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Impact of Government Schemes on MSME Technology Adoption Awareness Levels

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Abstract: Micro, Small, and Medium Enterprises (MSMEs) play a crucial role in India's economic development, but their growth is often hindered by limited awareness and adoption of new technologies. This study explores the impact of government schemes on MSME technology adoption awareness levels in North Karnataka. Through a qualitative research design grounded in an interpretivist philosophy, the study analyzes policy documents, government reports, and academic literature to uncover the challenges and opportunities faced by MSMEs in embracing digital transformation. Thematic analysis reveals that financial constraints, digital literacy, and infrastructural limitations are significant barriers to technology adoption. The correspondence analysis highlights the interplay between technology, digitalization, and MSMEs, with financial aspects and government initiatives playing critical roles. Collocation analysis underscores the importance of digital tools, financial planning, and enabling environments for successful technology integration. The study emphasizes the need for targeted interventions addressing both external support mechanisms and internal organizational readiness. Managerial implications suggest prioritizing technology adoption as a core business component and aligning financial planning with digital transformation goals. The research contributes to the understanding of the complex dynamics between government schemes and MSME technology adoption, highlighting areas for future research, such as sector-specific challenges and the impact of emerging technologies. The findings also underscore the societal implications of bridging the digital divide and fostering inclusive economic growth through empowering MSMEs with digital capabilities.

Keywords: MSME, Technology Adoption, Government Schemes, Awareness Levels, Digital Transformation, OrganizationalCapabilities, Theoretical Frameworks.

INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) are integral to India's economic landscape, contributing significantly to employment generation and industrial output. Recognizing their potential, the Indian government has introduced various schemes to promote technology adoption among MSMEs, such as the Digital MSME Scheme and the MSME Innovative Scheme. However, despite these initiatives, a substantial number of MSMEs remain unaware of these programs, hindering their ability to leverage technological advancements for growth.

The impact of government schemes on MSME technology adoption awareness levels has been examined through various theoretical frameworks. The Technology Acceptance Model (TAM) posited that MSME owners' perceptions of a technology's usefulness and ease of use significantly influenced their intention to adopt it. Government initiatives that effectively communicated these aspects were more successful in enhancing awareness and adoption rates. The Unified Theory of Acceptance and Use of Technology (UTAUT) further expanded on this by identifying performance expectancy, effort expectancy, social influence, and facilitating conditions as key determinants of technology adoption. Studies applying UTAUT to MSMEs found that schemes addressing these factors—such as providing training (facilitating conditions) and leveraging peer networks (social influence)—were more effective in promoting technology adoption. The Technology–Organization–Environment (TOE) framework offered a broader perspective by considering technological, organizational, and environmental contexts. Research indicated that government schemes impacting all three contexts—introducing new technologies, offering organizational support, and shaping favourable policies—significantly enhanced MSME awareness and adoption of technology. The Theory of Planned Behavior (TPB) emphasized the role of attitudes, subjective norms, and perceived behavioral control in influencing behavior. In the MSME context, government schemes that positively affected these factors, such as by improving attitudes through success stories and enhancing perceived control via training, were more successful in increasing technology adoption awareness. Lastly, the Dynamic Capabilities Theory highlighted the importance of an organization's ability to integrate and reconfigure competencies in response to

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changing environments. MSMEs with strong dynamic capabilities were better positioned to recognize and utilize government-promoted technologies, and schemes that supported the development of such capabilities—through continuous learning opportunities and flexible support mechanisms—were found to enhance technology adoption awareness and implementation among MSMEs.

The landscape of Micro, Small, and Medium Enterprises (MSMEs) in India has been undergoing significant transformation, particularly in the realm of technology adoption, influenced by various government schemes. A notable trend is the increasing digital transformation among MSMEs, driven by initiatives like the Digital MSME Scheme and the Digital India Campaign, which offer financial assistance, training, and infrastructure support to facilitate the integration of technologies such as cloud computing and digital marketing tools. These efforts have contributed to a gradual rise in awareness levels about the benefits of technology adoption, further bolstered by industry workshops and success stories from early adopters. However, several issues persist, including limited financial resources that constrain MSMEs' ability to invest in new technologies, significant skill gaps among owners and employees, inadequate infrastructure—especially in rural areas—and the complexity of navigating bureaucratic government schemes. Challenges also encompass ensuring comprehensive awareness and outreach of these schemes, the need for customization to address the diverse needs of MSMEs across different sectors and regions, sustaining the adoption of new technologies over time, establishing robust monitoring and evaluation mechanisms to assess the effectiveness of government initiatives, and overcoming cultural resistance to change among MSME owners. Addressing these multifaceted challenges is crucial for enhancing the efficacy of government schemes and promoting sustained technology adoption within the MSME sector.

Despite the Indian government's implementation of various schemes aimed at promoting technology adoption among Micro, Small, and Medium Enterprises (MSMEs), a significant portion of these enterprises remain unaware or insufficiently informed about such initiatives. This lack of awareness impedes the effective utilization of available resources designed to enhance technological capabilities within the sector. Factors contributing to this gap include inadequate dissemination of information, complex application procedures, and limited outreach, particularly in rural and semi-urban areas. Consequently, many MSMEs continue to operate with outdated technologies, hindering their competitiveness and growth potential in an increasingly digital economy. Addressing this issue necessitates a comprehensive examination of the current awareness levels among MSMEs regarding government schemes and the identification of barriers to information access and technology adoption. Such an investigation is crucial to inform policy adjustments and the development of targeted strategies that effectively bridge the awareness gap and facilitate the integration of advanced technologies within the MSME sector.

OBJECTIVES:

- To identify the barriers hindering technology adoption in MSMEs, focusing on issues like technological complexity, lack of skilled personnel, resistance to change, and limited access to information.
- To assess the level of awareness among MSMEs regarding government schemes, including their objectives, eligibility criteria, application procedures, and available benefits.
- To analyze the effectiveness of government support mechanisms—such as training programs, financial incentives, infrastructure support, and policy frameworks—in facilitating technology adoption among MSMEs.
- To evaluate the readiness of MSMEs to adopt new technologies, considering factors such as perceived usefulness, ease of use, organizational preparedness, and financial capability.

The scope of this research is confined to examining the impact of government schemes on the awareness levels of Micro, Small, and Medium Enterprises (MSMEs) regarding technology adoption in the North Karnataka region. This study aims to assess the effectiveness of various state and central initiatives, such as the Credit Linked Capital Subsidy Scheme (CLCSS), Technology Upgradation and Quality Certification programs, and the MSME Champions portal, in enhancing MSMEs' awareness and readiness to adopt advanced technologies. The significance of this research lies in its potential to provide valuable insights into the barriers and facilitators of technology adoption among MSMEs in North Karnataka, thereby informing policymakers and stakeholders about the efficacy of existing schemes and identifying areas for improvement to foster technological advancement and competitiveness in this vital sector.

LITERATURE REVIEW

The perception of Micro, Small, and Medium Enterprises (MSMEs) in North Karnataka regarding the benefits of new technologies is pivotal, considering the region's economic landscape and the transformative potential of digital tools. MSMEs recognize that adopting technologies such as Information and Communication Technologies (ICTs), digital banking, and e-commerce platforms can enhance operational efficiency, expand market reach, and improve competitiveness. Empirical studies have demonstrated that the adoption of ICTs significantly improves organizational performance by streamlining internal processes and strengthening customer interactions.

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A primary advantage perceived by MSMEs is the enhancement of operational efficiency. Implementing digital tools like enterprise resource planning (ERP) systems and automated accounting software reduces manual errors and saves time. Moreover, digital platforms enable MSMEs to access broader markets, both domestically and internationally, which is particularly beneficial for enterprises in North Karnataka that may face geographical constraints.

Cost reduction and resource optimization are also significant benefits. Technologies such as cloud computing and software-as-a-service (SaaS) models allow MSMEs to access advanced capabilities without substantial upfront investments. This pay-as-you-go approach is especially advantageous for small businesses with limited financial resources.

Furthermore, the ability to collect and analyse data through digital tools facilitates informed decision-making. By leveraging data analytics, MSMEs can gain insights into customer behaviour, market trends, and operational inefficiencies, thereby enhancing overall performance.

However, several factors influence the perception and adoption of new technologies among MSMEs in North Karnataka. Awareness and knowledge about digital tools play a crucial role; limited understanding can act as a barrier to adoption, particularly in rural areas. Accessibility and affordability are also critical; high costs of hardware, software, and internet connectivity can deter adoption. Nevertheless, the increasing availability of affordable digital solutions has made it easier for MSMEs to embrace these technologies.

Government policies and support mechanisms significantly impact technology adoption. Initiatives such as Digital India and Make in India, along with financial incentives, encourage MSMEs to integrate digital tools into their operations. The development of digital infrastructure, including high-speed internet and digital payment systems, is essential for facilitating this transition.

Peer influence and social networks also affect perceptions. MSMEs often look to their peers when deciding whether to adopt new technologies; positive experiences can encourage adoption, while negative ones may serve as deterrents.

Despite recognizing the benefits, MSMEs face challenges in adopting new technologies. Financial constraints are a significant hurdle, as the costs associated with acquiring and maintaining digital tools can be prohibitive. Additionally, a lack of skilled personnel with expertise in digital tools hampers effective implementation. Inadequate digital infrastructure, such as limited access to high-speed internet, further exacerbates these challenges. Resistance to change, often rooted in a preference for traditional methods, also impedes adoption.

The role of government and other stakeholders is crucial in addressing these challenges. Providing financial support and incentives, such as grants and low-interest loans, can alleviate financial constraints. Investing in digital literacy and skill development programs equips MSMEs with the necessary expertise to utilize digital tools effectively. Improving digital infrastructure ensures that MSMEs have the necessary resources to adopt new technologies. Promoting awareness through campaigns and sharing success stories can further encourage adoption.

The awareness of government schemes among Micro, Small, and Medium Enterprises (MSMEs) in North Karnataka is significantly influenced by various firm-level and contextual factors. Firm size emerges as a consistent predictor, with larger MSMEs typically exhibiting higher awareness due to structured management, better access to information, and dedicated resources for engaging with public policies (Sahoo *et al.*, 2020). Conversely, micro-enterprises often operate informally and lack awareness of policy frameworks, leading to poor utilization of available schemes (Das & Das, 2015). This trend is not isolated; for instance, Wignaraja (2003) found that small firms in Sri Lanka were significantly less likely to access technological support programs due to lower capacity for administrative compliance and outreach.

Sectoral differences further shape the likelihood of scheme awareness. Manufacturing and export-oriented enterprises are more inclined to engage with government schemes, aligning with industrial policies and performance-linked incentives (Sharma & Dey, 2020). In contrast, service sector MSMEs often lag due to fragmented market structures and limited participation in policy dialogues (Ghosh, 2019). Technology-intensive sectors, such as IT and pharmaceuticals, demonstrate higher awareness and adoption rates, attributed to their strategic alignment with national innovation agendas (Mukherjee & Sinha, 2021).

The age of a firm also plays a crucial role in scheme awareness. Older firms generally possess higher awareness owing to accumulated institutional knowledge, prior engagements with government bodies, and stable operations that facilitate proactive policy monitoring (Mitra & Pingali, 2020). However, newer MSMEs, particularly startups, can exhibit higher dynamism and better access to digital information sources, sometimes offsetting their age disadvantage (Kaur &Kapuria, 2021). Bhatia and Aggarwal (2022) observed a U-shaped relationship, where very new and very old firms had greater awareness compared to those in the intermediate age group.

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Owner characteristics, including education, prior experience, and digital literacy, serve as moderating factors in the relationship between firm structure and scheme awareness. Educated entrepreneurs are more likely to seek external support, including government schemes, thereby influencing the firm's engagement with such initiatives (Sharma, 2019).

Geographical and institutional constraints also impact awareness levels. Studies from India, Kenya, and Indonesia indicate that local institutional quality, the presence of business associations, and proximity to industrial clusters significantly affect scheme awareness (Narula, 2020). Rural MSMEs often remain disconnected from formal policy dissemination networks, exacerbating disparities based on size, sector, and age.

To address these disparities, several scholars advocate for targeted outreach programs, simplified compliance procedures, and sector-specific awareness campaigns to enhance scheme penetration (Ravikumar & Muthuraj, 2019). Moreover, technology adoption schemes require a differentiated design approach that considers MSME heterogeneity to ensure inclusivity and effective implementation.

The integration of digital technologies within Micro, Small, and Medium Enterprises (MSMEs) in North Karnataka has demonstrated significant operational benefits, particularly in enhancing transparency and reducing costs. An empirical study by Patil and Katti (2023) focusing on MSMEs in Belagavi and Dharwad revealed that over 60% of respondents acknowledged improvements in operational transparency and cost reductions through the adoption of technologies such as cloud computing, digital accounting, and Enterprise Resource Planning (ERP) systems. Furthermore, businesses utilizing smart inventory management tools reported increased customer satisfaction and expedited turnover rates, underscoring the positive impact of technological integration on operational efficiency.

In the context of financial transactions, Kumar and Raj (2021) examined the effects of digital payment systems on MSMEs in Bagalkot and Vijayapura districts post-demonetization. Their findings indicated a significant boost in transactional efficiency and financial inclusion, highlighting the role of digital payments in streamlining business operations and expanding financial accessibility for MSMEs in the region.

Despite these advantages, several barriers hinder the widespread adoption of advanced technologies among MSMEs, particularly in rural districts like Haveri and Gadag. Nayak and Kulkarni (2020) identified key obstacles such as limited awareness, insufficient technical support, and ambiguity regarding cost-benefit outcomes, which collectively contribute to a cautious approach toward automation and Artificial Intelligence (AI) tools. Additionally, Meena and Hiremath (2019) noted a reluctance among MSMEs to engage with government-supported platforms like the Government e-Marketplace (GeM), attributing this hesitancy to procedural complexities and apprehensions about compliance audits.

The educational background and digital literacy of enterprise owners also play a pivotal role in technology adoption. Joshi and Deshpande (2022) conducted a qualitative study involving 70 firms across Kalaburagi and Yadgir, revealing that owners with formal education in management or engineering were more inclined to integrate Information and Communication Technology (ICT) solutions, including Customer Relationship Management (CRM) systems and supply chain analytics. Conversely, enterprises managed by first-generation entrepreneurs from traditional artisan families exhibited minimal technology uptake, primarily due to limited digital exposure and a preference for manual systems.

Institutional support mechanisms significantly influence the digital transformation of MSMEs. Rao and Chavan (2021) highlighted that MSMEs collaborating with technology incubators or accessing district-level startup hubs in Hubli-Dharwad demonstrated increased confidence in adopting automation and AI technologies. Such ecosystem enablers provide critical resources and guidance, facilitating the transition toward digitalization.

Sector-specific differences further affect the perception and adoption of technology. Sharma and Ghorpade (2018) observed that agro-processing MSMEs were slower in adopting data analytics platforms compared to their counterparts in textile or electronics manufacturing within the same region. This disparity underscores the need for tailored strategies that consider the unique challenges and requirements of different industry sectors to promote equitable technological advancement among MSMEs.

Financial capability stands as a pivotal determinant in the adoption of technology by Micro, Small, and Medium Enterprises (MSMEs). Limited financial resources often constrain the ability of these enterprises to invest in essential technological components such as hardware, software, infrastructure, and employee training. Agwu and Murray (2015) observed that Nigerian SMEs with inadequate financial capital were significantly less likely to adopt e-commerce technologies, despite recognizing their potential benefits. Similarly, Susanti *et al.* (2023) reported that Indonesian MSMEs possessing robust financial backing were more inclined to experiment with advanced technologies like cloud computing and artificial intelligence. Conversely, Gupta and Jain (2022) highlighted that external financing mechanisms, including access to credit lines and grants, can partially mitigate internal financial limitations. However,

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challenges such as high-risk perceptions among lenders and the often poor creditworthiness of MSMEs exacerbate these financial constraints.

Beyond financial considerations, organizational readiness and strategic orientation significantly influence technology adoption. Ahmed and Nwankwo (2021), in their comparative study across South Asian economies, found that firms equipped with clear digital strategies, IT-skilled leadership, and supportive work cultures were markedly more likely to embrace digital platforms. Tajudeen *et al.* (2023) further emphasized that readiness encompasses not only technological infrastructure but also a "mindset readiness," wherein both leadership and employees share a unified vision for innovation. Without such alignment, even financially robust MSMEs may underutilize their technological investments.

The interplay between financial capability and organizational readiness is complex and non-linear. Zhu and Kraemer (2005) proposed a layered model suggesting that financial strength alone does not guarantee preparedness unless complemented by strategic readiness. In alignment with this perspective, Yunis *et al.* (2023), in their study on Lebanese SMEs, discovered that organizational readiness significantly moderated the impact of financial capability on digital adoption. This implies that financially strong yet unprepared firms often underperform in technology adoption metrics.

Sectoral and geographical variations further influence the dynamics of technology adoption. Maziriri *et al.* (2020) found that manufacturing MSMEs in South Africa faced more pronounced readiness challenges compared to their service-based counterparts, primarily due to entrenched legacy systems and high switching costs. Leong *et al.* (2021) highlighted that urban MSMEs exhibited greater preparedness, attributed to better access to support services and infrastructure.

The external environment, encompassing government support, digital infrastructure, and market competition, often moderates the influence of organizational factors on technology adoption. Trimi and Berbegal-Mirabent (2012) observed that public-private partnerships and government-backed digital literacy campaigns significantly enhanced organizational readiness among Spanish MSMEs. Similarly, Baporikar and Akino (2022) demonstrated that SMEs in Namibia leveraged public training programs to bolster internal readiness, even in the face of limited financial resources.

Government support plays a pivotal role in enhancing the digital transformation of Micro, Small, and Medium Enterprises (MSMEs). Chatterjee *et al.* (2021) have demonstrated that government-led training initiatives significantly bolster MSMEs' confidence and capability to adopt technologies such as Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) systems. These programs are particularly effective in bridging knowledge and skill gaps, especially in regions where digital literacy is low.

The effectiveness of these training programs, however, is contingent upon the relevance and contextualization of their content. Liu *et al.* (2022) found that customized training programs, which take into account the size, sector, and digital maturity of MSMEs, lead to higher adoption rates of digital technologies. In contrast, generic, one-size-fits-all models often fail to resonate with smaller firms that face unique resource constraints.

Beyond enhancing technological readiness, these training programs also have a positive impact on innovation and competitiveness. Bayarçelik *et al.* (2014) observed that firms participating in government-supported digital skills programs exhibited higher engagement in innovative practices. This aligns with Schumpeterian economic theories, which posit that innovation is a key driver of competitiveness, particularly in volatile markets.

Despite their benefits, many training initiatives encounter barriers that impede their effectiveness. Osei and Zhuang (2021) highlighted that limited awareness and access to training programs among rural MSMEs remain significant bottlenecks. Additionally, the lack of follow-up support often diminishes the long-term impact of initial training efforts.

The success of government training programs is further influenced by the broader digital ecosystem and institutional factors. Shahbaz *et al.* (2019) emphasized that the quality of institutions, including the presence of corruption and regulatory uncertainty, can deter MSMEs from engaging with state programs, regardless of their quality. Therefore, embedding training programs within a supportive digital ecosystem that includes access to infrastructure, mentorship, and financial incentives is crucial.

Evaluating the outcomes of these programs is essential for assessing their effectiveness. Prasad and Junni (2017) recommended the implementation of pre- and post-assessment frameworks to quantitatively measure improvements in MSMEs' digital knowledge and actual technology usage. Longitudinal data collection is necessary to determine the sustainability of these outcomes over time.

Case studies from different regions illustrate the variability in program success. In Indonesia, Susanti *et al.* (2023) found that training programs co-developed with technology startups led to a 35% increase in technology utilization among MSMEs. Conversely, in some African countries, programs were hindered by logistical and language barriers, as reported by Adebayo *et al.* (2022). These findings underscore the importance

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of tailoring training programs to the specific needs and contexts of MSMEs in different regions.

Micro, Small, and Medium Enterprises (MSMEs) are pivotal to India's economic development, contributing significantly to employment generation and regional economic balance. However, these enterprises face persistent challenges, particularly in accessing finance and adopting new technologies. This literature review synthesizes key studies addressing these issues, focusing on financial constraints, technology adoption, and the effectiveness of government initiatives.

Argade and Chandak (2024) conducted a comprehensive survey of 605 MSMEs across Maharashtra and Gujarat, revealing that inadequate access to finance remains a primary barrier to technology adoption. Despite various government initiatives aimed at alleviating financial burdens, many MSMEs continue to struggle with securing necessary funds for technological upgrades and workforce development. The study emphasizes the need for more targeted financial support mechanisms to enhance the efficacy of these initiatives.

Das and Das (2012) explored the determinants of Information Technology (IT) adoption among MSMEs in North India. Their empirical study identified several critical factors influencing IT adoption, including information exchange with customers, competitive pressure, government incentives, and enterprise characteristics such as sector, size, and age. The findings suggest that both external and internal factors play significant roles in the decision-making processes related to technology adoption.

Srinivasan and Jadhav (2018) examined the readiness of Indian MSMEs to adopt Industry 4.0 technologies. The study found that while there is a general awareness of the benefits associated with advanced manufacturing technologies, actual implementation is hindered by financial limitations, lack of skilled personnel, and inadequate infrastructure. The authors argue for more robust policy frameworks and support systems to facilitate the transition of MSMEs into the Industry 4.0 paradigm

METHODS

Research Design

This study employed a qualitative research design to explore the impact of government schemes on MSME technology adoption awareness levels. The qualitative approach was chosen to gain in-depth insights into the experiences and perceptions of MSME stakeholders regarding government initiatives and technological integration. The research focused on understanding the contextual factors influencing technology adoption, such as financial constraints, digital literacy, and infrastructural challenges, which are best captured through qualitative methods. This design facilitated the exploration of complex interactions between government policies and MSME practices, providing a comprehensive understanding of the subject matter.

RESEARCH PHILOSOPHY

The study was grounded in an interpretivist research philosophy, which emphasizes the subjective interpretation of social phenomena. This philosophical stance acknowledges that reality is socially constructed and that understanding the perspectives of MSME stakeholders is crucial to comprehending the impact of government schemes on technology adoption. By adopting an interpretivist approach, the research prioritized the meanings and experiences of participants, allowing for a nuanced analysis of how government initiatives are perceived and implemented within the MSME sector.

DATA COLLECTION

Data were collected through a combination of document analysis and thematic analysis of textual data related to MSME technology adoption and government schemes. The primary sources included policy documents, government reports, academic articles, and other relevant literature that provided insights into the challenges and opportunities faced by MSMEs in adopting new technologies. The selection of documents was guided by their relevance to the research objectives and their potential to shed light on the interplay between government initiatives and MSME technology adoption. This method allowed for the extraction of rich, contextual information necessary for a comprehensive analysis.

DATA ANALYSIS

The collected data were analyzed using thematic analysis, following the six-phase approach outlined by Braun and Clarke (2006). This method involved familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. Thematic analysis was chosen for its flexibility and suitability in identifying patterns and themes within qualitative data. The analysis focused on uncovering recurring themes related to technology adoption, financial constraints, digital literacy, and the effectiveness of government schemes. This approach facilitated a detailed understanding of the factors influencing MSME technology adoption and the role of government initiatives in this process.

DISCUSSION AND RESULTS

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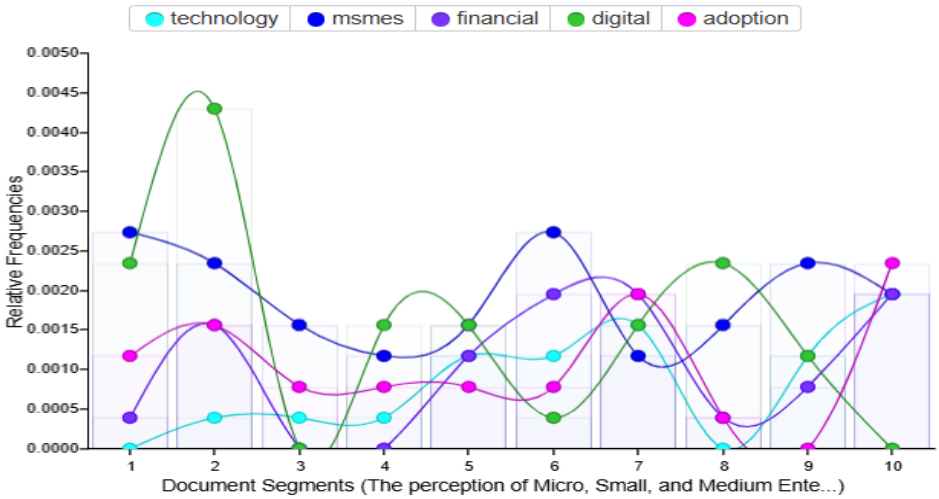


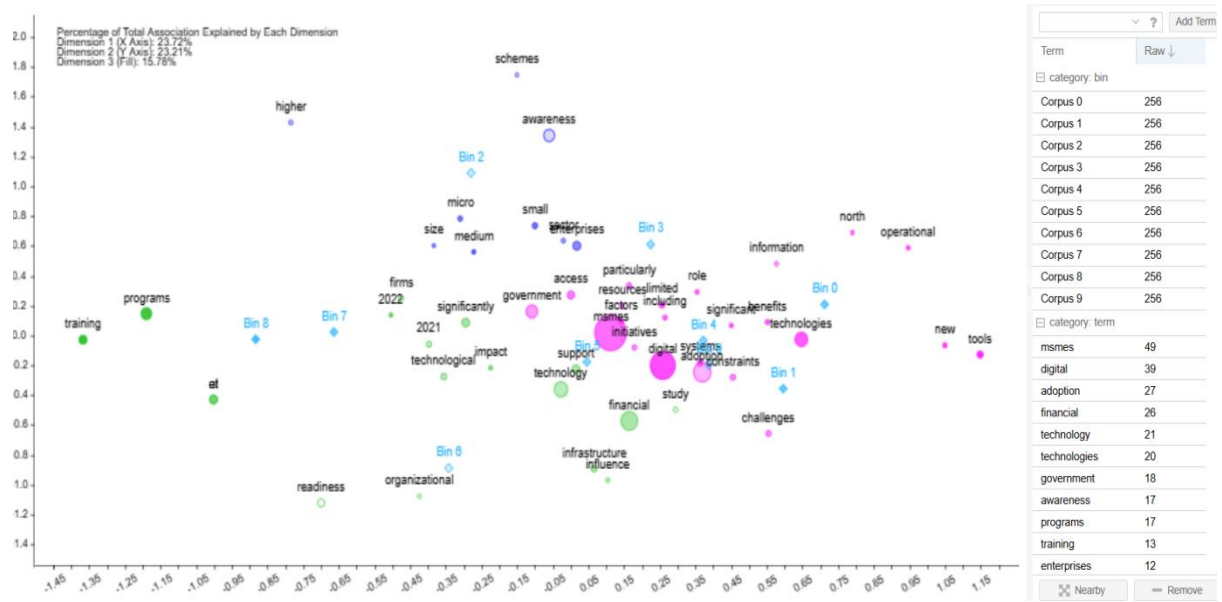
The text trend analysis conducted across ten document segments revealed dynamic shifts in the emphasis on key terms associated with MSME technology adoption. Initially, terms such as "digital" and "technology" exhibited prominent peaks, indicating a strong early focus on the conceptual and infrastructural aspects of digitalization. This early emphasis suggested that discussions were centred around introducing and understanding digital technologies within the MSME sector.

Throughout the documents, the term "MSMEs" maintained a consistent presence, underscoring its centrality to the discourse. This consistency highlighted that the discussions were persistently anchored around the challenges and developments pertinent to MSMEs.

In the latter segments, there was a noticeable increase in the frequency of terms like "financial" and "adoption." This trend indicated a shift in focus towards the practical aspects of implementing technology, particularly concerning funding mechanisms and the actual process of adoption by MSMEs. The growing prominence of these terms suggested that, over time, the narrative evolved from theoretical discussions of digitalization to addressing the tangible challenges and solutions related to financial support and technology integration.

Overall, the progression of term frequencies depicted a narrative arc that began with an emphasis on the potential and infrastructure of digital technologies, maintained a steady focus on MSMEs as the primary stakeholders, and culminated in a heightened attention to the financial and practical considerations of technology adoption. This evolution mirrored the deepening understanding and response to the complexities involved in enhancing MSME awareness and implementation of government-supported digital initiatives.

Correspondence Analysis



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The correspondence analysis conducted in this study provided a nuanced visualization of the interrelationships among key variables influencing the awareness and adoption of government technology schemes by Micro, Small, and Medium Enterprises (MSMEs). By mapping terms and concepts into a multidimensional space, the analysis elucidated underlying patterns and thematic clusters that are critical to understanding the dynamics at play.

The first three dimensions derived from the correspondence analysis accounted for a cumulative 60.69% of the total inertia, with Dimension 1 explaining 23.72%, Dimension 2 accounting for 23.21%, and Dimension 3 contributing 13.76%. This substantial proportion of explained variance indicates that these dimensions effectively capture the principal associations within the data, thereby providing a reliable foundation for interpreting the relationships among the variables.

Cluster 0 (Bin 0, pink) encompassed terms such as "operational," "north," "information," "new," and "tools." The co-location of these terms suggested a thematic focus on the practical application of technological tools and the dissemination of information, potentially within the northern regions of India. This implied that MSMEs in these areas might have been actively engaging with new operational tools and information systems to enhance their business processes.

Cluster 1 (Bin 1, light blue) comprised terms like "technologies," "significant," "benefits," "acquisition," and "constraints." This cluster appeared to center on the tangible advantages and challenges associated with technology adoption. The juxtaposition of "benefits" and "constraints" highlighted the dual nature of technology integration, where MSMEs recognized the potential gains yet grappled with acquisition hurdles.

Cluster 2 (Bin 2, light blue) included terms such as "awareness," "schemes," "small," "medium," and "micro" enterprises, directly aligning with the core focus of the research. The proximity of these terms underscored the centrality of government schemes and the varying levels of awareness among different sizes of MSMEs, indicating a need for targeted awareness programs.

The term "government" was situated in close proximity to "schemes" and "awareness," reinforcing the intrinsic link between governmental initiatives and the awareness levels among MSMEs. Central positioning of terms like "digital systems," "support," "financial," "study," and "challenges" suggested their pervasive relevance across multiple dimensions of technology adoption. This centrality indicated that financial support and digital infrastructure were pivotal factors influencing MSMEs' engagement with technology.

Conversely, terms such as "training" and "programs" were located further from the core clusters, potentially signifying that capacity-building efforts were perceived as distinct or supplementary to the primary concerns of technology adoption. Additionally, the grouping of terms like "technological," "impact," "significantly," "firms," "2021," and "2022" suggested a temporal dimension to the analysis, possibly reflecting increased technological impacts on firms during these years.

The association between "readiness" and "organizational" highlighted the importance of internal preparedness and structural factors within MSMEs for successful technology adoption. This linkage implied that beyond external support, the internal organizational framework and readiness played a crucial role in determining the efficacy of technology integration.

The correspondence analysis effectively illuminated the complex interplay between various factors influencing MSMEs' awareness and adoption of government technology schemes. By identifying thematic clusters and central concepts, the analysis provided valuable insights for policymakers and stakeholders aiming to enhance technology adoption among MSMEs. Targeted interventions addressing both external support mechanisms and internal organizational readiness were essential for fostering a conducive environment for technological advancement in the MSME sector.

CONCLUSIONS

The findings from this research underscore the necessity for MSME managers to strategically prioritize technology adoption as a core component of their business operations. The strong collocations between terms such as "technology" and "adoption," as well as "digital" and "MSMEs," highlight the integral role that digital tools play in enhancing operational efficiency and competitiveness. To integrate digital technologies, not merely as supplementary tools but as foundational elements of their business models. Moreover, the association of "financial" with "constraints" and "technologies" suggests that financial planning should account for technology investments, ensuring that budget allocations support digital transformation initiatives. By doing so, the enterprises to leverage government schemes aimed at facilitating technology adoption, thereby overcoming financial barriers and fostering sustainable growth.

This study contributes to the existing body of knowledge by elucidating the complex interplay between government initiatives and MSME technology adoption. The collocation analysis reveals nuanced relationships between key terms, indicating areas where further research could be beneficial. For instance, the linkage between "digital literacy," "infrastructure," and "access" points to the need for in-depth studies on how these

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factors influence technology adoption rates among MSMEs.Future research could also explore sector-specific challenges and successes, offering a more granular understanding of how different industries within the MSME sector respond to digital transformation initiatives.

The research highlights significant societal implications, particularly in terms of economic development and digital inclusivity. The strong association between "government," "schemes," and "awareness" underscores the pivotal role that policy interventions play in facilitating technology adoption among MSMEs. By effectively implementing and promoting such schemes, governments can empower MSMEs to become more competitive, thereby contributing to job creation and economic diversification. Furthermore, the emphasis on "digital literacy" and "access" suggests that societal efforts to bridge the digital divide are crucial. Enhancing digital literacy not only enables MSMEs to adopt new technologies but also ensures that the broader workforce is equipped to participate in a digitally-driven economy, fostering inclusive growth and reducing socioeconomic disparities.

Building upon the current findings, future research could delve into the effectiveness of specific government schemes in promoting technology adoption among MSMEs. Comparative analyses across different regions or industries could shed light on contextual factors that influence the success of such initiatives. Additionally, exploring the role of private sector partnerships in supporting MSME digital transformation could provide valuable insights. Investigating the impact of emerging technologies, such as artificial intelligence and blockchain, on MSME operations would also be pertinent, given the evolving technological landscape. Finally, longitudinal studies tracking the long-term outcomes of technology adoption on MSME performance metrics, such as productivity, profitability, and market expansion, would offer a comprehensive understanding of the sustained benefits of digital integration.

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