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Reem Khamis Hamdan *Editor*

Integrating Big Data and IoT for Enhanced Decision-Making Systems in Business

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Preface

The second volume of *Integrating Big Data and IoT for Enhanced Decision-Making Systems in Business* presents a curated selection of 53 chapters that reflect current research and practices in digital transformation, sustainability, and innovation across various business domains. Divided into two parts, the first part explores the intersection of Big Data and emerging trends in education, marketing, and entrepreneurship, while second part focuses on sustainable and innovative practices in business and financial environments. Together, they highlight how data-driven technologies like IoT and AI are reshaping organizational strategies, enabling more informed decision-making, and driving responsible growth.

We thank all contributors for their valuable insights, which we hope will inspire continued research and development in this critical and rapidly evolving field.

Janabiyah, Bahrain/London, UK — Dr. Reem Khamis Hamdan

Data Driven Decision Making in MSMEs: PRISMA Review of How Data Management Affects Business Innovation in MSMEs in India

S. Mohamed Absar Haneef and S. Sudha

Abstract This article explores the influence of data driven decision making on business innovation in Micro, Small & Medium Enterprises (MSMEs) in India. In the contemporary business landscape, data management has become a pivotal factor driving business innovation and strategic growth, particularly for MSMEs, which are backbone of Indian economy. However, despite the potential benefits, the adoption of data management practices in MSMEs is hindered by various challenges, including limited access to technology, inadequate data literacy, and resource constraints. This research follows a systematic approach using PRISMA–Preferred Reporting Items for Systematic Reviews and Meta Analyses method to analyze relevant empirical studies published between 2022 and 2025. 70 articles are preliminarily discovered using thorough search of academic database Google Scholar. After we apply careful addition & rejection criteria—focused on studies specific to Indian MSMEs and the role of data management in fostering innovation—18 studies were selected for in-depth analysis. The findings from these 18 studies highlight several key themes: (1) Data driven decision making significantly contributes to improving produce & procedure innovations in MSMEs, particularly by optimizing supply chains, improving customer engagement, and facilitating better market analysis. (2) The adoption of big data, cloud computing, and AI technologies is gradually being integrated into MSME operations, albeit at a slower pace due to resource limitations. (3) The challenges of data security, privacy concerns, and insufficient technical expertise among MSME employees are common barriers to effective data management. (4) Sector-specific differences in data adoption rates were observed, with manufacturing and retail MSMEs showing more progress in data utilization compared to service-based firms. The review also identifies opportunities for policy interventions and strategic frameworks aimed at enhancing the data capabilities of MSMEs. It suggests that

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governments, industry associations, and academic institutions cooperate essential part bridging technological & knowledge gaps within MSME sector. Additionally, the study emphasizes criticality of adopting data literacy & providing access to affordable tools that can facilitate incorporation of data analytics into MSME decisions making processes.

Keywords Innovation · India MSME · Data management · Data-driven

1 Introduction

The business world is rapidly evolving due to the increasing availability and importance of the data. Data driven decisions making is emerging as fundamental strategy of the organizations to stay competitive, innovate, and achieve sustainable growth. For MSMEs in India by leveraging data will help enhance business processes and improve creativity in product development, customer engagement and operational strategies. Micro, small, and medium enterprises (MSME) in India have recently grown into an important part of the country's economy. The Indian MSMEs definitions are shown in the Table 1.Also the distribution between the Manufacturing and Service enterprises are shown in then Fig. 1 MSMEs are facing tremendous challenges as they moving towards digital transformation while the large companies have been able to do the digital transformation effectively and adopt data driven strategies. MSMEs are often challenged by resource limitations, lack of technical expertise and insufficient technological awareness of the advantages of data management. The goal of this article is to explore the role of data management in driving innovation within Indian MSMEs, the research utilizing a PRISMA method to analyze and synthesize relevant literature.

Understanding Data Driven Decisions Making

Data driven decisions making is the strategic practice and an operational choice based on the analysis of data rather than relying solely on intuitions and experiences. DDDM consists of organized gathering, investigation, understanding of data that help business decisions. In today's information rich environment, the businesses that adopt DDDM are better positioned to respond to market changes, understand

Table 1 MSME India definition

Classification	Micro	Small	Medium
Manufacturing Enterprises and Enterprises rendering Services	Investment Not more than Rs. 2.5 crore and Annual Turnover not more than Rs. 10 crores	Investment Not more than Rs. 25 crores and Annual Turnover not more than Rs. 100 crores	Investment Not more than Rs. 125 crores and Annual Turnover not more than Rs. 500 crores

Source msme.gov.in

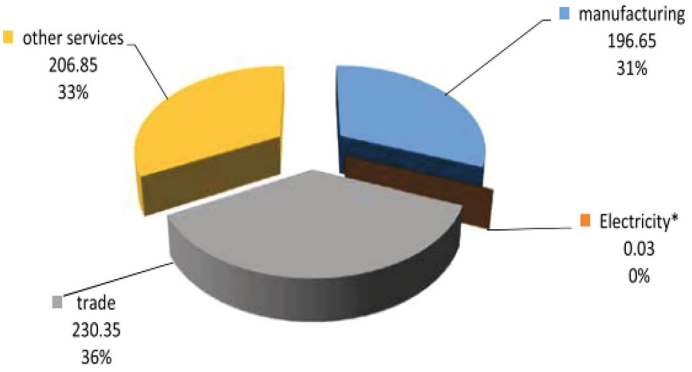

Fig. 1 Explaining the distribution of manufacturing and service enterprises within Indian MSMEs. *Source* MSME India Report 2024

customer needs and optimize internal processes. In the context of Indian MSMEs DDDM represents a significant opportunity to overcome traditional limitations such as limited market reach, inefficient processes, and lack of innovation. MSMEs often face challenges when trying to implement data driven practices including limited access to modern data analytics tools, budget constraints and insufficient skills among employees.

The Role of Data Management in MSME Innovation

Data management is a key enabler of business innovation in Indian MSMEs. By organizing and investigating data enterprises gets significant understandings helps in better decision making, increased satisfaction and more efficient operations. In India MSMEs can harness data in a variety of ways to drive innovations, Innovation in product development is essential for MSMEs to remain competitive in the marker. Data analytics allows MSMEs to analyze customer preferences, identify emerging trends and gather feedback on their products. This data be capable of applied to create modern commodities that are aligned with customer needs and to improve the features of existing offerings. One of the most powerful applications of data management for MSMEs is improving customer engagement. By analyzing consumer data, businesses can refine their marketing strategies to the individual needs. Personalization through targeted ads, customized recommendations and unique offers have been shown to increase customer loyalty.

Data management also play key role in developing operating processes. By utilizing data from the business, MSMEs can streamline supply chain, optimize inventory management, and improve resource allocation.

Challenges in Data Management for MSMEs in India

Although having exceptionally good potential that the data driven decision-making contains several barriers that prevent Indian MSMEs from fully embracing to the digital transformation. Advanced data analytics tools come with significant upfront

costs. For many MSMEs especially those in rural areas these costs may seem huge. Also, the returns on investment from such tools might not be immediate, thus making it harder for small business owners to justify the expense.

Data management and analytics require advanced technical skills. Many MSMEs lack the expertise necessary to analyze large datasets and interpret the findings. Though the businesses are willing to invest in technology they struggle to find qualified labor to manage and get insights from the data. In rural areas where there are more MSMEs the talent pool is even smaller which makes data management and analytics adoption more challenging.

Growing trust on modern platform, Data security and governance becomes especially important. For MSMEs ensuring that customer data is protected is critical to maintain legal requirement and trust. Many small enterprises will not have the essential infrastructure and sources to implement necessary data protection measures. This increases the risk of cyberattacks and data violations that may result to fiscal and reputational harm.

Awareness and Knowledge Gaps: Another significant barrier is the absence of knowledge. Many MSME owners may not fully understand how data led policy-making can improve their outcomes. Furthermore, there is often little understanding of the diverse types of data management tools available and how to effectively integrate them into business operations. This knowledge gap can result in missed opportunities for innovation and growth.

2 Objectives of the Study

1. To Review the Literature on the Function of Data Management for the Business Innovation enabling data driven decision making in Indian MSMEs
2. To Assess the challenges related to MSME built on review of literature

3 Research Methodology

Review Protocol and PRISMA Guidelines

The PRISMA method utilized to conduct an organized assessment of existing literatures on data management and business innovation in Indian MSMEs. The PRISMA process ensures that the analysis is thorough, apparent, and replicable by adhering to specific reporting laws for organized analyses (Moher, Liberati, Tetzlaff, & Altman, 2009). This approach helps synthesize findings from multiple studies to provide an extra strong knowledge on the topic.

Search Strategy

Comprehensive search was conducted in Google Scholar using the following keywords: “data-driven decision making,” “MSME,” “India,” “innovation,” and “data

Table 2 Characteristics of included studies

Variables	Percentage (%)
Study design (quantitative)	18
Study year 2022	2
2023	7
2024	7
2025	2

Source Authors data category (PRISMA standard)

management." The search included articles/book sections published between 2022 and 2025.

Inclusion and Exclusion Criteria

Studies were included if they focused on function of data management in MSMEs and by what means affects Business innovation in India. Articles were excluded if they were focused on large enterprises or did not provide empirical evidence on the relationship between data management and business innovation. Those written in English language were included. The detailed Inclusion and Exclusion Criteria Steps are given in Table 2.

Literature Extraction and Synthesis

18 papers existed later extraction, out of the 70 articles initially identified and key data were extracted, including the types of data management practices, innovation outcomes, and the challenges faced by MSMEs in India. The Fig. 2 illustrates the flow chart on the step by step filters applied to the Googles scholar results.

4 Results

Data Driven Decision Making in MSMEs

The article investigates the complex connection among Data Management & sustainability's methods in SME facing the disturbing influence of I4.0. The research examines the effect of leading technology linked to I4.0, like IOT, AI\ML on expanding data management framework and sustainability's efforts. (Dhone & Perumandla, 2024).

The study from Ghorpade explains the effort on computerization, connection, and data driven decisions making, smart production states favorable results to enhance local manufacture capability & minimize support from overseas resources. (Ghorpade & Sidharth, 2025).

Research (Ahmad & Husain, 2024) explains the adoption of digital technologies like ERP systems, business intelligence, and data analytics enables MSMEs to

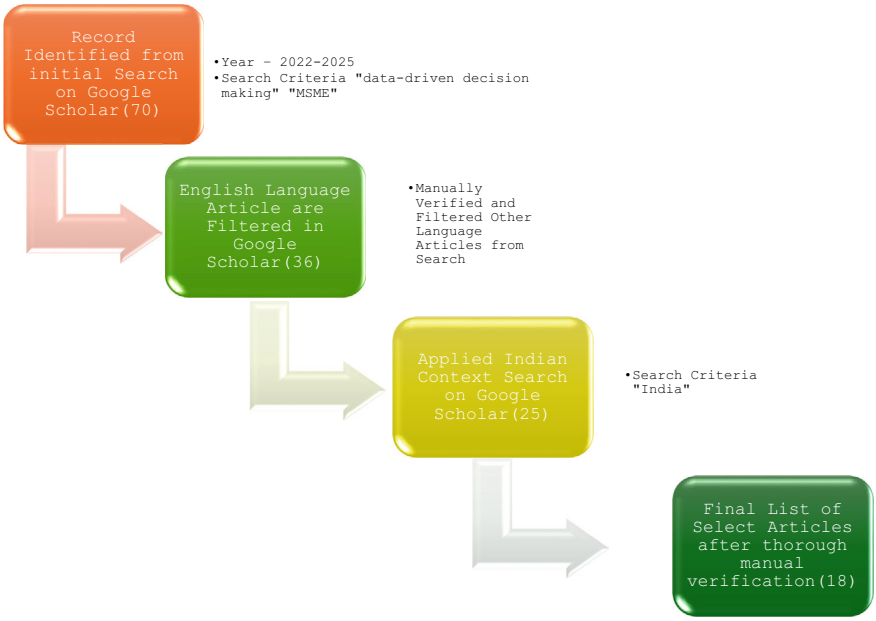

Fig. 2 Inclusion and exclusion criteria flowchart. *Source* Author's Own Compilation

improve operational efficiency, make data-driven decisions, and compete effectively in a global marketplace, fostering sustainable growth and adaptability.

This article promotes the blending of Lean six Sigma and I 4.0 (LSS 4.0) as effective excellence control standard for India textile field. The context utilizes Lean & Six Sigma philosophy to improve procedures & reduce flaws, effortlessly integrating I4.0 inventions to analyze data & computerization. (Sharma, 2023) (Singh, 2025). The research identifies and categories the type of AI\ML presently employed in India economic segment & studies the distinctive means of task those technologies in trend. Also explains series of concerns raised regarding adaptableness & sustainability's of those technologies in economic segment of advancing Indian economy. (Guha, Savage-Mansary, & Samanta, 2022).

The article investigates by what method Humar Resource analytics were utilized in different perspectives, for example resource growth, retaining, employee administration, conflict, hiring in IT segment. (Kalpana, Yasaswini, & Durga, 2023). The research explains the growth of LSS in the production area & how it helps in data driven decisions making with help from performance indicators (Kumar, Swarnakar, Phanden, Khanduja, & Chakraborty, 2023).

Impact on Innovation

The studies reviewed highlight a positive correlation between data-driven decision-making and business innovation in MSMEs. For example, (Chatterjee, Singh, & Garg,

2022) demonstrate that data-driven innovation in MSMEs can improve product development, streamline supply chains, and lead to new business models. MSMEs that adopted big data analytics have reported increased operating effectiveness, improved consumer fulfillment, and quicker reaction to market demands. In contrast, those with limited data management capabilities often struggle with inefficiency and missed innovation opportunities (Chatterjee, Singh, & Garg, 2022).

The research article from Hibban and Abhishek factors regarding in what way invention acts important part in integration & growth of SME. Invention management are provided with real value because of the enterprise's forthcoming is concluded by innovation of its produce. Described around part portrayed through invention management in SME & difficulties encountered in AI\ML realization, seeking to realize invention management. (Mohammed Hibban & Abhishek. 2024).

The article commenced advanced practices of determining inventory methods by discovering the effect of know how this will influence registry management ways & eventually influence the outcomes of developing SME. (Panigrahi, Shrivastava, & Nudurupati, 2024). The research identifies five themes specifically, Consumer experience & fulfilment excellence management and performances, excellence evaluation methods, excellence & maintainable growth & Excellence & good benefit. (Shrivastav, 2023).

Challenges in Implementation

The research article (Krishnan, 2024) explains difficult tasks tackled by SME in transforming to smart manufacturing, Utilization of the data in proper manner is one of the key challenges when moving towards smart manufacturing.

The paper stresses value of active management, group involvement, data driven decisions making, & global cooperation in challenge of international wellbeing catastrophes. Shows the Indian passage grants resources of understanding used to advise guidelines creation, advance intense resistance, support groups cross worries of a post COVID world (Kandpal, 2024).

The paper shows the administration programs is influential in helping MSMEs. The programs facilitated to upgrade admission to investment, improve marketplace & upgrade talent. But, still space for advancement in rationalizing activities, expanding knowledge & focusing the Modern division (Ramaswamy, & S H, 2024) (Citybabu & Yamini, 2022).

The study maps technology applicable in discrete supply chain & fill the theory in connection of I4.0 technology & SCR. Findings signal that the job of I4.0 technology in realizing elasticity in important events of enterprises. (Sharma, Modgil, & Singh, 2024).The research evaluates the leaders performance potential as well as possible record & by what means its connect to success of the organizations and how solves those challenges with data driven decisions making (Yadav, Shaik, Srinivasa, Krupavathi, & Kumar, 2023).

5 Discussion

The findings indicate that data management practices are crucial to fostering innovation within MSMEs in India. However, despite the potential, MSMEs face significant barriers to fully leveraging data-driven decision-making strategies. These include fiscal limitations, shortage of capable employees, ineffective technology infra, which hinder the acceptance of DA tools.

Limited capacity MSMEs will adopt advanced data analytics tools means that many organizations still rely on basic data management practices, resulting in suboptimal decision-making. A significant gap exists between larger enterprises with robust data infrastructure and MSMEs, which makes it difficult for MSMEs to innovate at the same scale.

Furthermore, businesses that invest in digital infrastructure and training can unlock substantial benefits. For example, MSMEs that integrate cloud-based solutions and predictive analytics can foster more agile business models and respond better to market changes. MSMEs in urban areas with better access to digital infrastructure have experienced notable improvements in business operations and innovation.

6 Conclusion

This PRISMA review provides precious understandings in the effect of data driven decisions making on business innovation within Indian MSME. The findings highlight that while the adoption of data management practices is associated with enhanced innovation, several challenges hinder their full potential.

Challenges Hindering Data-Driven Innovation

- **Resource Constraints:** Many MSMEs face financial limitations that impede investment in advanced data analytics tools and infrastructure (Kgakatsi, Galeboe, Molelekwa, & Thango, 2024).
- **Digital Infrastructure Deficits:** Insufficient digital infra, consistent cyberspace connect & data store services, hinders effective data utilization (Bhatia, 2023).
- **Skill Shortages:** A lack of data literacy and analytical skills among employees restricts talent to understand & utilize data efficiently.

Recommendations for Stakeholder Support

Toward focus to solve the questions and completely utilize the benefits of data driven decisions making, the following measures are recommended:

1. **Digital Literacy Programs**: Implement training initiatives to enhance data literacy among MSME employees, fostering a culture that values data-driven insights.

2. **Technology Adoption Subsidies**: Provide financial incentives or subsidies to reduce the cost obligation adopting data analytic tools, forcing them extra available to MSME.
3. **Affordable Data Analytics Tools**: Facilitate access to cost-effective data analytics outcomes designed for specific demands and dimensions of MSMEs, enabling to participate efficiently in Modern market.

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