanced understanding of both its opportunities and challenges. Organizations must not only focus on the technological aspects but also consider ethical, regulatory, and operational risks to harness the true transformative power of big data analytics in the digital age.

Supply Chain Decision-Making in SMEs

The application of big data analytics in supply chain decision-making has garnered significant attention, particularly concerning its implications for Small and Medium-sized Enterprises (SMEs) across different economic contexts.

Application of Big Data Analytics in Supply Chain Decision Making in SMEs from Developed Economies Perspective

Various studies have examined the adoption and impact of big data analytics in supply chain decision-making among SMEs in developed economies. For example, research by Karki (2024) investigated how SMEs in the United States leverage big data analytics to enhance supply chain visibility, optimize inventory management, and improve decision-making processes. Their findings highlighted the significant benefits of real-time data analysis in improving operational efficiency and responsiveness to customer demands. Similarly, research by Bach, et al. (2020) explored the use of big data analytics in supply chain risk management among SMEs in European countries. They found that advanced analytics

techniques, such as predictive modeling and machine learning, enable SMEs to identify and mitigate risks more effectively, thereby enhancing supply chain resilience and competitiveness. Literature from developed economies suggests that SMEs are increasingly recognizing the value of big data analytics in supply chain decision making. Key insights include the importance of real-time data analysis, predictive capabilities, and risk management functionalities in driving operational excellence and competitive advantage (Lee & Mangalaraj, 2022). However, this enthusiasm for big data analytics must be tempered with an awareness of its limitations, especially in the SME context. Many SMEs operate under financial and technical constraints that may hinder their ability to implement advanced analytics. The capital investment required for data infrastructure, the training of personnel, and ongoing maintenance may be prohibitive for smaller firms, potentially leading to a digital divide between large enterprises and SMEs.

Application of Big Data Analytics in Supply Chain Decision Making in SMEs from Developing Economies Perspective

In contrast, research on the application of big data analytics in supply chain decision-making among SMEs in developing economies is relatively limited but growing. Studies in this area often highlight unique challenges and opportunities faced by SMEs operating in less mature business environments. For instance, a study by Rahman, et al. (2017) investigated the adoption of big data analytics among SMEs in emerging markets, including India and China. They identified barriers such as limited access to technology infrastructure, data privacy concerns, and skills shortages as significant challenges hindering widespread adoption. However, they also noted that SMEs in developing economies can leverage big data analytics to gain insights into emerging market trends, consumer behavior, and competitive dynamics. Similarly, research by Chen & Zhang (2019) explored the role of big data analytics in supply chain innovation among SMEs in Southeast Asia. They found that while SMEs face resource constraints and institutional barriers, strategic partnerships and government support initiatives can facilitate the adoption and utilization of big data analytics for supply chain optimization and market expansion.

Literature on big data analytics adoption in supply chain decision-making among SMEs in developing economies underscores the importance of addressing adoption challenges infrastructure while leveraging the potential for market insights and innovation. The application of big data analytics in supply chain decision-making for SMEs in developing economies is undoubtedly beneficial, but not without its complexities. The optimism in the literature regarding real-time data analysis, predictive capabilities, and risk management functionalities must be balanced against the practical challenges of adoption for SMEs in developing countries, including resource limitations, scalability issues, and potential risks associated with automated decision-making. As SMEs in developing countries continue to explore the use of big data, future research should focus on strategies that address these challenges, ensuring that the benefits of big data analytics are accessible and sustainable for organizations of all sizes.

**Application of Big Data Analytics in Supply Chain Decision-Making in SMEs from a
Zambian Perspective**

Research specifically focusing on the application of big data analytics in supply chain decision-making among SMEs in Zambia is limited. However, various evidence suggests a growing interest in leveraging data-driven insights to enhance supply chain efficiency and competitiveness. Factors influencing the adoption and utilization of big data analytics in Zambia's SME sector include technological infrastructure constraints, data privacy and security concerns, and skills shortages. In addition, the availability of affordable analytics solutions tailored to the needs of SMEs and supportive government policies could play a crucial role in driving the adoption (Chellah & Kaunda, 2021).

Moving forward, research in this area could explore case studies of Zambian SMEs that have successfully implemented big data analytics in their supply chain operations, identifying best practices, challenges overcome, and lessons learned. In addition, studies examining the socio-economic impact of big data analytics adoption on SME growth, job creation, and economic development in Zambia would provide valuable insights for policymakers and practitioners alike. While there is growing recognition of the potential benefits of big data analytics in supply chain decision-making among SMEs in developed and developing economies, more research is needed to understand the unique challenges and opportunities in different contexts, including Zambia. Such insights can inform strategies to promote inclusive and sustainable economic growth through data-driven innovation in SME supply chains.

Challenges of Utilizing Big Data Analytics by SMEs

Data Analytics is rapidly being utilized by large companies on a global scale to gain competitive advantage which is well documented in the literature (Matthew Willetts et al., 2020). The challenges faced by SMEs in the supply chain decision-making with the integration of data analytics are mainly due to its complex characteristics of data analytics technologies, adopting and using analytics and big data present challenges for both big companies and SMEs. Arunachala et al. (2017) argued that general challenges in implementing analytics include organizational challenges and technical challenges. Those challenges also are faced by SMEs organizations, however, due to the limitations in the different type of necessary resources, challenges in SMEs can be in larger extents. These barriers and challenges have been categorized as human resources, strategy and awareness, finance, IT infrastructure, and Lack of Facilitating conditions. Evidence from the literature indicates that SMEs are underutilizing this technology for a variety of reasons, for example lack of expertise and cost implications.

Lack of Expertise

The study done by Willetts et al., (2020) aimed at identifying barriers to the adoption of data Analytics by SMEs to help them overcome the challenges and to exploit the benefits of data Analytics to improve their competitive advantage which will benefit the wealth of

the country, particularly in the aftermath of Covid-19. The study revealed that for relatively new technology, it is unlikely that SMEs will have the skillsets required to utilize it. This marks the first barrier to adoption and utilization of data analytics which is knowledge and skills, regulatory barriers, and privacy issues that organizations need to be aware of to ensure compliance, for example, data protection legislation which dictates how businesses should store and process personal data.

IT Infrastructure

Technical barriers related to the infrastructure required to facilitate data Analytics and hardware and software issues, including security, data storage issues, and the requirement of a high bandwidth internet connection to support Cloud-based services, Organizational structure, culture, top management support, and the lack of a strategy, and last but not the least the study also revealed identified resource barriers relate to the financial constraints an SME encounters. For instance, the cost of procuring Big Data Analytics technology, the resources required to implement and use it, and the time an SME needs to dedicate to the project. This theme includes the barriers-coded business cases, finance, and resources. In a survey of 40 SMEs, they may already have knowledge but their infrastructure is inadequate to facilitate data analytics. Alharthi, et al. (2017) state that data analytics infrastructure can be designed using low-cost commodity hardware, however, the servers and storage systems are connected via ethernet or fiber networks, therefore the network infrastructure must support the high throughput and bandwidth associated with the large volumes of data transmitted between servers.

Regulatory Issues

Regulatory issues refer to the legal, security, privacy concerns of collecting data. Lee suggests that: 'protecting privacy is counterproductive to both firms and customers, as big data is a key to enhanced service quality and cost reduction. Therefore, firms and customers need to strike a balance between the use of personal data for services and privacy concerns. To comply with relevant legislation including the EU's General Data Protection Regulation, SMEs are required to have sufficient knowledge about legislation and regulation to ensure their processes cater to these requirements. Coleman et al. state that the EU Handbook on European data protection law contains over 200 pages and that SMEs may not be able to afford to acquire support from lawyers to understand what the implications are for their business. Data security will likely require a review if new Big Data technologies are introduced into a business', IT infrastructure. If an SME does not have sufficient security mechanisms, confidential information could be transmitted or intercepted by unintended parties, resulting in finance failures.

Cost of Adopting Big Data Analytics

Financial barriers highlight the investment required to adopt data analytics. SMEs are not able to borrow large amounts of finance; therefore, they are cautious about investing in

technologies beyond their business scope. Similarly, SMEs may not have a budget for IT or data analytics investment. In addition to the cost factors associated with the generation, storage, processing, analysis and interpretation of data analytics., there are also other costs including cybersecurity and training. Lee highlights that a major issue of adopting data analytics is investment justification, as executives may be concerned about committing to a large investment to deliver tangible benefits which are outweighed by the tangible costs, despite potentially large intangible benefits being delivered.

Technological Barriers

Big data technologies offer numerous opportunities and its potential is undeniable. However, data scientists are facing different challenges when dealing with large data sets to dig out knowledge from such mines of information (Iqbal, et al., 2018). Other barriers include technological barriers which also refers to data scalability; data silos; infrastructure readiness; lack of suitable software; and poor data quality. The complexity of data is the challenge of managing data originating from a variety of sources, stored in a variety of structured and unstructured formats which may include SMS, images, videos, audio files and emails. Alharthi, et al., (2017) state that most organizations do not have a plan to address this problem with many preferring to delete data rather than accommodating data growth. Data scalability refers to the challenges of storing the large volumes of data analytics as many organizations have to delete their data after a certain period to allow newly created data to be stored. Arunachalam, Kumar, and Kawalek state that relational databases offer limited data scalability and therefore suggest that technologies including Hadoop, NoSQL, distributed file systems, parallel computing and Cloud Computing could be implemented to accommodate data scalability. Data silos are isolated datasets without links to other datasets, for example, data stored by individual departments of an organization in separate information systems. Data quality measures how well a dataset meets criteria for accuracy, completeness, validity, consistency, uniqueness, timeliness, and fitness for purpose, and it is critical to all data governance initiatives within an organization (IBM, 2024). Meaningful analytics require precise and high-quality data. Inadequate or inconsistent data can result in erroneous conclusions and decisions. Therefore, robust data integration solutions are necessary for integrating data from multiple sources, including Enterprise Resource Planning (ERP), and Internet of Things devices.

Strategies for Utilizing Big Data Analytics by SMEs

Small and Medium-sized Enterprises (SMEs) face various challenges in effectively utilizing big data analytics for supply chain decision-making. However, numerous strategies and best practices have emerged to help SMEs overcome these challenges and harness the potential of big data analytics. This literature review explores these strategies, providing insights into how SMEs can leverage big data analytics to enhance their supply chain operations.

Building Internal Data Analytics Capabilities

One of the key strategies for SMEs is to invest in building data analytics capabilities internally. This involves hiring or training employees with the necessary skills in data science, statistics, and programming to analyze large datasets and extract actionable insights. By developing an in-house team of data analytics experts, SMEs can gain greater control over their data analytics processes and tailor their analyses to meet specific business needs. Moreover, SMEs can foster a data-driven culture within their organizations by promoting data literacy and encouraging employees to use data-driven insights to inform decision-making (McAfee & Brynjolfsson, 2012).

Partnerships and Collaborations

Another effective strategy for SMEs is to leverage external expertise through partnerships or collaborations with data analytics firms or consultants. Outsourcing data analytics tasks to specialized service providers can help SMEs overcome resource constraints and access advanced analytics capabilities without the need for significant upfront investment in technology and talent. Moreover, collaborating with external partners can provide SMEs with access to domain-specific expertise and industry knowledge, enabling them to derive greater value from their data analytics initiatives (Davenport & Harris, 2007). Furthermore, SMEs can adopt a phased approach to big data analytics implementation, starting with pilot projects or proof-of-concept initiatives to test the feasibility and potential benefits of big data analytics in specific areas of their supply chain operations. By focusing on targeted use cases or business processes, SMEs can minimize risks and demonstrate the value of big data analytics to key stakeholders within the organization. In addition, starting small allows SMEs to iterate and refine their analytics strategies over time, gradually expanding the scope and scale of their analytics initiatives as they gain confidence and experience (Bhardwaj, 2022).

Adapting Previous Business Cases

Case studies and examples of successful implementation of big data analytics strategies can provide valuable insights and inspiration for SMEs looking to embark on their own analytics journey. For instance, companies like Amazon and Walmart have demonstrated how leveraging big data analytics can drive significant improvements in inventory management, demand forecasting, and supply chain optimization. By analyzing vast amounts of customer data in real-time, these companies can identify trends and patterns, optimize inventory levels, and personalize product recommendations to meet customer demand more effectively (Davenport, 2014). Moreover, SMEs can learn from the experiences of other businesses within their industry or peer networks that have successfully implemented big data analytics initiatives. By sharing best practices, lessons learned, and practical insights, SMEs can avoid common pitfalls and accelerate their analytics adoption journey. Industry associations, trade groups, and professional networks can serve as valuable

platforms for knowledge-sharing and collaboration among SMEs interested in leveraging big data analytics for supply chain decision-making (McAfee & Brynjolfsson, 2012).

SMEs can employ various strategies and best practices to effectively utilize big data analytics in supply chain decision making. By investing in internal capabilities, leveraging external expertise, adopting a phased implementation approach, and drawing insights from successful case studies and examples, SMEs can overcome challenges and unlock the potential of big data analytics to drive innovation, improve operational efficiency, and gain a competitive advantage in the marketplace.

Theoretical & Conceptual Frameworks

Informed by philosophical perspectives, the study incorporates three key theoretical perspectives: the Technology Acceptance Model, Social Penetration Theory, and Diffusion of Innovation Theory. These theories offer valuable frameworks for understanding the dynamics of technology adoption, human behavior, and innovation diffusion within the context of SMEs' engagement with data analytics. The Technology Acceptance Model was developed by Fred Davis in 1989, this theory states that the Technology acceptance model explains the determinants of information technology end user's behavior towards information technology cost. The study applied this model to investigate SMEs' behaviors towards the adoption and utilization of data analytics in supply chain decision-making. By examining how SMEs perceive the usefulness of data analytics technologies in enhancing their supply chain decision-making processes, we aimed to gain insights into the factors influencing their adoption decisions and behaviors. The diffusion of innovation theory seeks to explain how and why new ideas and practices are adopted, with timelines potentially spread out over long periods. The theory was established in 1962 by Everett Rogers but later edited in 2003 by Rogers. The diffusion of innovation theory was important to our study as we examined the process by which SMEs adopt and utilize data analytics in their supply chain and inventory management practices. Specifically, we investigated how potential adopters perceived the advantages and disadvantages of data analytics technologies and how these perceptions influenced their decision-making processes. The Social Penetration Theory was developed by Irwin Altman and Dalmis Taylor in 1973, with further elaboration in 1981, this theory explains how human exchange forms relationships with a focus on individual influences for sharing on social media. By applying the insights from the Social Penetration Theory, we aimed to uncover strategies for SMEs to maintain trust and credibility with their audience, allowing for meaningful communication and feedback exchange. These theories offer valuable frameworks for understanding the dynamics of technology adoption, human behavior, and innovation diffusion within the context of SMEs' engagement with data analytics.

Based on the research objectives and the reviewed pertinent literature, the conceptual framework in Figure 1 and hypotheses were developed for this study.

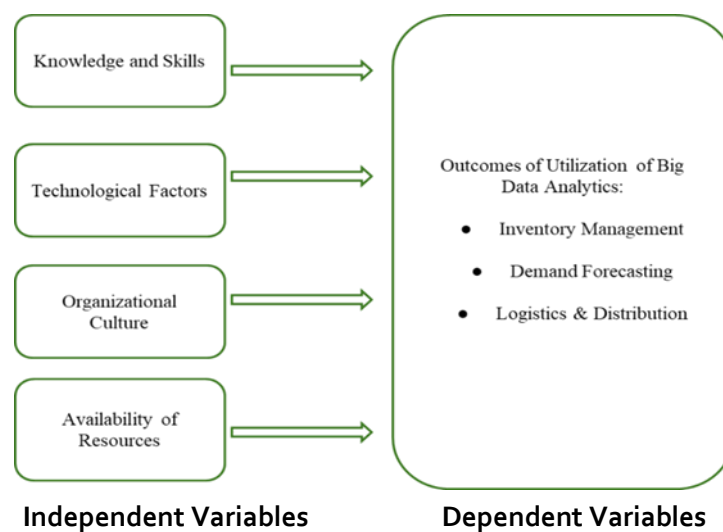


Figure 1.

Source: Author, 2024

The research hypotheses below were proposed as temporary solutions to the study's problem. In this case, the null hypothesis was that there was no significant positive relationship between the dependent and independent variables. Conversely, the alternative hypothesis posited a significant relationship between these variables.

Ho: Knowledge and skills have no significant effect on the utilization of big data analytics in SMEs.

Ha: Knowledge and skills significantly affect the utilization of big data analytics in SMEs.

Ho: Technological factors do not significantly impact the utilization of big data analytics in SMEs.

Ha: Technological factors significantly impact the utilization of big data analytics in SMEs.

Ho: Organizational culture does not significantly influence the adoption and utilization of big data analytics in SMEs.

Ha: Organizational culture significantly influences the adoption and utilization of big data analytics in SMEs.

Ho: The availability of financial and technological resources does not have a significant impact on the utilization of big data analytics in SMEs.

Ha: The availability of financial and technological resources significantly impacts the utilization of big data analytics in SMEs.

Research Methodology

The research was quantitative and employed a descriptive research design. According to Siedlecki, (2020), descriptive research designs aim to describe individuals, situations, or phenomena by studying them as they are in nature and providing answers to questions about what, where, when, and how. The target population for this study comprises of small and medium-sized enterprises (SMEs) registered with Patents and Companies Registration

Agency (PACRA) operating within the city of Lusaka, Zambia. The target population included SME owners, managers, and IT professionals from various industry sectors such as manufacturing, agri-business, and retail and wholesale trade. This diversity ensured that the findings were comprehensive and applicable across different types of businesses within the SME sector. The selection of Lusaka as the study area is based on its significance as the capital city and a major economic hub within the country. Self-administered structured questionnaires were utilized to capture owners, managers, and IT personnel's views of the study variables presented in the conceptual framework and summarized in the operationalization. The study utilized a structured survey questionnaire that contained elements related to the research questions on a Likert scale.

Furthermore, a stratified sampling technique was used to determine the sample size for both formal and informal SMEs. The population of SMEs was first categorized into formal and informal sectors based on predetermined criteria such as registration status, size, and legal structure. The sample size 278 was determined using Cochran's formula using PACRA's estimated population of 1000 SMEs in Lusaka's CBD. However, the number of successful respondents for this primary data comprised 220 participants categorized as 68 Manufacturing, 103 Agribusiness, and 49 Retail and Wholesale Trade. Secondary data sources utilized included previous research reports, journals, corporate websites, and books.

Validity & Reliability test

To ascertain that the instruments are authentic, the Split Half reliability technique was employed. Thus, the study items in the research instruments were split into two equal halves. Thereafter, Cronbach alpha was used to correlate the two halves using Spearman's correlation coefficient (ρ) to determine the reliability of the study instrument before being deployed in the field. Content validity of the instruments was ensured by constructing them within the strict confines of the study objectives as well as reviewed literature in order to guarantee that they measure what they ought to measure. Validity was also ensured through the supervisor who reviewed the instrument before going in the field and the research committee who are both experts in the area of data analytics and its utilization.

Results and Discussion

Figure 2 provides a breakdown of the job roles within a particular organization. The most common position is IT Personnel, with 102 individuals (43.6%) holding this role. Following closely are Owners and Managers, with 58 (24.8%) and 66 (28.2%) individuals respectively. A much smaller proportion of the workforce is comprised of support staff such as Cleaners, Receptionists, and Security Guards, each accounting for less than 1% of the total employees. In addition, there are a few individuals in roles like Students, Employees, General Workers, and Security Guards, each representing 0.4% of the workforce.

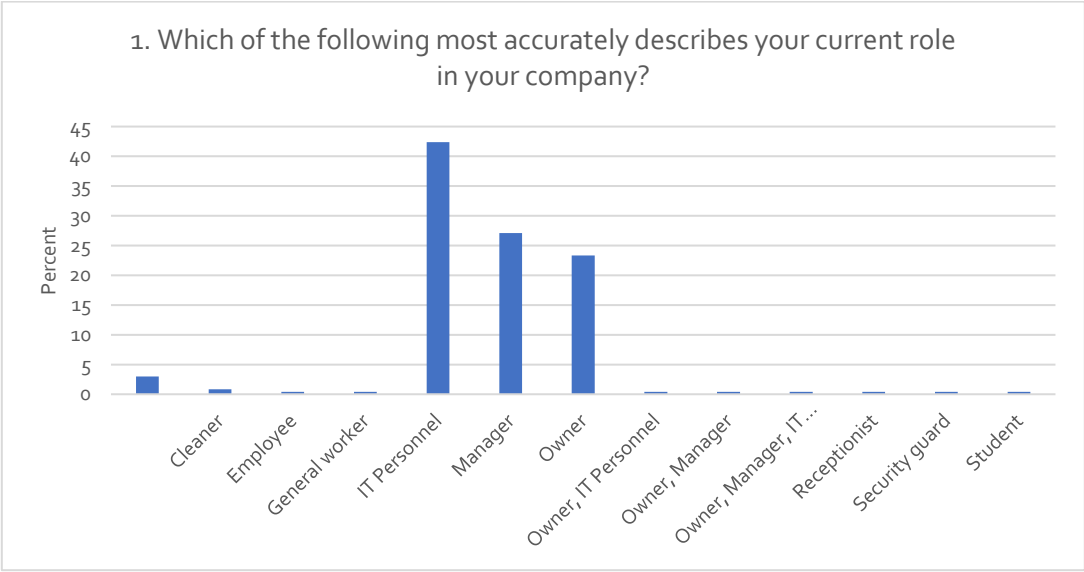


Figure 2: respondents Description of roles of respondents at time of data collection
Source: Field Survey, 2024

Sector of Firm

The figure below shows a breakdown of the sectors in which the businesses operate. The most prevalent sector is Agribusiness, with 103 businesses (47.5%) engaged in this industry. Manufacturing comes in second with 68 businesses (31.3%), followed by Retail and Wholesale with 49 businesses (22.6%). This indicates that the majority of the businesses in the sample are involved in agriculture-related activities, followed by manufacturing and trade.

Valid	217		
Missing	19		
		N	%
Manufacturing		66	28.0%
Agribusiness		103	42.8%
Retail and Wholesale		48	20.3%
Total		217	

Figure 3: The sector the businesses owned belong to.
Source: Field Survey, 2024

Knowledge on Data Analytics

The figure below presents the distribution of respondents based on their level of expertise in a particular skill or domain. The levels range from "None" to "Expert," representing increasing proficiency. The majority of respondents, 83 individuals (36.2%), fall into the "Intermediate" category, indicating a moderate level of expertise. A significant number, 70

respondents (30.6%), have a "Basic" understanding. The "Advanced" level encompasses 37 individuals (16.2%), while the "Expert" level is the least populated, with only 8 respondents (3.5%). This suggests that while many have a foundational understanding, a smaller proportion possess advanced or expert-level knowledge.

Valid	224		
Missing	12		
		N	%
Advanced		33	14.0%
Basic		70	29.7%
Expert		8	3.4%
Intermediate		78	33.1%
None		35	14.8%
Total		224	

Figure 4: Respondents knowledge on data analytics
Source: Field Survey, 2024

Type of Data Analytics Tools Used

This figure presents the distribution of respondents based on their preferred data analysis and visualization tools. Excel is the most popular tool, with 84 respondents (38.4%) choosing it as their preferred tool. Tableau follows closely with 68 respondents (31.1%). Custom in-house tools are used by 73 respondents (33.3%). SQL and Python are also popular, with 26 (11.9%) and 24 (11%) respondents, respectively. Power BI and R are used by 21 (9.6%) and 25 (11.4%) respondents, respectively. Statista, Java, and other tools are used by a very small number of respondents, each accounting for less than 1% of the total. This suggests that Excel and custom in-house tools are the most widely used tools for data analysis and visualization among the respondents. Examples of these tools are Microsoft Power BI, Sisense, Superset, and others.

	N	%
Custom In-house Tools	48	20.3%
Excel	56	23.7%
Power BI	5	2.1%
Python	3	1.3%
R	8	3.4%
SQL	7	3.0%
Tableau	44	18.6%
Total	121	

Figure 5: Data analytics tools used by the SME
Source: Field Survey, 2024

Small and medium enterprises (SMEs) have proved themselves to be slow adopters of the new technology of big data analytics and are in danger of being left behind (Coleman, et al., 2016). The data highlights a significant preference for familiar and accessible tools such as Excel and custom in-house solutions, which dominate the landscape of data analysis and visualization tools among SMEs. While these tools offer simplicity and affordability, the underutilization of advanced and versatile tools such as Python, SQL, Power BI, and R indicates a missed opportunity for SMEs to enhance their analytical capabilities and improve decision-making. Python and R, are among the most powerful tools for advanced data analytics, yet only 11% and 11.4% of respondents, respectively, reported using them. These programming languages offer unparalleled flexibility for performing predictive modeling, machine learning, and statistical analysis. For instance, Python has applications in every stage of the analytics process, including data mining, data processing, and data visualization which would enable users to efficiently gain insights from large data sets. For SMEs, adopting Python or R could enable the development of tailored solutions for demand forecasting, customer segmentation, and inventory optimization. On the other hand, Power BI and Tableau are increasingly recognized for their intuitive interfaces and robust visualization capabilities, yet their adoption is still relatively low compared to Excel. Power BI integrates seamlessly with Microsoft products and allows for real-time data updates and interactive dashboards, making it particularly advantageous for SMEs seeking to monitor performance indicators. Tableau, although slightly more popular, remains underutilized considering its ability to handle complex datasets and create highly customized visualizations that facilitate accurate and strategic decision-making. With only 11.9% of respondents utilizing SQL, its potential for database management and querying is vastly underutilized. According to Kelley (2024) SQL is a powerful tool used in data analysis for querying and manipulating data stored in relational databases. SQL provides SMEs with the capability to access and analyze structured data stored in relational databases efficiently. This can improve operational decision-making by enabling deeper insights into sales trends, customer behavior, and supply chain logistics. While the adoption of these tools may require specialized skills or additional resources, these tools often provide unique functionalities that can unlock new opportunities for efficiency and accuracy in supply chain decision-making among SMEs.

Impact of Data Analytics on Decision-Making

The figure below presents the distribution of perceived benefits of data analytics in supply chain management, as reported by 227 respondents. The most frequently cited benefit is "Better Forecasting Accuracy", with 108 respondents (47.6%) indicating this as a significant improvement. This suggests that data analytics is particularly valuable in improving the precision of demand forecasts. The next most common benefit is "Improved Efficiency", cited by 87 respondents (38.3%). This indicates that data analytics can help streamline supply chain processes and reduce operational costs. "Reduced Costs" is also a significant benefit, cited by 86 respondents (37.9%). This suggests that data analytics can help identify

cost-saving opportunities and optimize resource allocation. "Enhanced Supplier Relationships" is cited by 64 respondents (28.2%). This indicates that data analytics can help improve communication and collaboration with suppliers. "Improved Customer Satisfaction" is the least frequently cited benefit, with only 43 respondents (18.9%) indicating this as a significant improvement. This suggests that while data analytics can have a positive impact on customer satisfaction, it may not be the primary driver of this improvement.

	N	%
Better Forecasting Accuracy	57	24.2%
Enhanced Supplier Relationships	14	5.9%
Improved Customer Satisfaction	6	2.5%
Improved Efficiency	36	15.3%
Reduced Costs	36	15.3%
Total	149	

Figure 6: How Data analytics impacts decision-making in a company
Source: Field Survey, 2024

One of the most significant benefits of data analytics is its ability to improve the accuracy of demand forecasts. By analyzing historical sales data, market trends, and external factors, organizations can develop more accurate forecasts. This enables them to optimize inventory levels, production schedules, and resource allocation, reducing the risk of stockouts and overstock. As can be seen throughout the findings and literature, it is data analytics that helps organizations identify cost-saving opportunities throughout the supply chain. Using data on transportation costs, inventory levels, and supplier performance, businesses can negotiate better deals with suppliers, optimize transportation routes, and reduce waste. Data analytics can help organizations evaluate supplier performance, identify potential risks, and optimize supplier selection processes. The findings also show that data analytics is used to improve supply chain efficiency. Data analytics can be used to optimize transportation routes, identify bottlenecks, and improve the overall efficiency of the supply chain. Using data on transportation costs, lead times, and carrier performance, organizations can identify opportunities for mode shift, consolidation, and route optimization. Data analytics can help organizations evaluate supplier performance, identify potential risks, and optimize supplier selection processes. While the results show that a small percentage of the respondents use data analytics to improve customer satisfaction it is important to note that data analytics can be used to predict potential quality problems and take proactive measures to prevent them. Therefore, data analytics can help organizations understand customer preferences, identify potential opportunities, and improve customer satisfaction.

Knowledge and Skills of Data Analytics

	SD	D	N	A	SA
<i>Our employees possess adequate knowledge ...</i>	3%	55%	50%	93%	10%
<i>Our team has a deep understanding of how ...</i>	3%	35%	80%	85%	10%
<i>We regularly apply data-driven insights ...</i>	2%	35%	78%	85%	10%
<i>The lack of data analytics skills in our</i>	<1%	30%	75%	85%	10%
<i>We invest in training programs to ...</i>	<1%	30%	70%	83%	8%

Figure 7: Knowledge and skills

Source: Field Survey, 2024

The figure above presents the responses to five statements about the use of data analytics in supply chain management within a company.

i. Our employees possess adequate knowledge of data analytics to support supply chain decision-making.

- While the majority of respondents agree with this statement, indicating that they believe employees had sufficient knowledge in data analytics for supply chain decisions, a considerable number were either neutral or against the statement.

ii. Our team has a deep understanding of how data analytics can optimize supply chain processes.

- Similar to the first statement, most respondents agree with this statement, suggesting that the team's understanding of data analytics' potential in supply chain optimization is competent.

iii. We regularly apply data-driven insights in our supply chain decision-making processes.

- Again, most respondents agree with this statement, indicating that data-driven insights are frequently used in their decision-making processes.

iv. The lack of data analytics skills in our company limits our ability to make informed supply chain decisions.

- A significant portion of respondents agree with this statement, supporting the idea that a lack of data analytics skills hinders informed decision-making in the supply chain.

v. We invest in training programs to improve data analytics skills for supply chain management.

- While a fair number of respondents agree with this statement, indicating some investment in training, the majority either disagree or are neutral, suggesting that investment in training might not be sufficient or consistent.

Several factors contribute to the observed levels of data analytics knowledge among SMEs in Lusaka. Understanding these factors is crucial for identifying barriers to effective data utilization and for formulating strategies that can enhance analytical capabilities across these organizations.

A primary factor influencing data analytics knowledge is the limited access to quality education and training programs focused on this area. Many SMEs struggle to find affordable training opportunities that equip their workforce with the necessary skills, which can significantly hinder effective data utilization (Selamat et al., 2018). The lack of accessible training resources not only limits skill development but also prevents organizations from staying updated with emerging trends and technologies in data analytics. This lack of expertise is critical as it could hinder the ability of these organizations to implement effective data-driven decision-making strategies that are essential for optimizing supply chain operations (Chen et al., 2012). These findings underscore the urgent need for targeted educational initiatives aimed at enhancing data literacy among SMEs. Additionally, resource constraints significantly impede SMEs' ability to adopt data analytics effectively. Financial limitations often restrict investments in essential analytical tools and software (Abrol & Gupta, 2023). Many SMEs prioritize immediate operational needs over long-term technological investments; this short-term focus can stifle innovation and growth within these enterprises.

Data quality and accessibility issues significantly affect the effectiveness of data analytics in SMEs (McAfee & Brynjolfsson, 2012). Poor-quality data—characterized by inaccuracies or incomplete datasets can severely limit insights derived from analysis efforts, leading organizations to make decisions based on flawed information. Furthermore, challenges in accessing relevant data from various sources can impede analytical processes; many SMEs struggle with collecting, cleaning, and integrating data effectively due to limited resources or expertise available within their teams (Proventa International, 2023). Without reliable and accessible data streams feeding into their analytical frameworks, even advanced analytical tools will yield limited results; this reality further discourages SMEs from pursuing robust data-driven strategies as they may perceive them as ineffective or unmanageable.

Challenges of Utilizing Data Analytics in Supply Chain Decision-Making

Respondents were also requested to indicate the challenges they face in the utilization of data analytics as the figure below shows.

	SD	D	N	A	SA
We face challenges in accessing ...	3%	30%	60%	90%	15%
The high costs of data analytics ...	2%	29%	60%	90%	17%
There is resistance within the ...	2%	25%	72%	90%	15%
Lack of training in data ...	1%	25%	60%	90%	15%
Our company struggles to ...	1%	30%	60%	85%	15%

Figure 8: Challenges of utilizing data analytics in supply chain decision-making
Source: Field Survey, 2024

The figure above presents the responses to five statements about the challenges faced in implementing data analytics in supply chain management within a company. Let's break down the responses for each statement:

- i. We face challenges in accessing accurate data for supply-chain decision-making.
 - The majority of respondents agree with this statement, indicating that data quality and accessibility are significant challenges in data-driven supply chain decision-making.
- ii. The high costs of data analytics tools prevent us from fully utilizing them in supply chain management.
 - A significant portion of respondents agree with this statement, suggesting that the cost of data analytics tools is a barrier to their wider adoption.
- iii. There is resistance within the organization to adopting data-driven supply chain practices.
 - A significant number of respondents agree with this statement, indicating that there is resistance to change and a lack of understanding about the benefits of data-driven approaches.
- iv. Lack of training in data analytics is a significant barrier to effective supply chain decision-making.
 - The majority of respondents agree with this statement, highlighting the need for training and education in data analytics to improve decision-making capabilities.
- v. Our company struggles to integrate data analytics tools with existing supply chain processes.
 - A significant portion of respondents agree with this statement, indicating that integrating data analytics tools into existing processes is a challenge.

Despite the numerous benefits of data analytics, SMEs often encounter several challenges in effectively utilizing data analytics in their supply chain operations. These challenges can be attributed to several key factors such as data quality and accessibility, lack of skilled personnel, cost constraints, and cultural and organizational barriers. Drawing from existing literature, particularly the works of Asiri, et al. (2024) and Lutfi, et al. (2022) several insights can be gleaned regarding the challenges of utilizing data analytics in supply chain management.

Data quality is a fundamental aspect of effective data analytics. The presence of inconsistent data, missing values, and errors can lead to inaccurate insights and ultimately result in misleading conclusions that affect strategic decisions (McAfee & Brynjolfsson, 2012). SMEs often struggle to maintain high data quality due to various reasons, such as reliance on manual data entry processes, which are prone to human error, outdated systems that cannot handle modern data demands, and a lack of established data governance practices that ensure consistency and accuracy across datasets. Furthermore, accessing accurate and timely data from diverse sources can be particularly challenging for SMEs with limited resources and inadequate IT infrastructure. These challenges necessitate

the implementation of robust data quality management practices, including systematic data cleaning, validation processes, and standardization efforts to ensure uniformity across datasets. Additionally, integrating data analytics tools with existing supply chain systems presents complexities that can impede successful implementation efforts within SMEs. Issues such as compatibility between different software systems, problems related to data synchronization across platforms, and inherent resistance to change from employees can all hinder the effective deployment of these solutions (Selamat et al., 2018). SMEs can mitigate these challenges by investing in advanced data integration tools and platforms that can further streamline data collection processes and enhance overall data accessibility, allowing SMEs to leverage their data more effectively for decision-making. However, the financial implications associated with acquiring and implementing data analytics tools represent a significant barrier for many SMEs, particularly those operating with constrained budgets. Advanced analytics tools—such as those used for data mining, machine learning applications, and predictive analytics software—can be prohibitively expensive and often require specialized expertise for effective operation (Abrol & Gupta, 2023). This creates a challenging environment where smaller firms may feel unable to compete with larger organizations that have the resources necessary to invest in such technologies. Organizational resistance to change is also a common challenge encountered during the adoption of data analytics within SMEs. Employees may exhibit hesitance towards embracing new technologies and processes due to fears of job displacement or concerns about increased workloads associated with new systems (Udeh et al., 2024). This resistance can significantly slow down the implementation of data-driven initiatives and hinder the potential benefits that these technologies could bring. To effectively overcome this resistance, it is essential for management to communicate the benefits of adopting data analytics clearly and persuasively throughout the organization. Top management's support can result in the vision of its effective perceived ease of use and perceived usefulness in the range of activities (Asiri, Al-Somali, & Maghrabi, 2024). Leaders must champion data-driven practices by setting an example and communicating the importance of data in achieving organizational goals. Additionally, providing employees with the necessary training ensures they feel confident and capable of using data in their roles. Resistance often stems from a lack of knowledge and skepticism about new technology. Suffice it to say that top-management support can bring about technology learning and diffusion throughout the organization, and thus plays a key role in its various adoption stages (Lutfi, et al., 2022). Finally, a significant shortage of skilled data analysts combined with limited training opportunities can severely restrict the effectiveness of data analytics initiatives within SMEs. Many organizations may lack personnel with the necessary expertise required to collect, clean, analyze, and interpret complex datasets accurately (Yoshikuni et al., 2023). This deficiency can lead to poor-quality insights that do not adequately inform decision-making processes, resulting in suboptimal outcomes for the business. Providing comprehensive training programs can help employees develop the necessary skills to utilize

data-driven insights effectively while also alleviating fears related to job security by emphasizing how these tools can enhance rather than replace their roles.

Conclusion

This study has explored the utilization of data analytics in supply chain decision-making within SMEs in Lusaka. Through a comprehensive literature review, empirical research, and in-depth analysis, the study has shed light on the current state of data analytics adoption, the challenges faced by SMEs, and the potential benefits that can be derived from its implementation. The study revealed that several intertwined factors contribute significantly to the lack of big data analytics use in supply chain decision-making among SMEs in Lusaka. Firstly, while many SMEs acknowledged adequate employee knowledge and team understanding of how data analytics can optimize supply chain processes, gaps in expertise and uneven distribution of skills remain evident. The findings also suggested a significant gap in data analytics knowledge and application within the company's supply chain management. Despite some investment in training, the majority of SMEs believe that employees lack sufficient knowledge and understanding of data analytics. This lack of expertise limits the company's ability to effectively utilize data-driven insights in decision-making processes, hindering the optimization of supply chain operations. Additionally, the findings provide valuable insights into the extent of data analytics utilization among SMEs in supply chain decision-making. While many SMEs possess foundational knowledge of data analytics tools, the low proportion of those with advanced or expert-level proficiency accentuates a need for skill enhancement. The widespread use of accessible tools such as Excel and custom in-house solutions reflects a reliance on familiar platforms, yet the limited adoption of advanced tools like Python, Power BI, and R highlights untapped potential for leveraging sophisticated analytics capabilities. Despite this, the reported benefits—such as better forecasting accuracy, improved efficiency, and cost reductions demonstrate the positive impact that data analytics has on supply chain operations. Predominantly applied in supplier selection, demand forecasting, and inventory management, data analytics is driving optimization in key areas. Overall, while progress has been made, gaps in skills, tool sophistication, and awareness remain, emphasizing the need for targeted training, investment in advanced tools, and organizational commitment to enhance the strategic utilization of data analytics in supply chain decision-making. Finally, the findings highlight key challenges faced by SMEs in utilizing data analytics for supply chain management. A significant number of SMEs reported difficulties in accessing accurate data, emphasizing data quality and accessibility as major obstacles to effective decision-making. High costs of data analytics tools also emerged as a substantial barrier, limiting their adoption and utilization across organizations. Resistance to adopting data-driven practices within organizations further complicates efforts, emphasizing a need for cultural shifts and greater awareness of the benefits of analytics. Additionally, the lack of data analytics skills and training in data analytics were identified as a critical impediment, reflecting a pressing need for educational initiatives to build analytical competencies. Finally, the struggle to integrate

data analytics tools with existing processes highlights operational and technological hurdles that SMEs must overcome. However, in fostering the adoption of data analytics among SMEs, government policies play a pivotal role in shaping an enabling environment for technological advancement. According to (Mahardhani, 2023) public policy must handle several key challenges, which are of utmost importance such as creating a stable environment and ensuring legal certainty for industry players. Clear and progressive regulations can help attract investment, encourage research and technology development, and increase the level of trust of the parties involved. Additionally, the government can provide financial incentives and support for companies or individuals who invest in sustainable technology research and development. This could be in the form of tax exemptions, research grants, or specialized funding for innovative projects. Addressing these challenges through favorable government policies, investments in affordable data analytics tools, comprehensive training programs, and organizational change can significantly enhance the adoption and impact of data-driven decision-making in SMEs. By overcoming obstacles related to data quality, technical expertise, cost, and cultural barriers, SMEs can unlock the full potential of data analytics to improve forecasting accuracy, optimize inventory management, streamline logistics, and strengthen supplier relationships. As a result, SMEs can achieve greater efficiency, reduce costs, and enhance their overall competitiveness. By embracing data analytics, SMEs can contribute to Zambia's economic growth and social development by creating jobs, stimulating innovation, and improving the quality of goods and services.

Recommendations

Based on the findings of this research, the following recommendations are proposed to enhance the utilization of data analytics in supply chain management among SMEs in Lusaka:

For SMEs:

- **Invest in Data Infrastructure:** Develop robust data infrastructure, including data warehousing and data integration tools, to ensure data quality, accessibility, and security.
- **Prioritize Data Analytics Training:** Invest in training programs to equip employees with the necessary skills to collect, clean, analyze, and interpret data.
- **Foster a Data-Driven Culture:** Encourage a culture of data-driven decision-making and innovation within the organization.
- **Collaborate with Technology Providers:** Partner with technology providers to access affordable and user-friendly data analytics tools.
- **Start Small and Scale Gradually:** Begin with small-scale data analytics projects to gain experience and build momentum.

- Leverage External Support: Seek support from industry associations, government agencies, and consulting firms to access expertise and resources.

For Policymakers and Regulators:

- Create a Supportive Policy Environment: Develop policies that encourage the adoption of data analytics by SMEs, such as tax incentives, grants, and subsidies.
- Promote Data Literacy and Skills Development: Invest in education and training programs to improve data literacy and data analytics skills among the workforce.
- Facilitate Data Sharing and Collaboration: Promote data sharing and collaboration between SMEs, government agencies, and industry associations to improve data quality and accessibility.
- Support the Development of Data Infrastructure: Invest in infrastructure development, such as high-speed internet connectivity, to facilitate data-driven decision-making.

Limitations of the Study

The study covered three sectors in Lusaka with a thorough primary data collection which might have benefited from a broader sectorial coverage, considering variations in data analytics utilization across different sectors. However, this was not done due to limited time and budget as the researcher self-funded the research.

Additionally, during the research period, some key stakeholders in SMEs were unavailable or acting in temporary roles, which posed challenges in securing accurate responses. This limitation may have impacted the accuracy of the data collected, as some respondents were unable to provide comprehensive insights into their organizations' use of data analytics in supply chain management.

Further Research

Future research should expand its scope to encompass a broader range of sectors, to capture a more comprehensive understanding of data analytics utilization and outcomes. Additionally, in-depth exploration of specific sectors may reveal unique challenges and opportunities.

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