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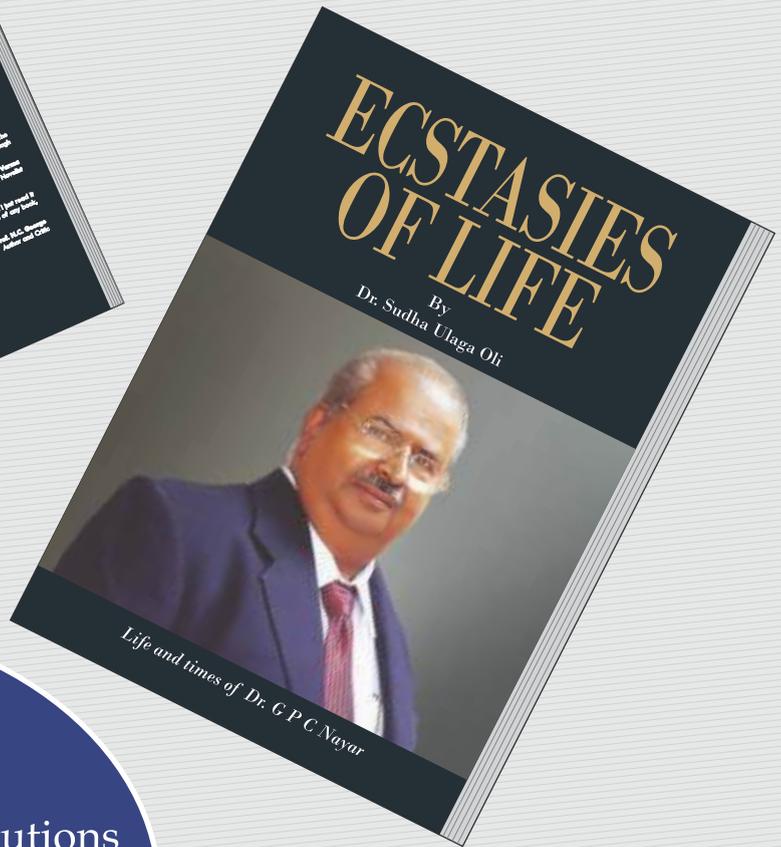
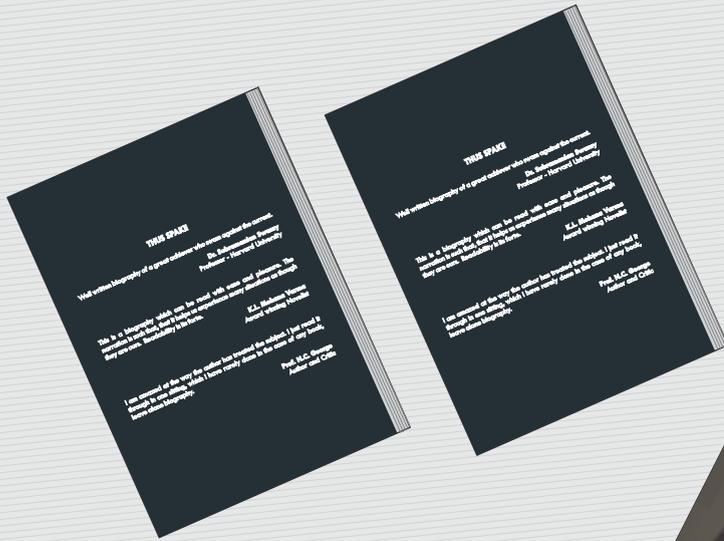
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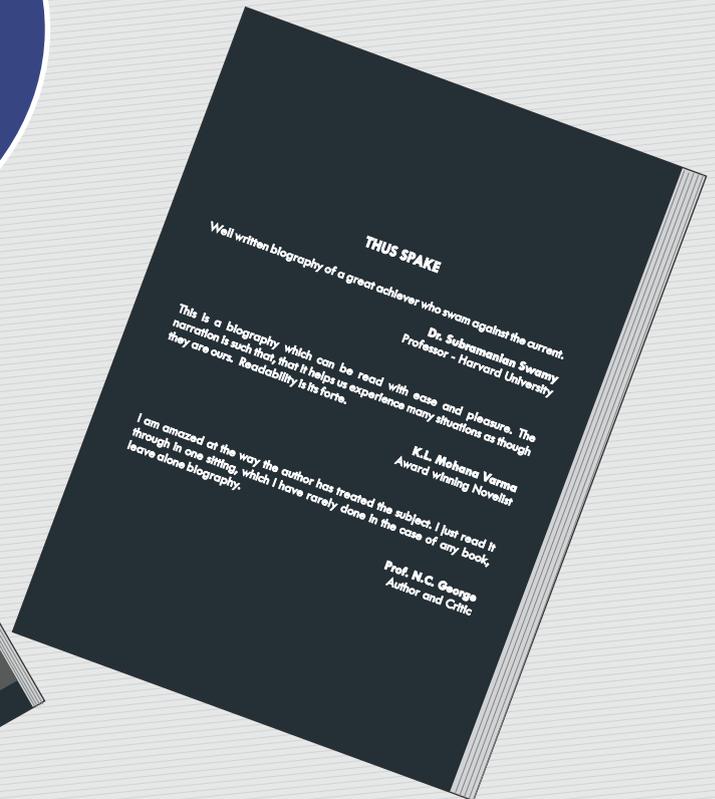
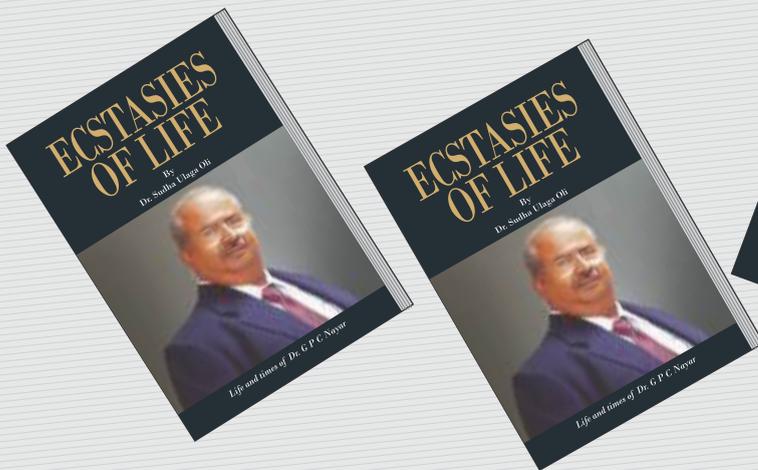


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- ◆ **Market Structure and Industrial Loan Portfolio Diversification: Differential Effects on Performance and Stability in Indian Banking**  
*Arrpita J Barua and Ambika Prasad Pati*



Here's an entrepreneur who has created some excellent academic institutions in an unfriendly environment. It is a saga of trials and tribulations in an extremely readable manner by a consummate writer in English.



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## Chairman's Overview

The rapid integration of Artificial Intelligence (AI) into academic research and publishing presents both transformative opportunities and serious ethical responsibilities. As a scholarly platform committed to rigor, transparency, and intellectual integrity, the SCMS Journal of Indian Management recognises that the ethical use of AI is central to sustaining trust in management research.

AI tools now assist in language refinement, data analysis, literature discovery, coding, and idea development. While such technologies can enhance efficiency, they must not compromise originality, accountability, or scholarly authenticity. The Journal's guiding principle is clear: AI may support scholarly work, but it cannot replace human intellectual contribution or responsibility.

Accordingly, both authors and reviewers are bound by clearly articulated expectations. Authors remain fully responsible for the accuracy, integrity, and originality of their submissions, irrespective of technological assistance used. Any use of generative AI for drafting, editing, data analysis, coding, or image generation must be transparently disclosed in a dedicated statement within the manuscript. AI tools cannot be listed as authors, as authorship entails accountability, ethical responsibility, and the capacity to engage with peer critique. Undisclosed or excessive AI-generated content that undermines genuine scholarly contribution may result in desk rejection or withdrawal at any stage of the editorial process.

Reviewers, likewise, carry an equally critical responsibility. Peer review is a confidential and privileged process grounded in trust. Manuscripts or any part thereof must not be uploaded into generative AI systems, as doing so may breach confidentiality and intellectual property obligations. While limited AI assistance for language refinement in review reports may be acceptable, evaluative judgments, critical insights, and recommendations must remain entirely the reviewer's own intellectual work.

To uphold these standards, the Journal undertakes preliminary similarity checks and AI-content screening as part of its editorial workflow. However, these tools function only as indicators; final decisions rest on careful human evaluation and scholarly discernment.

These policies are aligned with evolving global publishing standards and the guidance of the Committee on Publication Ethics (COPE), which emphasises transparency, accountability, and human oversight in scholarly communication. By embedding disclosure norms, prohibiting AI authorship, and safeguarding confidentiality in peer review, the SCMS Journal of Indian Management integrates internationally recognised ethical principles while embracing responsible innovation.

As AI technologies evolve, the Journal remains committed to ensuring that technological advancement strengthens—rather than diminishes—the credibility and integrity of management scholarship.

**Dr. G. P. C. NAYAR**

Chairman, SCMS Group of Educational Institutions.

# SCMS Journal of Indian Management

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## Editorial

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The articles in this issue of the *SCMS Journal of Indian Management* reflect the diverse and evolving concerns of contemporary management research. Covering themes such as financial systems, technology adoption, entrepreneurship, marketing, and organisational behaviour, the contributions provide insights into how organisations respond to rapid technological change, economic uncertainty, and shifting societal expectations.

Several studies in this issue examine financial systems and their broader economic implications. The lead article presents a bibliometric review of research on stock market connectedness during and after the COVID-19 pandemic, highlighting how financial shocks spread across global markets and identifying emerging research themes. Another study analyses the impact of working capital management on profitability in the Indian automotive sector, focusing on factors such as firm size, sales growth, and the cash conversion cycle. Subsequently, an article examines the relationships among infrastructure development, carbon emissions, macroeconomic variables, and financial development in India, revealing important growth–environment trade-offs. The issue also includes research on the Indian banking sector that explores how industrial loan portfolio diversification influences bank performance and stability under different market structures.

Technology-driven transformation is another key theme. A multiple case study methodology is used to examine how organisational environments shape the development of artificial intelligence competence among professionals in Indian organisations. Another article uses a mixed-method approach to investigate the factors influencing the implementation of digitalisation initiatives in Indian social enterprise start-ups and proposes a framework to guide successful digital transformation.

Entrepreneurship and economic development are addressed through an inter-country analysis of BRICS nations, which evaluates how entrepreneurial ecosystems support innovation and knowledge exchange. Complementing this perspective, a firm-level study from Nigeria shows that female-owned enterprises contribute significantly to productivity growth, particularly when supported by higher levels of education among women entrepreneurs.

The human dimension of organisations is explored through studies on marketing and leadership. One article examines how social media marketing activities influence higher education brand equity, with brand love and brand trust as mediating factors. Another study examines leadership in the hospitality sector, showing that leaders' commitment and self-efficacy influence organisational citizenship behaviour through employees' job satisfaction.

With this eclectic curation of scholarly research, we offer our readers valuable perspectives on the evolving challenges and opportunities shaping management practice and research today.

Dr. Radha Thevannoor

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# Stock Market Connectedness During and Post Covid 19: A Bibliometric Review

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## A b s t r a c t

To better understand the transmission of risk during and post crises, it is essential to study the interconnectedness of stock markets during and post-COVID-19, which shows how financial shocks spread throughout global markets. In our study, we have conducted a bibliometric analysis by presenting insights into the field of stock market connectedness during and post-crisis period, particularly the Covid-19 pandemic. This research examines 481 journal articles from the Scopus database, published between 2020 and 2024, using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. A bibliometric analysis was conducted in RStudio to evaluate critical metrics, including annual scientific production, citation patterns, the most-cited publications both internationally and locally, the top-cited countries, and prominent authors. Along with co-citation networks, word clouds, thematic maps, and bibliographic coupling, these methods were utilised to outline the current literature and identify research gaps. The word cloud and thematic map in our study indicate a growth of research on stock market connectedness during the COVID-19 pandemic, with some emerging themes such as 'crude oil' and 'clean energy' gaining increased focus. However, the degree of novelty and limited exploration of these research areas suggest substantial opportunities for future research, especially in investigating the interconnectedness among energy markets, sustainability, and stock market behaviour during crisis periods.

Our study's novelty lies in the application of bibliometric techniques to comprehend and assess the evolution of research on stock market connectedness during and post-COVID-19 pandemic. This provides a novel methodological contribution and highlights the unexplored research domains, with practical insights for risk assessment.

**Keywords:** *Stock market connectedness, Covid-19 pandemic, Thematic map, Co-citation analysis, Bibliometric review, Systemic Risk, Financial Contagion*

## 1. Introduction

The COVID-19 pandemic caused a global health emergency of unprecedented proportions, resulting in significant economic disruptions and volatility in global stock markets. Financial markets became more responsive to this "black swan" event as governments imposed lockdowns and restrictions on various economic activities (Lang et al., 2024). This weakened investor confidence, economic uncertainty, and economic growth and stability during this turmoil (Iyke & Ho, 2021). Furthermore, (Yaseen & Omet, 2021) emphasised the macro-level repercussions that influenced the capital market, especially stock markets. Recent studies have provided insight into the long-term impacts of pandemic-induced disruptions on financial market frameworks and investor behaviour (Yang et al., 2025; Zonon et al., 2025).

Numerous empirical studies investigating the interconnections among stock markets have shown that COVID-19 has significantly affected the interconnectedness of these markets. For instance, So et al. (2021) utilised dynamic financial networks centred on stock return connections to analyse the financial network interconnectedness in Hong Kong amid the pandemic. Their research showed that network connectedness grew during the COVID-19 outbreak.

Financial markets around the world are closely connected, and problems in one area can quickly spread to others (Amar et al., 2021). This connectedness affects how the financial system reacts to different economic shocks and crises. Connectedness arises through various channels, such as policy choices, shifts in capital, or trade relationships, that facilitate the transmission of volatility across borders. Risk managers and investors need to know how these things are related (Bouri et al., 2021).

The interconnectedness of the stock market has become a major topic of interest in finance, especially during tough economic times like COVID-19. Previous research has comprehensively examined the notion of stock market connectedness, scrutinising spillover effects, systemic risk, and contagion effects. Comprehending these interconnections provides crucial insights into effective risk management, portfolio diversification, and market dynamics during crises (Bouri et al., 2021; Diebold & Yilmaz, 2012, 2014). Connectedness is a key factor in assessing and controlling financial risk (Demirer et al., 2020).

The COVID-19 pandemic has prompted a considerable increase in empirical research into how it impacted market interlinkages, with researchers reporting significant changes in traditional market relationships and the emergence of new patterns of connectedness across different geographical regions, as noted by Zhang et al. (2020a). Emerging evidence indicates that stock market connectedness has undergone a fundamental transformation, resulting in the emergence of new sectoral linkages between conventional financial markets and alternative assets, including cryptocurrencies, commodities and green energy stocks (Kaur et al., 2025; Wu et al., 2025; Yadav et al., 2025).

This study conducts a detailed bibliometric analysis, where a wide review of stock market connectedness is being performed during and post-COVID-19, covering publications from 2020 to 2024. The main objective is to trace the structure and evolution of this rapidly developing research domain. Specifically, our research examines four main questions. First, what is the yearly trend in scientific output? The volume of scientific studies produced is an important indicator of the progress made in a specific area of research (Fusco et al., 2020). Second, who are the most influential authors, journals, and countries shaping the discourse on stock market connectedness during COVID-19? Understanding the key contributors is important for identifying renowned authors and recognising potential collaboration opportunities (Donthu et al., 2021; Rey-Martí et al., 2016). Third, what are the key patterns of collaboration among researchers examining stock market connectedness in the context of COVID-19? Such information is important for understanding various patterns of collaboration among authors, institutions, and countries (Baker et al., 2021). These connections are investigated using Collaboration and co-authorship analysis. Fourth, what are the major emerging themes and core ideas from studies on stock market connectedness during COVID-19, and how have these themes evolved as the pandemic progressed to different stages? Examining thematic evolution through bibliographic coupling (Ferreira, 2018) and keyword analysis helps identify shifting research patterns and emerging opportunities (Aria & Cuccurullo, 2017a; Cobo et al., 2011).

Bibliometric analysis was selected as the methodological approach for this study due to its unique advantages over Systematic Literature Reviews (SLR) and meta-analysis. While SLR provide rigorous qualitative synthesis of a

limited number of studies and meta-analysis offers quantitative aggregation of empirical findings from homogenous studies, bibliometric analysis excels at managing and analysing large volumes of literature to identify and evaluate the macro-level patterns and trends (Donthu et al., 2021; Kumar, 2025; Linnenluecke et al., 2020). The primary advantage of bibliometric analysis lies in its ability to objectively analyse large datasets, in our case, 481 articles, using statistical and quantitative techniques to map the intellectual structure, identify influential authors, and reveal emerging themes within a particular research domain (Hallinger, 2019). Unlike SLRs, which are limited by their intensive nature and potential for subjective bias in study selection, bibliometric analysis offers replicability, transparency, and the capacity to process thousands of publications systematically (Aria & Cuccurullo, 2017b). Besides, bibliometric analysis is highly appropriate in rapidly developing areas, such as financial market studies during periods of crisis, where publication numbers increase exponentially and it is hard for narrative reviews to capture their extent and dynamics (Obrenovic et al., 2024). This method allows for visualising collaboration networks, patterns of co-citation, and the thematic evolution over time that are not covered by other conventional review methods (van Eck & Waltman, 2009).

This bibliometric study is based on the knowledge domain analysis paradigm, which asserts that scientific areas develop through the accumulation and interrelation of scholarly contributions that can be systematically mapped and analysed (Marzi et al., 2025). Our application of bibliometric techniques in stock market connectedness research aligns with the conceptual framework that financial market connectedness during crises is most effectively understood through systematic analysis of research networks, citation trends, and thematic development rather than through isolated empirical investigations (Salem & Shahimi, 2025). This approach is especially vital for synthesising the rapidly growing corpus of financial research during the crisis period to cover the full range of theoretical advancements (Chang & Ho, 2024). Utilising co-citation analysis and bibliographic coupling, we systematically define the predominant theoretical frameworks, namely the Diebold-Yilmaz spillover framework, contagion theory, and systemic risk models that inform stock market connectedness research, thereby offering a descriptive mapping and a theoretical synthesis of the conceptualisation of market interdependencies during the COVID-19 pandemic (Y. Lu et al., 2023).

This study offers three key contributions to the existing literature on stock market connectedness. First, it is a theoretical contribution, as it represents the first comprehensive bibliometric analysis of stock market connectedness research in and after the COVID-19 pandemic period (2020-2024), synthesising evidence from 481 peer-reviewed articles and disclosing the intellectual structure and thematic evolution of this critical research area during an unprecedented global disruption. Second, the methodological contribution comes through the application of a suite of advanced bibliometric techniques, namely co-citation analysis, bibliographic coupling, thematic mapping, and keyword analysis, for the purpose of systematically investigating the dynamic research landscape of crisis-period financial market studies and providing a replicable framework for future bibliometric studies in finance and economics. Third, it provides practical contributions to multiple stakeholders, namely: (1) researchers will be able to locate new emerging topics, influential authors, and potential collaborations. (2) policymakers and financial regulators will be able to identify a clear view of the evolution of systemic risk perspectives and market connectedness patterns during crisis periods. Finally, (3) investors and risk managers will benefit from the enhanced insights about the changing nature of market linkages and volatility transmission mechanisms that will contribute toward informing better portfolio diversification strategies and risk assessment frameworks during global uncertainties (Donthu et al., 2021; Paul & Criado, 2020). This study bridges the gap between empirical research during crisis periods and systematic knowledge mapping. It contributes to both scholarly understanding and real-life application of the concept of stock market connectedness in extraordinary conditions.

Our findings contribute significantly to the literature of stock market connectedness during the pandemic era. The study documents a considerable growth in scholarly interest, with publications rising from 28 articles in 2020 to 157 in 2024, reflecting increased academic focus on stock market connectedness during crisis periods. The bibliometric mapping identifies Sang Hoon Kang, Walid Mensi, and Aviral Kumar Tiwari as the leading authors. China, the United Kingdom, and Korea emerged as primary geographical hubs in this domain. Co-citation analysis shows that Diebold and Yilmaz's methodological framework on spillover measurement and connectedness indices remains pivotal to the field's intellectual structure.

Thematic evolution analysis reveals a shift from initial COVID-19 impact studies toward contemporary themes linking stock market connectedness with energy sectors like crude oil, sustainability factors like clean energy, and alternative assets, pointing to expanding research horizons beyond traditional equity market analysis. The word cloud and thematic map indicated that basic themes such as stock markets, financial markets, and spillover effects are well-established. In contrast, emerging themes, including carbon emission trading, clean energy, and sectoral interconnectedness, also offer high-potential areas for future research. These findings collectively illustrate how the COVID-19 pandemic has both amplified existing research avenues and catalysed novel directions in stock market connectedness research, with implications for comprehending systemic risk and market dynamics in subsequent crisis scenarios.

## 2. Methodology

### 2.1 Data Sources and Search Strategy

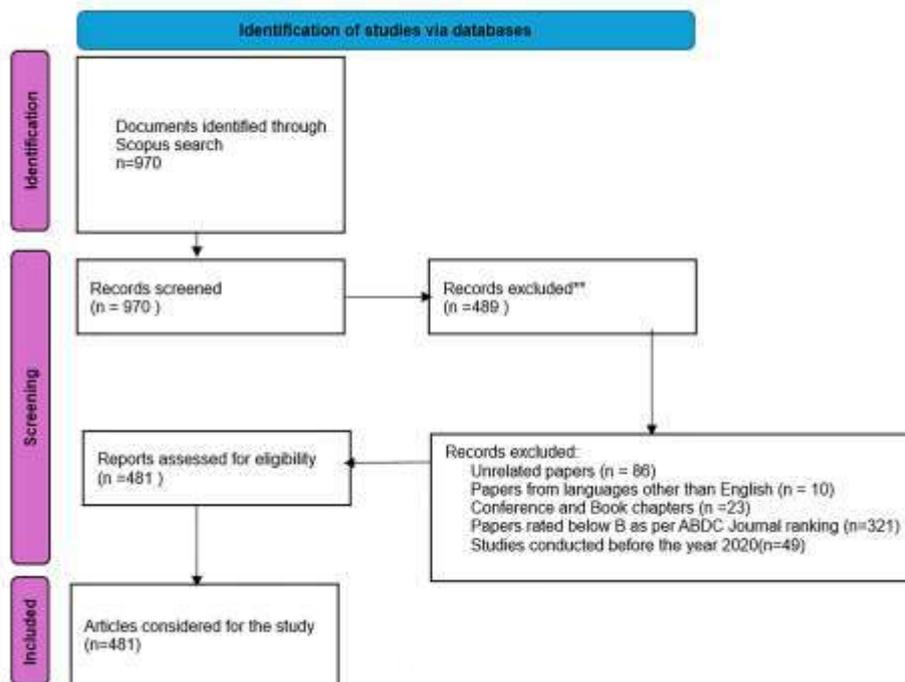
This study used the Scopus database for identifying publications related to stock market connectedness. Scopus served as the primary data source due to its extensive compilation of peer-reviewed publications dating back to

1970, offering broader coverage than Web of Science (Pranckutė, 2021). The database includes substantial content from multiple publishers and academic disciplines and also offers comprehensive metadata for scientific articles, making it the optimal data source for rigorous bibliometric analysis (Baas et al., 2020; Schotten et al., 2017).

The search strategy employed the following keyword combination in Scopus: (TITLE-ABS-KEY ["Connectedness in Stock Market"] OR TITLE-ABS-KEY ["Interconnectedness in Stock market"] AND TITLE-ABS-KEY ["Sectoral connectedness in Equity Market"]). The search was restricted to the subject areas of Social Sciences, Business Management and Accounting, Economics, Econometrics, and Finance to ensure relevance to the research domain. No language restrictions were initially applied to maximise coverage.

### 2.2 Sample Selection and Data Preparation

Following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 guidelines (Page et al., 2021), a systematic screening process was implemented. The initial search resulted in 970 articles. The inclusion criteria were: (1) peer-reviewed journal articles in



Source: Modified from Page et al. (2021)

Figure 1. Flow Chart illustrating sample selection using PRISMA guidelines

ABDC-ranked journals (B or above); (2) publications from 2020 to 2024, covering the COVID-19 pandemic period (Sharif et al., 2020) through the WHO's declaration ending the global health emergency in May 2023 (WHO, 2023); and (3) English language publications. The exclusion criteria removed conference papers, book chapters, non-English publications, and articles unrelated to stock market connectedness during the pandemic period.

The rigorous screening method led to the exclusion of 489 records from 970, based on various criteria. First, 86 unrelated papers that did not concentrate on stock market connectedness during the Covid-19 period were excluded. Second, papers not written in English were excluded (n=10). Third, conference papers and book chapters were excluded, leaving solely peer-reviewed journal articles (n=23). Fourth, papers published in journals classified below B-level, as per ABDC (Australian Business Deans Council) journal quality filtering (n=321). Finally, studies conducted prior to 2020 that did not cover the pandemic period were omitted (n=49). This multi-phase process resulted in 481 papers for our final analysis. The complete selection process is illustrated in Figure 1, following the PRISMA flow diagram framework.

These rigorous cleaning procedures provided data accuracy and consistency for our subsequent bibliometric analysis (Aria & Cuccurullo, 2017c; Lim et al., 2024). The bibliometric analysis was conducted using Biblioshiny, the web-based interface of the Bibliometrix R package, which enables both performance analysis and science mapping (Büyükkidik, 2022; Ghorbani, 2024).

### 2.3 Bibliometric Analysis Techniques

The study used two interconnected analytical approaches based on the framework established by Donthu et al. (2021) and Mukherjee et al. (2022), namely Performance Analysis and Science Mapping.

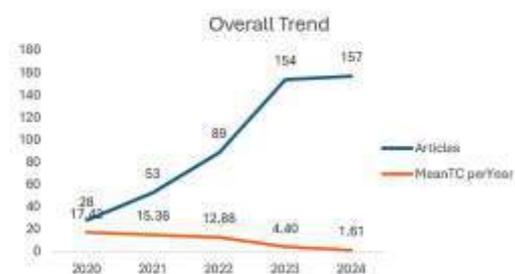
Performance analysis helps in evaluating research output across multiple dimensions: (1) yearly scientific production trends from 2020 to 2024; (2) citation analysis including total citations, average citations per article, and identification of highly cited publications both globally and locally; (3) assessing author contributions that is measured by publication frequency; (4) geographical mapping based on publication and citation indicators; and (5) journal analysis which helps in identifying primary publication venues.

Science mapping techniques provides visual representation of intellectual structure and thematic evolution of the field (Cobo et al., 2011; van Eck & Waltman, 2009): (1) co-citation analysis identifies frequently co-cited documents to uncover the foundational scholarship (Small, 1973); (2) keyword co-occurrence analysis maps major research themes and their interconnections (Callon et al., 1983); (3) thematic mapping employs Callon's centrality and density measures to categorise themes into motor, basic, niche, and emerging/declining categories (Callon et al., 1991); (4) word cloud shows keyword frequency distributions (Heimerl et al., 2014); (5) bibliographic coupling analysis identifies documents sharing common references to reveal contemporary research fronts (Kessler, 1963); and (6) co-authorship network analysis maps collaboration relationships among authors, organisations, and countries (Glänzel & Schubert, 2004).

## 3. Results and Discussion

### 3.1 Performance Analysis- Overall Trend

The overall trend in Article production and Average Total Citations per year is shown in Figure 2, which indicates a clear increase in the number of articles on connectedness in the stock market from 2020 to 2024. In 2020, during the early stages of COVID-19, there were relatively few published articles, specifically 28. This can be linked to the initial ambiguity and the crisis's emerging nature. However, by 2024, the number reached 157, indicating continued interest and possibly a stabilisation in the publication as the field of study becomes stronger. However, the average citations per year is showing a decreasing trend with 17.42 citations in the year 2020 and 1.61 in 2024, as studies done in the early period receive more citations; however, as the field of study grows the distribution of citations becomes more distributed across a larger number of publications (Ahlgren et al., 2018; Tahamtan et al., 2016).



Source: Authors' own work

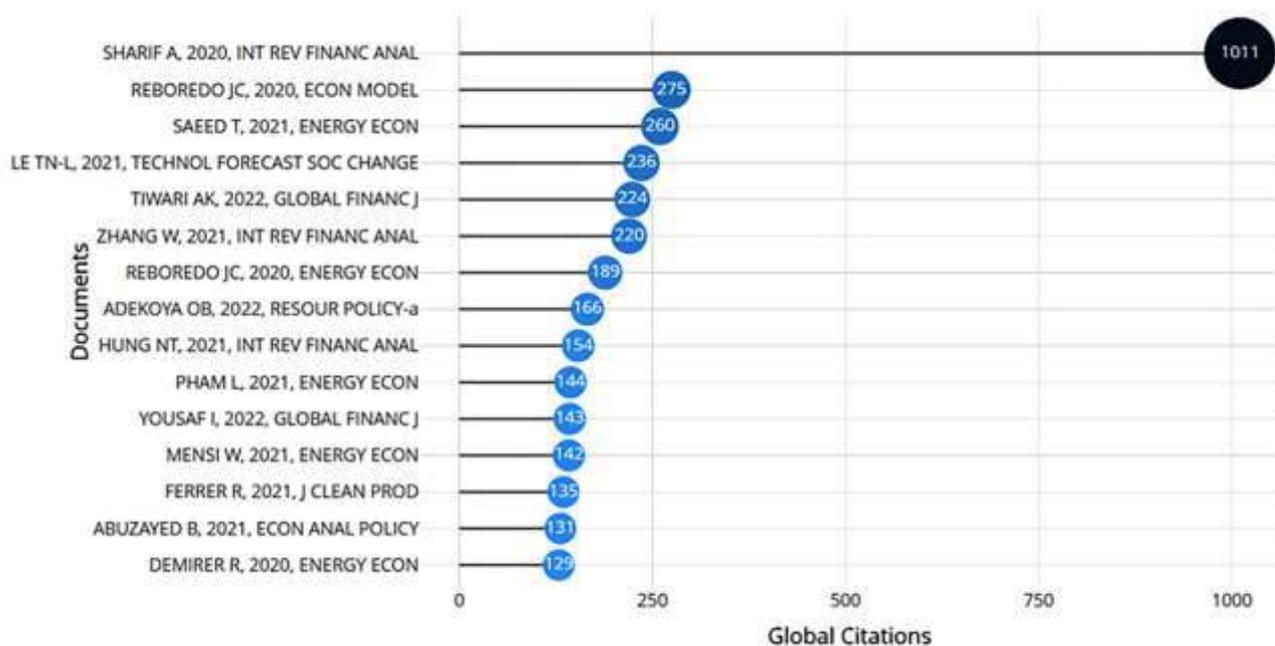
**Figure 2. Overall Trend**

Notes: The blue line indicates the annual scientific production, and the orange line indicates the average total citations per year

### 3.2 Most Influential Publications

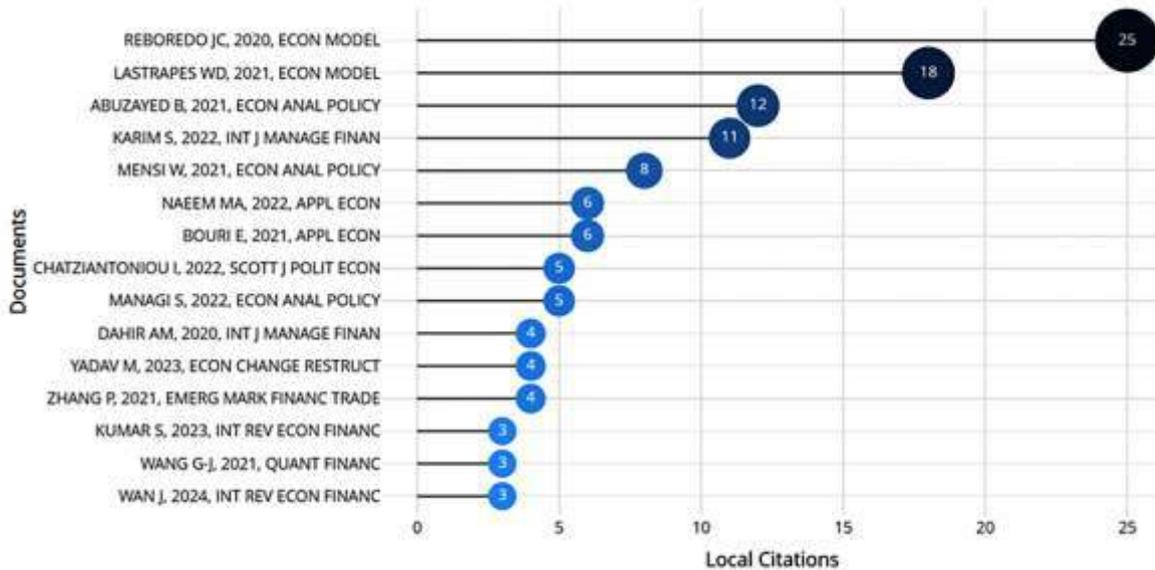
Figures 3 and 4 indicate the top 15 core research publications in stock market connectedness, both globally and locally. Global citations provide an extensive assessment of an article's impact in the scholarly community by considering the total number of citations it has received from multiple sources. Local citations concentrate on the frequency of an article's citations within a particular collection of literature (Kim & McMillan, 2008; Tahamtan et al., 2016). This provides useful insights into its significance and impact within the specific research examined. "COVID-19 pandemic, oil prices, stock market, geopolitical risk and policy uncertainty nexus in the US economy: Fresh evidence from the wavelet-based approach" is a highly cited research paper authored by Sharif et al. (2020) where they examined the relationship between the recent spread of COVID-19, oil price volatility shock, the stock market, geopolitical risk, and economic policy uncertainty in the US through a time-frequency framework. "Price connectedness between green bond and financial markets" is the second most influential study globally and the first most influential study locally authored by Reboredo Ugolini (2020), where they mainly focused on the relationship between financial market and green bonds by employing a structural vector autoregressive (VAR) model to analyse the direct and indirect spread of financial

fluctuations across different markets. Another significant research work is by Saeed et al. (2021) where investigations were carried out on the factors that contribute to the transfer of impacts between green and dirty energy sources by expanding the mean-based VAR measures to quantile-based analysis of connectedness by focussing on the daily returns of green bonds, clean energy shocks, energy ETFs (Exchange-Traded Funds) and crude oil for a period spanning from January 3, 2012 to November 29, 2013. Antonakakis et al. (2018) is the second most influential, presenting a new measure of system-wide connectedness relative to the most widely used generalised spillover index. They mainly decompose variance by using a joint conditional forecast. Followed by "Systemic risk spillover across global and country stock markets during the COVID-19 pandemic" by Abuzayed et al. (2021), who investigated the transfer of systemic distress risk from the global stock market to individual stock markets in the countries that the COVID-19 pandemic has severely impacted. In addition to citation impact, these significant publications exhibit methodological diversity, utilising wavelet analysis (Sharif et al., 2020), structural VAR models (Reboredo & Ugolini, 2020) and quantile-based connectedness measures (Saeed et al., 2021), highlighting the field's methodological richness in analysing market connectedness during crises.



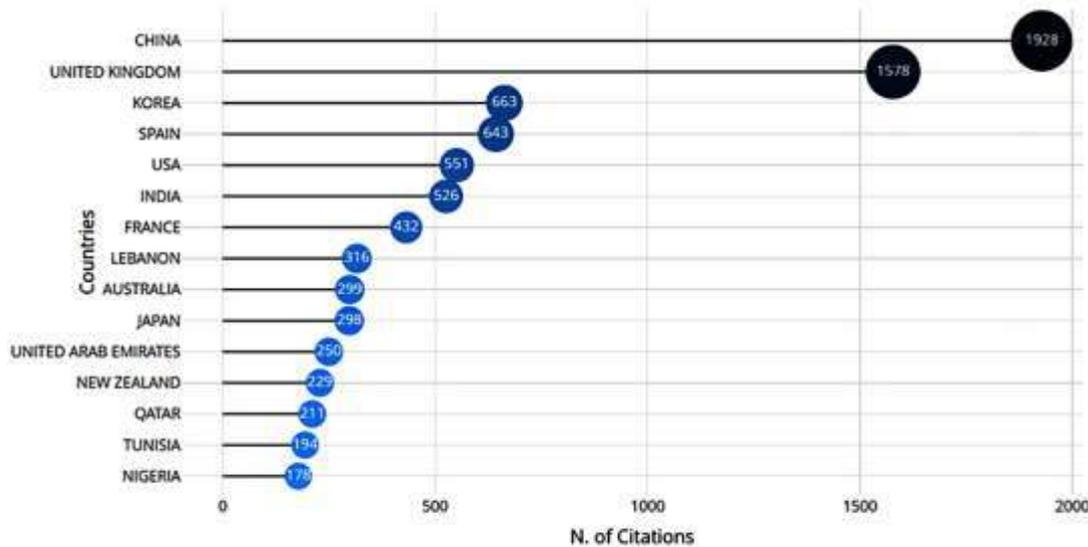
Source: Authors' own work

Figure 3. Most globally cited documents



Source: Authors' own work

Figure 4. Most Cited Local documents



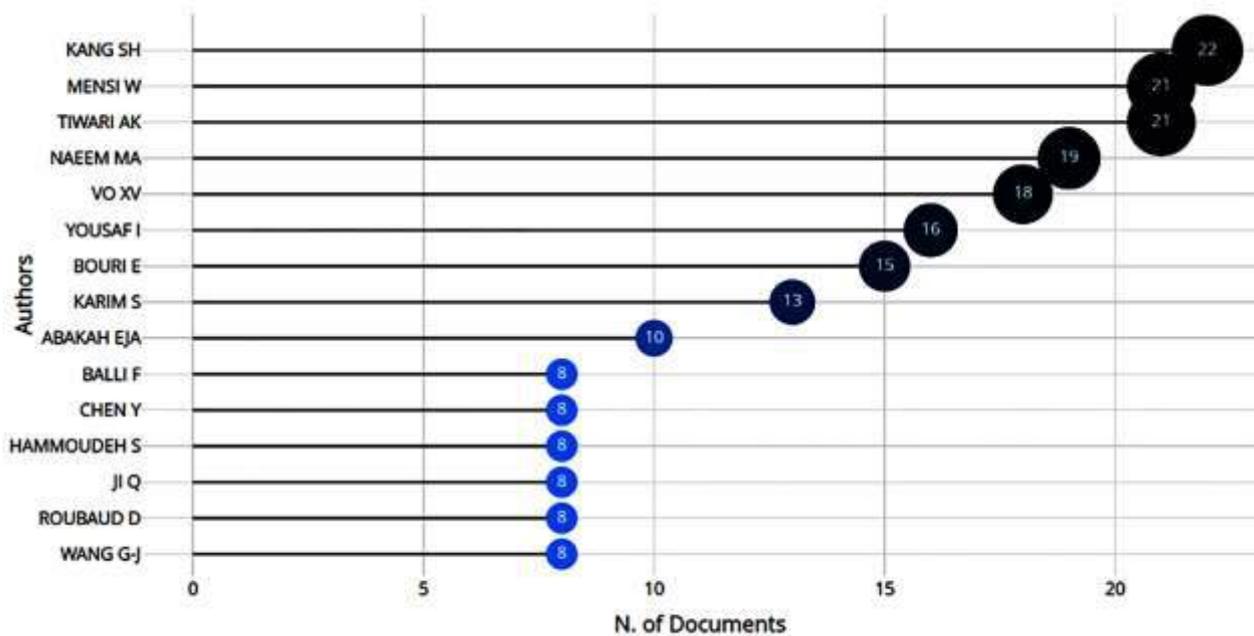
Source: Authors' own work

Figure 5. Most cited countries

### 3.3 Geographic Distribution of Research

Figure 5 indicates the most cited countries. China is among the top countries in terms of total article citations, with a notable 1,928 citations. This number is almost twice that of the next-highest country, the United Kingdom, with 1,578 citations. China's research output is significant and has a greater impact on the global academic community, as evidenced by extensive citations (Xie & Freeman, 2019). The United Kingdom, Korea, Spain, and the USA are

among the top 5 most cited countries. These institutions are well-known for their significant research contributions, demonstrating their ability to produce influential work in various academic fields. The geographic distribution indicates both citation impact and significant international collaboration, with China, the United Kingdom, and Korea emerging as principal research hubs that often co-author studies on market connectedness, illustrating the global nature of financial market research during the pandemic.



Source: Authors' own work

Figure 6. Most relevant authors

### 3.4 Most Productive Authors

Figure 6 indicates the authors with the greatest number of documents. Sang Hoon Kang (2021) has published an extensive number of articles in notable publications covering energy economics, international finance, and commodity markets, which highlight his high level of productivity and consistent contributions to research by collaborating with various other researchers in the field (Bhattacharjee et al., 2024; Nekhili et al., 2024). Kang's publications employ advanced quantitative methods, including tail quantile connectedness analysis, dynamic spillover and connectedness models, and frequency-domain approaches. Followed by Walid Mensi and Aviral Kumar Tiwari, with 21 articles published in top journals, many of which are collaborative with Kang.

### 3.5 Science Mapping

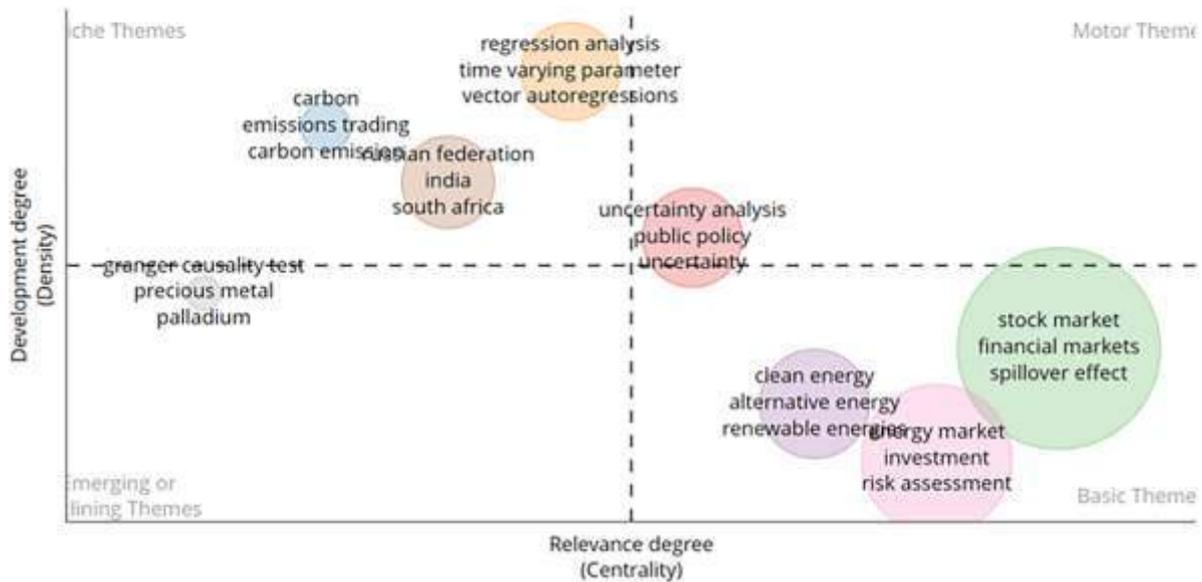
Science mapping explores the connections between different elements of research, providing details about their intellectual and structural relationships (Baker et al., 2021; Cobo et al., 2011; Donthu et al., 2021; Ramos-Rodríguez &

Ruíz-Navarro, 2004). This analytical approach includes techniques such as co-citation analysis, citation analysis, co-word analysis, bibliographic coupling, and co-authorship analysis.

### 3.6 Co-Citation Network Analysis

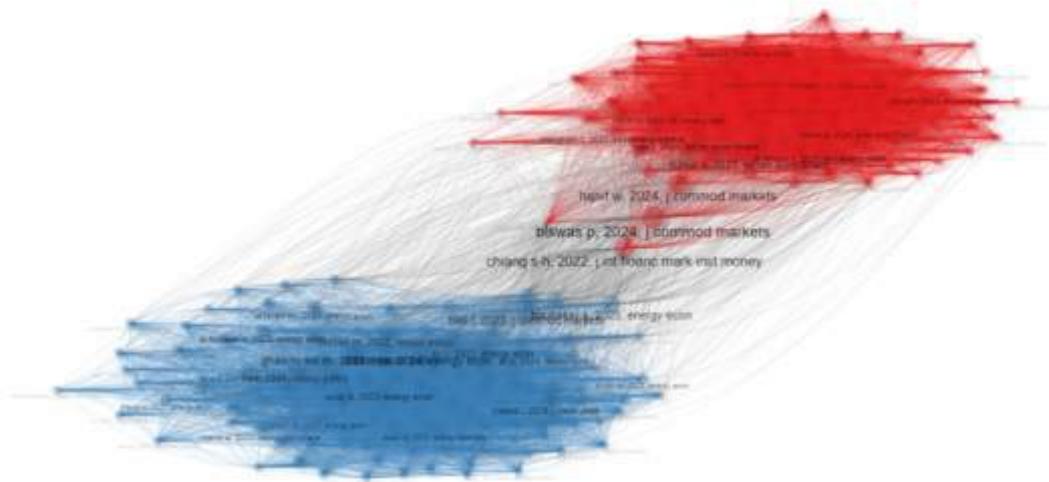
Through bibliometric co-citation analysis, as displayed in Figure 7, our study identifies the similarities and research streams in the literature. Co-citation is the practice of articles citing each other, usually because they pertain to the same concept or idea (Kim & McMillan, 2008). The research cluster contains prominent authors in the connectedness literature, like Diebold F.X., Pesaran H.H., and Bouri E. This cluster consists of a small set of highly cited publications in the field of stock market connectedness, in which entries by Diebold, F.X. appear to be of particular importance. In the blue cluster, there are various articles by Diebold F.X. and authors such as Koop G., Barunik J., and Antonakakis N, indicating distinct aspects of financial market connectedness. Nodes represent the co-occurrence of two research papers as citations in the co-citation analysis (Hjørland, 2013).





Source: Authors' own work

Figure 9. Thematic Map



Source: Authors' own work

Figure 10. Bibliographic Coupling

### 3.8 Bibliographic Coupling

Figure 10 demonstrates the bibliographic coupling of the articles, highlighting different clusters in two colours, red and blue. The link strength is 250. The size of the nodes reflects the relative count of citations for each article. The bibliographical nodes also indicate the closeness of the studies in the network. It is interesting to note that articles that share an extensive number of references indicate a strong relationship between them, as described by

Marchiori and Franco (2020). In the red cluster, the main groups identified are the stock market, spillover effect and COVID-19, and in the blue cluster, the groups are financial markets, commerce and investments. The impact score for the red cluster is 3.076, and for the blue cluster is 4.240. Both clusters are central in the network, whereas stock market clusters are more central. However, the financial market clusters are more influential as they have a high impact score.

## 5. Discussion of Key Findings

Through bibliometric analysis, we were able to bring significant insights into the trends and patterns influencing the stock market connectedness during Covid 19. The results are presented across multiple levels. To address the first study question, "What is the yearly trend in scientific output?", we have produced the graph showing the overall trend of annual scientific production and average citations per year, which demonstrates a steady increase in articles published from 2020 to 2024 (Boubaker et al., 2023). However, the citation count decreased year on year, as noted by Ahlgren et al. (2018). As the topic grows, the citation count spreads across various publications.

Our second study question is, "Who are the most influential authors, journals, and countries shaping the discourse on stock market connectedness during and post-COVID-19?" We have considered the results of Most Relevant Authors, Most Cited Countries and Most Global and Local cited documents. Among the 15 Authors, Sang Hoon Kang, Walid Mensi and Aviral Kumar Tiwari were the top three authors, and Sang Hoon Kang published 22 articles in top-tier journals. His articles are both numerous and extremely significant, enhancing the knowledge of financial market dynamics throughout the crisis period, followed by 21 articles by Walid Mensi and Aviral Kumar Tiwari. These leading authors have significantly advanced their knowledge of stock market interconnectedness, especially during times of increased uncertainty, such as the COVID-19 pandemic. Through the analysis of Most Cited Countries, China tops in terms of the number of citations, totalling 1928, followed by the United Kingdom and Korea, suggesting that these regions are at the forefront of the discussion on stock market connectedness during the COVID-19 pandemic (Basuony et al., 2022).

Further analysis of Most Global Cited documents and Most Locally Cited documents continues to demonstrate the influence of specific studies across the broader research group. More cited papers, typically with innovative methodologies and frameworks, establish a scope for future research. In the paper authored by Sharif et al. (2020), where they found that COVID-19 and the associated regulatory responses constitute major sources of geopolitical risk, they were able to advocate using the geopolitical risk index in future studies of the financial impacts of the COVID-19 outbreak. In the same vein, the study authored by Reboredo and Ugolini (2020) revealed both immediate and delayed causal connections between the green bond market and other financial markets through a structural vector autoregression (VAR) model. The methodology measured the degree of price return spillovers from other markets to the green bond market by decomposing the forecast error variance.

Research question three is to find out "What are the key patterns of collaboration among researchers examining stock market connectedness in the context of Covid-19?" which was evidenced in our study through the Co-Citation Network, Bibliographic Coupling and Co-Occurrence Network. The observed collaboration patterns through co-citation and bibliographic coupling align with previous studies, underlining the significance of clustering in the progression of specialised study fields. Furthermore, Surwase et al. (2011) observe that co-citation implies similarity among themes and intellectual integration, as researchers who cite one another typically engage in closely connected concepts. Our study identifies Diebold F.X. and Pesaran H.H. as key nodes in the co-citation network, corroborating earlier findings that their contributions are essential in influencing the knowledge of financial market connectedness (Diebold & Yilmaz, 2014). Moreover, through bibliographic coupling, our study aligns with Marchiori and Franco (2020) as indicative of robust alignment of research. Articles with extensive references, particularly those analysing stock markets and spillover effects during and post COVID-19, exhibit a common methodological and conceptual framework, which is very crucial for comprehending market connectedness during the crisis period (Adekoya et al., 2022).

The final question "What are the major emerging themes and core ideas from studies on stock market connectedness during and post COVID-19, and how have these themes evolved as the pandemic progressed to different stages?" is analysed through word cloud and thematic map. The results from the word cloud and thematic map indicate that research on stock market connectedness during and post-COVID-19 period has developed to include many themes and approaches. The high usage of terms like "stock market," "financial market," and "spillover effect" indicates that the initial study focused on understanding the immediate effects of the pandemic on market connectedness (Younis et al., 2023). The combination of themes such as "crude oil" and "clean energy" suggests that, as the pandemic advanced, researchers widened their scope to investigate the relationships between stock markets and many economic conditions (Chien et al., 2021; Mukherjee & Bardhan, 2022). The development of analytical tools such as TVP-VAR and the possible obsolescence of procedures like the Granger causality test evidence the evolution of research methodologies to effectively analyse the complex structure of stock market connectedness throughout various stages of the COVID-19 pandemic (Zhu et al., 2024). This reflects the impact of the COVID-19 pandemic on stock market connectedness.

### 6. Implications of Research

This bibliometric analysis helps in improving the theoretical comprehension of financial market research in many ways. First, the study demonstrates that COVID-19 has increased the integration of cross-disciplinary approaches in stock market connectedness research, particularly visible in the emergence of themes that connect conventional financial markets with energy markets, sustainability factors, and geopolitical risk dimensions. The presence of themes including crude oil, clean energy, and carbon emission trading in the thematic map indicates that theoretical frameworks are advancing beyond traditional contagion and spillover models into a more detailed understanding of market interconnectedness that integrates environmental and sustainability aspects (Zhou et al., 2022).

Second, the co-citation analysis asserts that Diebold-Yilmaz spillover indices and connectedness frameworks represent the current theoretical foundation for crisis-period market analysis. Nevertheless, the emergence of advanced techniques, including quantile-based approaches, wavelet analysis, and TVP-VAR, among specialised research themes, suggests theoretical advancement in capturing nonlinear, time-varying, and frequency-dependent market relationships, which conventional models fail to represent adequately (López-Penabaz et al., 2025).

The results from this bibliometric analysis offer significant practical implications for various stakeholders in financial markets and policy-making domains. For investment managers and portfolio strategists, the research reveals that stock market connectedness strengthens considerably during crisis periods, as evidenced by the increased growth in connectedness research from 2020 to 2024 (Chatziantoniou et al., 2022a).

Regarding policymakers and financial regulators, the study stresses the importance of regulatory frameworks that manage cross-market systemic risks emerging from interconnections between traditional financial markets and energy or commodity markets. The prominence of “uncertainty analysis” as a motor theme indicates that policy interventions during crises should include mechanisms for reducing uncertainty alongside traditional monetary and fiscal instruments (Baker et al., 2020).

For academic researchers, the study pinpoints significant research gaps that require future investigation. These comprise: (1) limited research on emerging market connectedness during turbulent periods, as indicated by the specialised positioning of India, Russia, and South Africa (Yarovaya et al., 2022); (2) inadequately developed conceptual models systematically integrating sustainability factors (green bonds, clean energy, carbon trading) with conventional market connectedness (Pham, 2021); (3) high potential for methodological innovation beyond the current reliance of Diebold-Yilmaz frameworks to capture asymmetric and state-dependent connectedness patterns (Baruník & Křehlík, 2018); and (4) inadequate longitudinal research examining structural transformations in market connectedness following the intense crisis period.

### 7. Future Research Directions

The bibliometric analysis uncovers multiple critical research gaps that require academic attention to enhance comprehension of stock market connectedness throughout crisis episodes and their aftermath. Table 1 represents the prioritisation framework, prospective research avenues derived from the thematic map, and recognised knowledge gaps.

**Table 1. Future Research Directions**

SI No	Research Gaps	Relevant Studies
1.	Emerging Market Connectedness During Crises Basis: India, Russia, and South Africa appear in the niche theme category (Figure 9) with low centrality despite growing global importance. Gap: Limited understanding of whether connectedness patterns in emerging markets differ from developed markets during crisis periods; how regional spillover dynamics operate within emerging market blocks; role of institutional factors in crisis transmission.	(Wu et al., 2019), (Zhang et al., 2020a) focused only on countries severely impacted. Need: India -Russia-South Africa block; ASEAN markets; African markets; Latin American interconnections during COVID-19

SI No	Research Gaps	Relevant Studies
2.	<p>Sustainability-Finance Connectedness Integration                      Basis: Green bonds, clean energy, and carbon emission trading appear as basic and niche themes (Figure 9) rather than motor themes, indicating insufficient theoretical integration.                      Gap: The extent to which environmental and social governance factors shape conventional market connectedness during pandemic; the potential for green assets to offer portfolio diversification during the crisis periods; the impact of carbon pricing mechanisms on inter - market transmission effects; the functions of ESG considerations in transforming network patterns.</p>	<p>(X. Lu et al., 2023; Reboredo &amp; Ugolini, 2020; Umar et al., 2024; Zhou et al., 2022)                      Need: Integration frameworks; crisis-period green asset behaviour; carbon market spillovers; ESG-connectedness nexus.</p>
3.	<p>Longitudinal Post-Pandemic Structural Change Analysis                      Basis: Existing research (2020-2024) concentrated on the immediate pandemic phase; the thematic map reveals evolution but lacks extended period structural analysis.                      Gap: Distinguishing between structural transformations and transient responses in the connectedness patterns; timeframe of returning to pre -pandemic patterns; whether crisis-triggered modifications generate new vulnerabilities ; consequences for long-term portfolio diversification.</p>	<p>(Baker et al., 2020; Bouri et al., 2021; So et al., 2021b; Zhang et al., 2020b)                      Need: Extended longitudinal studies; examination of structural break analysis; incorporating regime shifts; permanent vs temporary decomposition.</p>
4.	<p>Sector-Specific Connectedness During Crisis                      Basis: Word cloud (Figure 8) shows generic terms (stock market, financial market) dominate; sector-specific analysis remains underdeveloped.                      Gap: Whether technology, healthcare, and financial sectors exhibit distinct connectedness patterns; sector rotation strategies accounting for time-varying connectedness; the role of digital transformation; and cryptocurrency integration with traditional markets.</p>	<p>(Adekoya et al., 2022; Chatziantoniou et al., 2022b; Costa et al., 2022; Shen et al., 2022)                      Need: Technology sector connectedness; healthcare sector during pandemic; fintech-traditional finance linkages; crypto-equity connectedness</p>
5.	<p>Geopolitical Risk and Policy Uncertainty Integration                      Basis: "Uncertainty analysis" appears as a motor theme (Figure 9) with high centrality and density, but geopolitical dimensions are underexplored.                      Gap: What geopolitical events (trade wars, conflicts, sanctions) affect network structures; whether policy uncertainty predicts regime changes; regulatory divergence effects; central bank coordination role.</p>	<p>(Hu et al., 2024; Sharif et al., 2020)                      Need: Trade war impacts on connectedness; sanction effects; policy divergence analysis; monetary policy coordination studies.</p>

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# Influence of AI Environment on Development of AI Competence among Professionals: A Multiple Case Study Approach

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## A b s t r a c t

*Background and Objectives:* In the evolving landscape of Artificial Intelligence (AI), understanding the role of the AI environment in fostering AI competence among professionals is crucial. This study aims to explore how various aspects of the AI environment contribute to the development of AI competencies in the workforce, particularly within the Indian context.

*Methods:* A qualitative research design was employed, utilising a multiple case study approach. Data were gathered from six organisations in India where AI plays a significant role in operations. Interviews, observations, and document analysis were used to collect comprehensive data.

*Results:* Data were analysed using ATLAS.ti software, and the analysis identified four key elements of the AI environment important for developing AI skills. They include technological, human resource, job, and business environment, which refer to AI tools & technologies, knowledge & skills related to AI, roles & responsibilities related to AI, and market & industry changes in AI, respectively. Findings also indicated that, together, they create a system that can either support or hinder the development of AI skills among professionals.

*Implications for Practice:* As the study uses a multi-case method, the findings are based on actual AI lending implementations, which lend them credibility and emphasise the importance of building a strong AI environment in organisations, providing practical advice for managers and decision-makers. It also underscores the importance of investing in modern AI technologies, offering ongoing learning opportunities for employees, creating AI-focused job roles, and staying up to date with emerging industry trends.

*Keywords:* AI Competence, AI Environment, Technological Environment, Human Resource Environment, Job Environment, Business Environment, India, Case Study.

## 1. Introduction

In modern business ecosystems, managers and business leaders have adopted digital transformation across their operations. To further accentuate this ever-evolving business landscape, research indicates that Artificial Intelligence (AI) plays a pivotal role (Dwivedi et al., 2021). Further, the Indian AI ecosystem has shown significant growth, and it is estimated that the ecosystem's market value will contribute significantly to GDP by 2025 (Hammer & Karmakar, 2021). Research indicates that AI will transform the global economy over the next decade, and its future use will do so in ways that may be hard to imagine (Torino, 2025). Such an accentuation of the transformative potential of AI has resulted in a sense of urgency amongst organisations to adopt AI and amongst the workforce to develop capability in this dynamic environment (Almatrooshi et al., 2016).

In response to the emergent demand for AI skills in the workforce, the understanding of AI skills has shifted from mere technical know-how to a core competency. As a concept, competency was originally conceived as an individual's natural ability to display behaviours that lead to desired outcomes (McClelland, 1973). It was further developed by Boyatzis (1982), who highlighted that competency included a person's internal capacity to exhibit behaviour that met or exceeded job expectations and positively impacted the work environment. In today's era of AI emergence, competencies that bring together a set of abilities and actions and contribute to the organisational growth have gained momentum as they allow the workforce to seize the vast opportunities presented by AI technologies and their applications (Chen et al., 2022).

Researchers have suggested that the set of various abilities and actions leading to AI competencies includes technical, cognitive, and adaptive problem-solving skills (Faruque et al., 2021; Long & Magerko, 2020). Researchers also suggested that AI competencies were continuously evolving not only in consonance with the fast-changing developments in AI technologies, tools and algorithms, but also with the enhancement in its understanding, interpretation, and consideration of the ethics involved, social impact, and business implications (Cox, 2023; Khan et al., 2023). In an attempt to consolidate understanding of AI competency, Psyche et al. defined it as a lifelong learning mindset, given that the domain is in continuous change (Psyche et al., 2023).

In this regard, AI skills extended past technical skills (Finegold & Notabartolo, 2010). These were a comprehensive range of skills, including critical thinking, creativity, and collaboration, that all professionals needed to succeed in an AI-integrated workplace (Bruneault et al., 2022; Santana & Diaz-Fernandez, 2023; Thomas et al., 2024). The competencies allowed people not only to use AI systems but also to innovate, adapt, and lead in an AI-driven business environment (Baki et al., 2023; Chandra et al., 2022; Mikalef et al., 2023). Therefore, the definition of competency has in the present-day world, where AI continues to transform industries rapidly, pushed beyond its traditional boundaries in terms of its conceptualisation, representing a more holistic and dynamic set of skills that are in line with the needs and opportunities of the AI revolution (Khang et al., 2023; Liaw et al., 2022; Spirgi et al., 2022; Tuomi, 2022).

This paper aims to explore how the AI ecosystem can improve AI skills among professionals in India. It reviews the interactions and contributions by various elements of the AI environment, including technological, human resource, occupational, and commercial factors, to the development of AI skills. It is centred on the interactions among these factors and their combination to provide a favourable environment for training AI skills. The technological dimension examines the effects of AI technologies and tools, as well as the infrastructure that supports their relevance in a professional environment (Chowdhury et al., 2024). The human resource factor considers learning programs, learning activities, and implementation of the learning culture in AI (Jovari, 2024). An occupational perspective examines how AI has been introduced across various job positions and how job descriptions have changed as AI has developed (Hamouche et al., 2025). Lastly, business dimension analyses of market trends, industry needs, and how AI use affects the overall economy are present (Babashahi et al., 2024).

The results of this research shall offer evidence-based recommendations for organisations and policymakers and provide valuable insights into creating an AI-skilled workforce. It is hoped that these results will contribute to the broader debate on the future of AI in the workforce and the need to align AI technological advancement with workforce development policies.

## 2. Theoretical Background

The idea of competencies at work has now developed quite significantly, no longer a focus on job-specific personal

capabilities but on a wider range of capabilities, behaviours, and personal qualities (Moore et al., 2002). Although the competencies were primarily popularised by McClelland in the 1970s, over the course of the years since, the competencies have been theorised as being more effective predictors of employment performance, relative to traditional IQ tests (McClelland, 1973), resulting in a paradigm shift, transferability of various skills and behaviours at the workplace. Over time, several models and frameworks have been developed to explain and classify these competencies. Competencies have been described as knowledge, skills, self-concept, traits, and motives (Spencer & Spencer, 1993), as per the Competency Model and have proven useful to organisations to recognise and develop key competencies in the various job roles, thus improving recruiting, training, developing, and performance management processes (Abdullah & Sentosa, 2012; El Asame & Wakrim, 2018; Gholami et al., 2022; Krishnan & Singh, 2011; Sherman et al., 2007; Voss et al., 2022; Wright, 2018).

With the advent of the digital age and the introduction of revolutionary technologies, the concept of competencies began to broaden to accommodate the subtleties of new technologies, especially Artificial Intelligence (AI). The AI capabilities have gone beyond the scope of traditional technical skills, such as programming and data analysis, to an awareness of the ethical, societal, and business implications of AI. Companies with extensive AI use across various industries explain this expansion of competencies. This has been complemented by recent scientific literature, which not only emphasises the importance of cognitive abilities, such as critical thinking and problem-solving (Gerlich, 2025), but also highlights adaptability and collaboration (Tenakwah & Watson, 2025) in AI-based workplaces. The multidimensionality of AI competencies, namely a set of technical, cognitive, and interpersonal skills, was also emphasised by such studies (Jaiswal et al., 2022; Shet & Pereira, 2021; Sofia et al., 2023).

Specific frameworks on artificial intelligence have also been proposed. They are generally subdivided into technical (including machine learning and natural language processing) (Davenport, 2018), cognitive (including logical reasoning and ethical judgment) (Santana & Diaz-Fernandez, 2023), and interpersonal (including communication and teamwork) (Anton et al., 2020) skills. These AI competencies are complex tasks that cannot be implemented in the workplace without changing the organisation into an AI-adaptive culture, which cannot

happen without people developing these competencies. Researchers suggest that the transition will require developing lifelong learning opportunities, cultivating comprehensive AI competence (Ng et al., 2021), and promoting innovation and ethical conduct in artificial intelligence (Borenstein & Howard, 2021).

As per the current discourse in the field, and even in present-day science, it is not so much a movement as it is a need to make jobs and organisations future-proof through AI-trained skills (de Waal & Linthorst, 2020). In a way, this vision preconditions the discussion of developing such competencies and their support, especially in an active country like India, where the application of AI can quickly alter the professional environment. The AI proficiency of human resources is essential for successfully obtaining, implementing, and utilising AI investments to align with the business strategy and support business operations (Wamba-Taguimdje, 2020). The AI competency of personnel signifies the extent to which a firm possesses AI knowledge and utilises it effectively to manage the information and insights generated within the firm (Mikalef & Gupta, 2021). The role of AI in offering businesses a competitive edge is increasingly recognised (Kemp, 2023).

AI competency can be defined as “collective AI knowledge, expertise, relationships, and skills essential for building and sustaining a competitive advantage for the business.” This definition of AI competency will be applied throughout the paper whenever the phrase AI Competency is used. Delving deeper into this definition, especially regarding AI knowledge, it has been found to encompass AI technologies, applications, system development, AI management, and access to AI knowledge. The AI environment is expected to play a significant role in enhancing employees' AI competence. The AI environment can be perceived as a dynamic system characterised by regular interactions with stakeholders both within and outside the system, for upgrading AI infrastructure and managing networks. Thus, it encompasses both the application of current technology and the assimilation of scientific knowledge developments through networks. This constant exchange of knowledge and interaction renders the system dynamic and pivotal in the development of AI competence.

### 3. Methods

For this qualitative research, six Indian organisations were selected, spanning diverse sectors to explore how AI competencies are developed in professional environments.

The study, conducted throughout 2024, received prior approval from an institutional review board, ensuring ethical standards were met.

### **3.1 Data Collection and Analysis**

The primary methods of data collection included semi-structured interviews and focus group discussions. These interviews were conducted in English and various regional languages to accommodate the linguistic diversity of the participants. The primary intention behind conducting focus group discussions was to develop a deep understanding of the upcoming themes from the interviews, motivate participants to engage in constructive discussions, and provide diverse perspectives.

### **3.2 Participant Selection and Organisational Context**

The participants were divided into key informants, who were central to AI efforts in their organisation (including heads of AI innovation or strategy), and general employees who used AI technology to varying degrees in their work. The organisations chosen to participate in the study were broad in terms of the professional settings in India. They consisted of two big commercial corporations (one that operates in a large metropolitan area and another operating in a smaller and developing region), two middle-sized businesses with various market orientations (one that serves a wide range of domestic markets and the other that is internationally oriented), a large non-profit organisation that engages in technology-driven social development, and a civil society organisation that has a significant interest in using AI to benefit society. The participant organisations, at varying degrees, were committed to introducing AI into their operations. This diversity in the scope and scale of AI adoption provided for a holistic understanding of the developments in AI capabilities across an array of companies, organisations, and institutions in India. The diverse mix of participant organisations also provided a broad spectrum of experiences and perceptions of the development of AI competencies in varying work settings in relation to the emerging AI scenario.

### **3.3 Procedure**

The study employed interviews and focus group discussions within a virtual environment. A total of 27 informal interviews and 38 semi-structured individual interviews were conducted across six institutions with key informants using secure online platforms. These interactions aimed to gather data on AI strategies and

employee competency development across the participating institutions. The key informants provided nuanced insights into the organisations' digital infrastructure. Policy documents and internal communications were also accessed with permission from the participating organisations. The follow-up communications were completed using telephone calls and emails in instances where additional information was required. Besides the individual interviews, 7 face-to-face group sessions, each consisting of 4-8 participants, were scheduled online, and interactive discussions were facilitated through breakout rooms and online whiteboards. These meetings lasted 90 to 120 minutes and gave participants time to discuss and reflect on their experiences with AI collectively.

Before these sessions, participants had been given oral and written information about the study's purpose, confidentiality, the voluntary nature of their involvement, and the electronic consent form for recording the conversations. This online research design enabled effective and adaptable data collection across the various geographic locations where participants in India were located.

### **3.4 Data Analysis**

In line with our study's focus, as outlined in the structured abstract, the data analysis was designed to thoroughly investigate the role of the AI ecosystem in the development of AI competencies among Indian professionals. All interview and focus group recordings were transcribed verbatim. An initial comparison of data from both sources showed consistent themes, allowing for a unified analysis approach as shown in Table 1 below:

Further analysis was done using ATLAS.ti. This involved coding the transcripts into segments relevant to the key elements of the AI ecosystem: technological, human resource, occupational, and commercial aspects. This segmentation aligned with our research objectives to identify how these elements contribute to AI competency development. Through thematic analysis in ATLAS.ti, patterns related to the facilitation and barriers in AI competency development, as well as strategies at the individual and organisational levels were identified as shown in Table 2. A significant part of the analysis also focused on the interplay between organisational dynamics and individual competencies, consistent with the aims outlined in our abstract.

**Table 1. Reliability and validity of interview data**

<i>Aspect</i>	<i>Strategy Employed</i>	<i>Purpose</i>	<i>Description</i>	<i>Impact on Study</i>
Reliability	Standardised Interview Protocols	To ensure consistency in data collection	Uniform interview and focus group guidelines across all sessions	Guarantees consistent data collection
	Audio Recording and Accurate Transcription	To accurately capture participant responses	Digital recordings of all interviews and focus groups, followed by verbatim transcription	Provides an accurate and reliable record of all discussions
	Iterative Data Analysis	To refine and validate findings	Repeated analysis of data to check for consistency in coding and theme identification	Ensures findings are consistently derived from the data
	Peer Debriefing	To cross-validate the researcher's approach	Regular discussions with peer researchers to review data analysis and interpretations	Offers an external check on the research process and findings
Validity	Triangulation	To validate findings through multiple data sources	Use of interviews, focus groups, and document analysis for cross-verification	Enhances the credibility and comprehensive nature of findings
	Expert Validation	To authenticate the study design and findings	Submission of study methodologies and findings to field experts for review	Provides expert confirmation of the study's validity
	Participant Feedback (Member Checking)	To confirm the accuracy of data interpretation	Participants were invited to review and provide feedback on the findings	Allows for participant verification of the research interpretations
	Reflexivity	To minimise researcher bias	Maintaining a reflective journal to document and acknowledge the researchers' biases and perspectives	Increases the objectivity and integrity of the research

Source: Author generated

**Table 2. Thematic analysis and results**

<i>AI Ecosystem Component</i>	<i>Key Themes</i>	<i>Findings</i>	<i>Implications for AI Competence</i>	<i>Quotes from Respondents</i>
Technological Environment	- Rapid Advancement - Technological Obsolescence	- Need for continuous technological adaptability - Necessity to stay updated with AI developments	- Professionals must quickly learn new AI technologies - Staying relevant in the industry	"The pace of AI innovation demands rapid upskilling to stay competitive."
Human Resource Environment	- Onboarding and Socialization - Collaborative Learning Initiatives - Training and Development	- Effective integration into AI culture - Shared learning and skill development in AI	- Fostering an environment conducive to AI learning - Equipping professionals with AI skills	"Collaborative learning sessions in AI are crucial for building our team's competencies."
Job Environment	- Job Enlargement - Job Enrichment - Cross-Functional Collaboration	- Expansion of job responsibilities - Involvement in meaningful AI tasks - Engagement across various departments	- Enhancing versatility and effectiveness in AI roles - Broadening professional experiences	"My role evolution in AI has been a significant motivator for skill development."
Business Environment	- Increased Competition - Business-Level Decisions	- Awareness of competitive AI landscape - Adaptation to changing business and AI needs	- Need for rapid adaptation in AI - Aligning skills with business and technological shifts	"Adapting to new AI platforms quickly is essential in our fast-paced sector."

Source: Author generated

## 4. Results and Discussion

### 4.1 Technological Environment

The concept of Continuous Technological Adaptability has emerged as crucial within the AI ecosystem, as it connects three independent yet interrelated themes: Rapid Technological Change, Technical Obsolescence, and Skill Adaptation.

*Rapid Technological Change:* The pace of AI technology change is not only high but also unpredictable. This momentum, largely driven by changing customer requirements and organisational research and development, requires rapid learning and adaptation. One of the key informants of a big business corporation has pondered over this fact:

*“Recently, our management emphasised the necessity to implement a new AI solution as soon as possible to follow the market. This has put a premium on rapid upskilling our team in the new AI technologies”.*

In the same way, one member of a non-profit organisation dealing with technology-related efforts noted, *“the technology world, as well as clients and solutions, are continually in flux. Our team must quickly change and learn to keep up with these changes”.*

*Technological Obsolescence:* One more theme that became very apparent is the rapid obsolescence of AI technologies. One of the IT professionals of one of the mid-sized enterprises involved in the study said:

*“In AI, what is state of the art today may soon become obsolete with newer innovations by other players”.*

*Enduring Availability of Skill Raise:* Since the AI technology is dynamic, the existing occupations have undergone redesign and require more talent development. One of the respondents who represented a commercial company dealing with AI applications told:

*“It is important to adapt to the AI development. Roles have changed, and new skills are in demand. It is about keeping up with the times and working in a job that is constantly changing”.*

Another social purpose organisation member replied, *“The difficulty in our area is not only keeping pace with other participants, but also with the capabilities of AI. To be effective and successful, one needs to be in touch with the latest developments of AI”.*

### 4.2 Human Resource Environment

The human resource environment was recognised as one of the key areas that play a central role in developing AI competencies within the AI ecosystem. Onboarding and socialisation, collaborative learning projects, and training and development were the primary themes in this category. They made a significant contribution to the competency development within a relatively short time frame.

*Onboarding and Socialisation:* Onboarding and socialisation were viewed as the priority in helping new workers adapt to an AI-driven organisational culture. One of the latest graduates working in an AI position in a commercial organisation said:

*“I was not ready at first after getting my degree in AI. However, the onboarding process was extremely relevant in filling the gap between my theoretical knowledge in academia and its practice. It also exposed me to the new AI technologies and abilities”.*

*Collaborative Learning Programs:* Collaborative learning programs have become a prominent approach to competency development, replacing traditional mentoring, given AI's formative role in most Indian companies. They also offered a platform to study together, as well as to learn AI in peer learning teams and across-departmental collaborations. One of the experts of a mid-sized company that deals with AI said:

*“In a company we work in, we have regular knowledge sharing meetings where we talk about AI developments. It is a good method through which we can develop and distribute our AI competencies”.*

*Training and Development:* As noted, the ongoing training and development process would be critical in ensuring the AI's competitive edge. An artificial intelligence professional of a non-profit organisation with a technology focus stressed:

*“We regularly update our training modules as our training department follows the latest trends in AI. Continuous training is key to our AI technology preparation”.*

The opinions reflect the value of an effective human resource management strategy that includes structured onboarding activities, collaborative learning programs, and specific training programs. In an environment that demands technological proficiency, up-to-date skills, and deeper AI

knowledge, people-centric human resource strategies ensure organisations remain agile and competitive in the fast-evolving field of AI.

### 4.3 Job Environment

The central areas of importance in this area include job rotation, job enlargement, job enrichment, cross-functional collaboration and exploration opportunities leading to AI competencies. Analysis shows that exposure to the latest technologies, diversification of job roles and change of location influence the job environment significantly. Organisations that engage in such practices experienced a better job environment with confident and competent employees, as their competencies were based on wider experiences and encounters with technology.

#### *Job Enlargement:*

Job enlargement emerged as a critical factor in improving AI-related competencies within the organisation. It results from the increased scope of job duties and changing job tasks, leading to increased skill development opportunities. One of the representatives of a giant AI-driven company shared:

*"I was a software engineer, but nowadays I work in different domains like staffing and customer support. This has not only increased my job scope, but it has also given me a feeling of increased responsibility and contribution".*

#### *Job Enrichment:*

Another important strategy was job enrichment, or providing a more interesting and more challenging job. In this way, it enhances employee engagement and aligns them more closely with organisational goals. An AI professional remarked:

*"I was lucky to be put in charge of a large-scale AI project, and it has been the most radical experience of my life. It made me feel our organisational mission needs me and empowered me".*

Another respondent said, *"My organisation has allowed me to pursue my studies in the area of AI and business management, which has proved to be a game changer in terms of career development"*.

#### *Cross-Functional Collaboration:*

Another sub-dimension that appeared was the cross-functional collaboration. This means that employees will be operating in different departments and applying AI in

different business operations. One of the respondents in a non-profit organisation working on AI applications remarked:

*"Working on cross-functional projects has helped me expand my knowledge of the use of AI in various business sectors, which makes me more prepared to participate in the development of overall AI solutions".*

The given observations indicate the nature of the job environment in the development of AI skills. Job enrichment, job enlargement, and cross-functioning help employees to learn and experience an unbelievable number of things and skills that will help them become more flexible and efficient in the constantly changing world of AI.

### 4.4 Business Environment

In line with the themes presented in the formulated abstract, the business environment was found to be a paramount factor that affects the formation of AI competencies. It was based on the need to understand how increased competition affects the business and which business-level decisions contribute to the development of AI competencies. We found that respondents were highly conscious of the competitive environment in the AI industry in India and around the world, and that they can perceive how the trends and economic state of the industry affect their professional development.

#### *Increased Competition:*

The AI industry does not rely on a standard workforce as much as it relies on a technologically advanced one. The access to talent in cloud computing, big data and artificial intelligence is changing the talent scene. One of the respondents in the sample organisations that specialises in AI solutions commented:

*"The increasing number of people who have been trained to work with specific AI types is changing the labour market. Today, to be competitive is to continuously advance our AI capabilities and keep them up to date".* One of the representatives of a commercial organisation noted, *"The business world has changed. Nowadays, it is not only about school education but also about the skills that are associated with AI that you are offering. It is a change that we have been getting used to within the last ten years or so"*.

#### *Business-Level Decisions:*

Decisions at the business level, especially with respect to technology adoption and integration, have taken centre

stage in ensuring relevance in the AI sphere. The skill to quickly adjust to emerging AI technologies and platforms is becoming a highly valued skill. A specialist in AI gave an account of their experience:

*“A transition to a multi-platform environment, rather than a single AI platform, was difficult but necessary. The AI industry had to learn and adapt quickly, which is what it did”.*

These observations support the structured abstract's focus on a dynamic business setting as a key to the development of AI capabilities. The dynamic aspect of AI technology requires agility, constant learning, and adaptation to competition and business requirements.

## 5. Findings and Results

Results indicate the growing significance of AI competencies amongst working professionals in India within the AI ecosystem, which comprises the technological, human resource, job, and business environments. The study sheds light on the multidimensional, multifaceted process of AI competency development and the interconnectedness among environmental variables that facilitate the enhancement of AI capabilities. The study presents a deep analysis and understanding of the technological environment, the nature of technological evolution and the impact of obsolescence in AI technologies. It validates the findings of Bughin, who proposed that in the AI ecosystem, even experts need to possess certain critical foundational knowledge and have the tenacity to upskill themselves to adapt to the ever-evolving technological space. In addition to being able to follow new trends in AI and acquire new skills as quickly as possible, it is also important to keep pace with the industry and remain on the competition side (Watson, 2021).

In the human resources setting, the importance of properly organised onboarding processes, the facilitation of team learning, and comprehensive, holistic training opportunities has been noted. Here are the following, which are necessary to establish a positive environment for studying and mastering AI skills, preparing professionals to operate a business in the ever-changing world of AI (Vrontis, 2022). In terms of the scope of work, the research confirms the viability of job enlargement and enrichment and cross-functional teamwork (Cimini et al., 2023). These attributes of a work environment are essential to expand professional experiences and competencies of the workers,

to make them more flexible and efficient within an AI-based business environment. Finally, the business environment discussed in this study provides insight into the high competitiveness of the AI sector and highlights the significance of making intelligent business-level decisions (Mishra & Tripathi, 2021).

The study identifies the various elements within the AI ecosystem, presents a robust synthesis of the various elements, identifies their interaction and the resultant impact on the development of AI competencies among working professionals. The study also presents an in-depth exploration of each element to develop an understanding of the complexities involved in the accumulation of AI skills that lead to competencies among working professionals in India.

### 5.1 Implications for Practice

The findings from the study have implications for organisational leaders and policymakers alike. As the workforce prepares for the age of enhanced AI use in organisations, it is imperative that a conducive ecosystem be created that fosters AI proficiency and competencies for faster, more effective adaptation. Organisational leaders and policymakers can make use of the findings from this study to make decisions regarding future investments in AI technologies. They can also use the findings to design employee growth paths that are intricately linked to AI competencies, develop specialised job roles in the domain of AI and prepare themselves for rapid changes in the marketplace. These strategic initiatives shall not only help in the growth of individuals working in organisations but also prepare organisations for sustainability in the era of AI-powered competition.

### 5.2 Contribution to AI Competency Discourse

The study contributes to the ongoing debates and deliberations on the potential impact of AI on individuals, organisations and the marketplace by providing evidence-based findings on the role of the AI ecosystem in competency development of the working professionals in varied industries. It also contributes to the ongoing discussions on the synthesis of environmental parameters to use while designing AI-skilling of professionals working in various kinds of industries.

Though the study is relevant in the modern times of technological change, it has limitations. The study was conducted in India with a set of participating organisations,

which limits the generalisation of its findings. Further, the study used qualitative rather than quantitative methodology, which may also be a limitation. It is also possible that the responses gathered during the interviews and focus group discussions were subjective, biased, and based on participants' personal opinions of the AI environment. As the area of study was AI technologies, and it is a dynamic and fast-evolving area, it is possible that the respondents might not have covered the latest changes in the technology. In line with the limitations, it is suggested that the implications be replicated cautiously rather than generalised.

### 5.3 Future Directions

Future research may use a longitudinal design to develop a deeper understanding of AI competency development and its long-term impact on organisational performance. Similarly, further research could also be undertaken to understand the impact of personal traits and motivations of individuals on their approach towards competency development.

Finally, the study was conducted in an Indian context and on organisations operating in India. Further research should be undertaken in other geographic and organisational contexts, as understanding how to address the various components of the AI ecosystem would be of paramount importance for researchers, organisation leaders, and policymakers alike.

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# Female – Owned Enterprises and Productivity Growth in Nigeria: A Firm Level Data Empirical Evidence

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## A b s t r a c t

This study examined female-owned enterprises and productivity growth in Nigeria. Specifically, it sought to ascertain whether enterprises owned by females have a significant impact on productivity growth in Nigeria and to determine how the educational levels of female entrepreneurs affect productivity growth in Nigeria's economy. Data from World Bank enterprise surveys (2014) was utilised for this purpose. Two-stage least squares regression was used for data analysis. The regression was run using STATA 17. The study's findings revealed that female-owned businesses have a significant positive influence on productivity growth in Nigeria. Results for the second objective revealed that the primary, secondary, university, and postgraduate levels of education of female top managers have a significant, positive impact on productivity growth in Nigeria. In contrast, vocational education has a negative and insignificant impact. It was suggested that the government urgently develop supportive policies and activities to reduce the barriers and biases that prevent women from advancing to top managerial positions in the country.

**Keywords:** *Female-owned enterprises; Productivity growth; Entrepreneurship; Women Entrepreneurship; Firm-level data; Nigeria; Enterprise survey; Two-stage regression.*

## 1. Introduction

Female-owned enterprises have been identified as a critical factor in advancing the progress of female businesspersons in the country (Tende, 2016). The exploration into the relationship between women-owned enterprises and productivity growth in Nigeria constitutes a critical area of study. Recently, there has been a shift in the entrepreneurship landscape, with a growing emphasis on productivity growth. Women entrepreneurs are seen as a newfound engine of economic growth, with investors pointing to them as an untapped resource for economic development (Minniti & Naudé, 2010).

Female-owned enterprises are businesses owned and operated daily by women (WBENC – [Women's Business Enterprise National Council], 2024; World Bank, 2019). These enterprises play crucial roles in driving economic growth, stimulating innovation, and promoting gender equality (Brush, de Bruin, & Welter, 2009; Omeje, Mba, & Rena, 2024; Sultanova, 2025). As the number of women-owned firms grows, female entrepreneurs are recognised as critical drivers of growth and prosperity in many countries. They are often referred to as the emerging stars of the economy, with stakeholders highlighting women's potential as crucial yet underutilised resources for economic development (Minniti & Naudé, 2010).

Women play central roles in both the non-monetary economy, including activities such as subsistence farming, childcare, and domestic work, and the monetary economy, encompassing trading, wage labour, and employment (Yawa, 1995). Generally, women holding major shares and control in business are not limited to a particular region, as this is a universal concept. According to Manerkar (2015), female business owners are women who start, organise, and run enterprises. On the other hand, Iyiola and Azuh (2014) argued that women entrepreneurs play an enticing role in society by repeatedly connecting with, and deftly responding to the support, financial, and socioeconomic domains.

Women in entrepreneurship have two characteristics: women and business owners. Furthermore, female business owners possess the following features which includes: adaptability (Kilby, 1968), innovativeness (Schumpeter, 1935; Drucker, 1985), strength and resilience (Annenkova, 2001; Omeje, et al, 2020; Sajuyigbe et al., 2021), the aptitude to contemplate, motivate quick, and withstand some business shocks (Mayoux, 2001), and managerial skills as well as accountability and risk taking (Thompson,

2002). Research conducted in numerous advanced countries and some African nations offers evidence that female entrepreneurs play a crucial role in driving productivity and economic advancements. As outlined by Brusha and Cooper (2012) and Ifelunini et al. (2018), one of the business clusters worldwide with the fastest growth is female-owned businesses, which contribute considerably to innovation, job opportunities, and wealth production across a variety of nations. It is argued that women's entrepreneurship over the past ten years has grown tremendously as the proportion of females in companies has risen, driving productivity growth and sustainable economic development in both advanced and developing countries.

In Nigeria, over 50% of the population is female, and women own 30% of all registered enterprises (Adetoyin, 2021). Among working adult females, 4 out of 10 are involved in early-stage entrepreneurship, taking responsibility for around 47%, compared with 39% among their male counterparts (Nasimiyu, 2019). Female-owned enterprises are naturally innovative, creating economic value and meeting family needs; women contribute to the sustenance of families and the economies of their individual communities (Gusua, 1998; Omeje et al., 2022). According to the SMEDAN (2017) survey, there has been a steady rise in the number of female entrepreneurs in Nigeria, with more of them operating micro, small, and medium-sized enterprises (MSMEs) than their male counterparts. Female-owned businesses in Nigeria rely on loans from other sources, such as banks, which poses an additional challenge to their growth.

To further buttress the existence and number of female-owned enterprises in Nigeria, the World Bank Enterprise Survey (2014) confirms the percentage of firms owned by females within the period under survey. For instance, among the 409 women-led firms that took the survey, about 25 firms, representing 6% of the total, reported that they do not know whether they are owned by females or males. Again, only 7 firms, representing 2% of all women-led firms, reported not being owned by females. 27 firms, representing 7% of all women-led firms, reported being jointly owned by males and females. In comparison, 350 firms representing 85% of all women-led firms reported being solely owned by female individuals. Hence, female ownership of businesses is on the low ebb. However, there are instances where no information (i.e., missing data) is available for the records of businesses owned by women in the dataset.

Female-owned business contributions to productivity growth cannot be overemphasised. This has been confirmed by several studies (Tiwari & Goel, 2017; Ugwu & Omeje, 2021; Shamaki et al., 2022). Female-owned businesses contribute to economic growth by creating jobs, generating wealth, reducing poverty, and promoting sustainable development. Female-owned enterprises create employment opportunities and foster social development in Nigeria, thereby increasing national output to help reduce poverty and promote productivity growth across the entire economy. For example, the contributions of female-owned enterprises to output levels have helped increase productivity growth in the Nigerian economy, as noted by the World Bank Enterprise Survey (2014).

In the survey conducted, World Bank enterprise survey(2014) for Nigeria reports that the percentage distribution of enterprises' level of production for the year 2014 was only 4% for those that do not know (don't know) whether their main product was sold either at the local level or at the international level markets. However, 69% of these enterprises sold their main products locally, i.e., in the local market, indicating a strong focus on domestic markets. Again, 26% of enterprises in the sampled data reported selling their main products at the national level, indicating that a significant portion of firms' products are sold nationwide and suggesting a broader reach within Nigeria. Further, at the international level, only a few enterprises, representing 1% of firms, sell their products in the international market, indicating a smaller presence in global markets by these establishments. In the context of female-owned enterprises, this data suggests that these businesses' outputs play a vital role in driving productivity growth in Nigeria's economy.

In Nigeria, therefore, female-owned businesses are vital because they generate revenue and create jobs (Obodoechi et al., 2022; Awosika & Ndidi, 2023). Despite their potential, female entrepreneurs still encounter obstacles, such as inequality or discrimination in firm ownership, constraints of being a female top manager, educational constraints, and other forms of discrimination based on gender. Thus, creating policies that promote gender equality and economic prosperity requires an understanding of these businesses' characteristics. The study of female-owned enterprises and productivity growth in Nigeria is driven by the goal of reducing gender inequalities in entrepreneurship and showcasing their contribution to the country's economic advancement.

The purpose of this study is to ascertain whether female-owned enterprises have a significant impact on productivity growth in Nigeria and to determine how the educational levels of female entrepreneurs affect Nigeria's productivity growth.

This study varies from previous studies by using World Bank Nigeria firm-level enterprise survey data and a Two-stage Least Squares regression model to simultaneously examine whether there is a significant impact of female-owned enterprises on productivity growth in Nigeria, and determine, as well, how the educational levels of female entrepreneurs affect productivity growth of Nigeria's economy. This study therefore contributes to the literature and/or extends the existing literature on enterprise ownership by gender and productivity growth in Nigeria.

The first part of this study introduces the study, as seen in subsection one. The remaining part of this study is organised as follows: subsection 2 presents the theoretical literature; subsection 3 reviews the literature; subsection 4 covers methodology and data; subsection 5 presents the results and discussion; and subsection 6 presents the conclusion and policy recommendations.

## **2. Theoretical Framework**

In this research, the theoretical framework examined and/or reviewed is gender and development theory, total factor productivity theory, and the Solow-Swan growth model. These theories are briefly explained below:

### ***2.1 Gender and Development Theory***

This theory originated in the 1980s as a substitute for the Women in Development (WID) approach. The Gender and Development hypothesis called into question Women in Development's emphasis on women as an important target population and untapped development resources. The theory was heavily influenced by scholars such as Oakley (1972) and Rubin (1975), who argued that men's and women's relationships are systematically subordinated. In addition, economists such as Beneria and Sen (1981) examined colonialism's influence on gender disparities and development.

The theory links reproduction relations and considers all aspects of women's lives, filling the vacuum left by modernisation theorists, since it is rooted in communist feminism (Jaquette, 1982). Gender and Development theory is a concept that focuses on the social structure of

gender roles and relationships, the impact of class disparities on development, and the importance of confronting conventions and differences between men and women (Zosuls et al., 2011; MacArthur et al., 2022). It aims to ensure that both men and women in an economy participate in and gain equally from development, with a focus on benefits and control in any organisation (Zosuls et al., 2011; Resurrección, 2024). This idea signalled a shift in thinking about the need to understand how the social acts that both define and characterise those creations have a strong reinforcement effect (Beneria & Sen, 1981; Zosuls et al., 2011; MacArthur et al., 2022; Resurrección, 2024).

### **2.2 Total Factor Productivity Theory**

Robert Solow, a Nobel Prize-winning economist, developed the Total Factor Productivity theory in the 1950s to capture the cumulative impact of technological advances, innovation, management improvements, and other factors that increase economic productivity (Bannaga & Lezar, 2024). This idea was based on calculations from Solow's work on the invention of the Solow Residual concept (Zaman, 2024). Solow (1957) believed that Total Factor Productivity (TFP) played an important role in explaining and predicting growth because it examines the fraction of output that cannot be determined from the amount of inputs used to produce goods. Its value indicates how proficient/efficient, and fierce the inputs are used in production.

The proportion of the entire output (GDP) to the overall input is used to estimate total factor productivity (Rakhimjanovich, 2025). Based on some oversimplifying presumptions about production technology, total factor productivity (TFP) growth represents the fraction of output growth that cannot be attributed to increases in labour and capital inputs, which are conventionally measured in production (Simwanza, 2025). Oftentimes, the mean labour and capital contributions are measured in an orderly manner, with labour taking 0.7 and capital taking 0.3 as their weighting factors, and these are further divided by output to determine total factor productivity (Bannaga & Lezar, 2024; Rakhimjanovich, 2025). This theory used multifactor productivity as a proxy measure developed to account for multiple factors, but not all of them.

### **2.3 Growth Model of Solow-Swan**

This particular model is commonly known as the Solow (1956) model, and it was designed to study national output in connection to factors such as population growth, savings,

investments, capital, depreciation, and technical advancement (Solow, 1956; Swan, 1956; Aibinu et al., 2025). The Harrod-Domar model, which was limited by the supposition that only capital contributes to growth, was expanded upon by this model (Solow, 1956; Swan, 1956). The Solow model enhanced the Harrod-Domar model by including labour as a factor of production and capital-output ratios (Ferrara, 2025).

This model assumed, among other things, perfect competition, full employment, decreasing marginal returns in capital and labour use, a production function return to scale that is constant and/or homogenous, but considered as being exogenous because it includes variables or parameters whose value is determined outside the model (Caraballo-Cueto, 2025). Also, the Solow model is geared towards understanding sustained economic growth, illustrating the equilibrium point at which investment and depreciation stabilise over time due to technological advancement, and determining the capital-to-labour ratio for a country (Webb, 2024). All these were recorded in economic articles published by these scholars around that time (Webb, 2024; Caraballo-Cueto, 2025; Ferrara, 2025).

## **3. Literature Review**

Urama et al. (2022) examined how women's labour force participation influences economic progress in Sub-Saharan Africa. It also examined Israel's initiatives to empower women and increase their labour-force participation, and how these efforts have helped drive economic growth. Through the application of the two-step GMM technique on panel data of 35 SSA nations from 1990 to 2017, with all data coming from WDI for 2018, it was revealed that a positive association exist among investment, contribution rate of females in the labour force, and economic progress in Sub-Saharan African nations, as well as a negative correlation between regional growth and fertility rates. The researchers recommended that each country's government establish a policy framework to promote and support greater female participation in Sub-Saharan Africa.

Schröde et al. (2021) examined the factors that influence the success and long-term viability of female entrepreneurs, as well as their broader impact on Taiwan's economic expansion. To analyse this, the researchers used data from the FEI, that is, the "Female Entrepreneurship Index," and the Global Entrepreneurship Monitor (GEM), which included 1098 observations of Taiwanese women aged 18 to 64, as well as 117 interviews. A logistic regression method

was used to evaluate the relationship between multiple parameters and female entrepreneurs' business success. The data found that female entrepreneurs' success in Taiwan was substantially associated with their fear of failure and their personal networks, but not with their level of education. They proposed integrating additional criteria to improve the model's accuracy, and comparing Taiwan with other regions will provide intriguing insights into this study.

Obodoechi et al. (2022) studied how social inclusion could impact female-owned businesses in Nigeria. The study employed survey data from 2011 to 2017 from the World Bank's Global Findex database, excluding a few northern states that account for 7% of Nigeria's total population. The analysis method of choice was the logistic regression method of estimation. The study's conclusions indicate that several factors, including the number of women-owned enterprises in Nigeria, were favourably and significantly affected by the proportion of female account owners, rural financial intermediary accounts, startup business grants or loans, and rural and urban household sizes. The recommendations made were for the government of a given nation to create increased feasible funding or credit facilities that target female businesspersons in both urban and rural areas in order to encourage these businesses' growth in the country.

Onoshakpor et al. (2022) conducted an investigation to decipher the consequences of the gendered entrepreneurship environment for business success. The study examined the social reality in which entrepreneurship was performed using an interpretivist paradigm. Ten Nigerian business owners—five men and five women—who had hired as many as fifty people during their three years in operation provided qualitative data for analysis. The results show that structural support is clearly present and that societal norms around gender affect the funding process for entrepreneurship. We can better understand what it means to be entrepreneurial in practice through this social perspective on entrepreneurship. Although authorities and financial institutions may provide financial support in a "one size fits all" manner, gender affects the nature of entrepreneurial activity, particularly in patriarchal nations.

Diaka and Asenge (2019) and Shamaki et al. (2022) independently evaluated the effects of microfinance loans, savings services, and training on businesses owned by females. A questionnaire was used to collect data from 68 owners in Makurdi metropolis, using a survey design with a

census sample. The study used simple percentages, mean, and standard deviation to present the data, and regression analysis to evaluate hypotheses. Notably, the study found that microfinance loan services, savings services, and training had a significant positive impact on the effectiveness of enterprises owned by females in Benue State. In conclusion, the study emphasises the significant impact of microfinance bank services on the overall effectiveness of firms owned by females within the State metropolis. The study suggested that microfinance banks provide low-interest loans to female entrepreneurs in Benue State to help increase the development of enterprises and enhance their standard of living.

Ariguzo et al. (2018) and Sddiqui et al. (2023) studied how tactics influence the success of female-owned micro, small, and medium-sized firms. It examined a wide range of theoretical and empirical literature to investigate the linkages and impacts associated with MSMEs' strategy and success. The study collected primary data by administering validated questionnaires to 56 female-owned businesses in the Ikenne LGA, Ogun State, Nigeria, using a purposive sampling method. To demonstrate how tactics influence business success, a hierarchical regression analysis was conducted in conjunction with defined multiple regression models. The findings suggested that information transmission and novelty were critical in promoting business enterprises. Furthermore, the duration of the business was discovered to moderate the association between strategies and success in female-owned businesses. Based on their findings, the researchers advocated knowledge transfers and entrenched novelty to help MSMEs succeed in different areas and maintain the lifespan of their businesses.

Ogundana (2022) conducted a study to identify and prioritise the difficulties faced by female-owned companies in Sub-Saharan Africa. This information is critical for properly planning and allocating resources to promote the expansion of women-owned enterprises in SSA. The analysis is based on secondary data acquired from World Bank enterprise surveys done in 40 Sub-Saharan African nations. Between 2006 and 2018, 2341 female business owners were polled, and the results were examined using exploratory data analysis. The findings found that the primary barrier to businesses owned by females in SSA is inadequate access to funding, followed by challenges such as insufficient energy, informal sector practices, tax-related concerns, and political instability. The study added its quota to the the existing body of literaton gender-driven

entrepreneurship byough ranking the barriers faced by female-owned by businesses the in the developing region of SSA. This study proposes that female entrepreneurs adopt innovative approaches to overcome constraints rather than waiting for external aid, which often fails to materialise.

Nwokocha (2022) explored how geography influences the efficiency of small and medium-sized businesses owned by women. Using purposive random sampling, 58 WSMEs were selected from 1,366 SMEs across five manufacturing sub-sectors listed in the research area's industrial directory. A combination of surveys and already published data was utilised. Data was analysed using the standard deviation, simple mean, and principal component analysis (PCA). The data shows that the location has 41.10% and 29.14% significant contributions to WSMEs, with a comparative improvement in enterprise production, while 14.59% saw no change in performance. The PCA results indicated economic variables, infrastructure, economies of scale, individual interests, and public policy as key factors in WSMEs' location selection in the study. Based on this study, the researcher recommended that female entrepreneurs consider location and locational variables before establishing their businesses to fully understand the factors that may influence their businesses' performance, either positively or negatively.

Awosika and Ndidi (2023) conducted a study to evaluate how strategic product innovation affects the businesses of women-owned SMEs in the Port Harcourt area of Nigeria. The study used a descriptive approach and targeted a population of 200 SMEs owned by females residing in the Port Harcourt locality, with a sample of 100 drawn via stratified random sampling. Survey data were used, and Pearson correlation analysis was employed in conjunction with linear multiple OLS regression to assess the relationship between SME success and strategic product innovation. The results showed that these female-based SMEs' production in Port Harcourt is positively and significantly impacted by strategic product innovation. The null hypothesis was rejected, indicating a strong correlation between strategic product innovation and the performance of SMEs. They advised SMEs to allocate funds for in-depth market research and the analysis of customer needs and preferences.

Tiwari and Goel (2017) explored the factors driving the growth of female-driven enterprises in India. The study employed a survey approach using a common questionnaire and was conducted in five large cities, with a sample size of

373. Data was evaluated using multiple regression, and various criteria emerged as predictors of women entrepreneurs' success. The outcome of this study suggests that female enterprises do not credit their success to government assistance. The study proposed modifying the government's role to make occupational segregation reduction more effective and fruitful.

Ekwochi (2020) studied Nigerian SMEs to evaluate the motivational characteristics of female businesspersons, concentrating on rural entrepreneurships of women in the South-east states of the country. The study employed stratified and simple random sampling to examine 376 female entrepreneurs out of 6,281 working in five industries. The data was examined using fundamental statistical methods, including descriptive indicators. The study found that both personal characteristics and enterprise-related variables influence women entrepreneurs' performance in SMEs. Economic constraints, such as a lack of land, restricted financial access, fierce competition, insufficient training opportunities, limited technological access and raw materials, have been identified as important performance indicators of female SMEs' entrepreneurial characteristics. It then recommended that a fund be formed for female entrepreneurs with government assistance, and that these women improve their skills.

Etim (2020) analysed how female entrepreneurs in less developed nations, such as Nigeria, may strategically utilise social media to overcome business obstacles. It utilised a survey approach with 73 people who responded to the questionnaires. Using SPSS, the acquired data were descriptively examined, and a regression-based model was also employed. Findings suggested that using "social media" can assist in mitigating gender stereotyping and overcoming problems such as work-life balance, limited mobility, family responsibilities, and relationships, eventually improving corporate operations and long-term sustainability. The research recommended that the government and other stakeholders implement measures that increase the country's competitiveness by boosting Nigeria's e-readiness rankings.

Habiba et al. (2022) and Olaleye et al. (2023) conducted a study to evaluate how digital technology influences customer satisfaction in female-owned enterprises in the Federal Capital Territory (FCT) and northern Nigeria. Using standardised closed-ended questionnaires, 113 registered female-owned firms were surveyed to collect primary data. The study examined digital technology features, including

digital transformation, digital direction, and digital capacity, and utilised multiple regression to analyse their impact on consumer happiness. The study concludes that female-owned enterprises should embrace and leverage digital technology to enhance business performance, gain strategic competitive advantage, and contribute to economic development. They recommended prioritising the adoption and adaptation of new technology to enhance business results.

Ademola (2016) and Ogbonne et al. (2021) analysed the effects of financial management techniques and non-institutional factors on the success of female business owners in Oyo State, Nigeria. The study looked at how certain social conditions and the use of ICT affect how well women run their businesses. To investigate a sample population of 348 female entrepreneurs, this study used a straightforward stratified random sampling technique. An analysis of the correlation between personality traits, social networks, informal savings, and entrepreneurial performance was conducted using Spearman's rank correlation analysis. Based on data analysis, the study's conclusions suggest that effective financial management techniques and non-institutional components are essential for micro-entrepreneurial success. Furthermore, the study proposed that women entrepreneurs should implement policies that enhance their financial management skills, such as keeping account records and conducting trade feasibility assessments, to help them stay focused.

None of the reviewed literature examined whether female-owned enterprises have a significant impact on productivity growth in Nigeria, and/or how the educational levels of female entrepreneurs affect Nigeria's productivity growth. Most of these studies employed descriptive statistics while analysing their data, which is either individually collected survey data that is limited in scope or time series data. This study, therefore, varies from these previous studies by using World Bank Nigeria firm-level enterprise survey data (which is a nationally represented survey data) and applies the Two-stage Least Squares regression model to simultaneously examine the study's objective. Thus, the research questions that easily come to mind are: (i) Is there a significant impact of female-owned enterprises on productivity growth in Nigeria? (ii) how does entrepreneurs' educational levels of females affect productivity growth of Nigeria's economy?

The hypotheses of the study therefore include:

**H<sub>01</sub>:** There is no significant impact of female-owned enterprises on productivity growth in Nigeria.

**H<sub>02</sub>:** Entrepreneurs' educational levels of females do not significantly affect the productivity growth of Nigeria's economy.

## 4. Data and Methods

### 4.1 Data

The adopted data for this research are cross-sectional data from the World Bank's most recent enterprise surveys for Nigeria. This is a survey data conducted to generate relevant information among enterprises in Nigeria, and it collected information of these firms located in various States (i.e. all 36 States and FCT) in Nigeria. One advantage of utilising this national data is that it includes all the variables needed to conduct this research.

### 4.2 Model Specifications

In a bid to empirically examine female-owned enterprises and productivity growth in Nigeria using firm-level data, this study employed total factor productivity as its theoretical framework. Total factor productivity theory measures the proportion of overall output to total input. Assuming simplified production technology as a whole, the portion of production growth that cannot be ascribed to the expansion of conventional inputs like labour and capital is represented by productivity growth. Total factor productivity is used to evaluate an organisation's operational efficiency by dividing its output by the weighted average of its inputs. This theory is based on the concept of Solow residual, which is monumental as it points to multiple social factors such as labour inputs, human capital, and physical capital regarding economic growth. These identified factors are important to capture the role of productivity growth in economic analysis.

In line with this theory, productivity is a function of firms' ownership structure (for this study, female-owned enterprises) as specified in the following equation:

$$ltp_{i,j} = f(pfem_{i,j}) \quad (1)$$

where;

$ltp_{i,j}$  = log of total factor productivity (a proxy for productivity growth) of firms (i), by females (j)

$pfemf_{i,j}$  = % of the firms (i) owned by females (j) (a proxy for female owned enterprises)

f = functional notation

However, other variables can also affect the productivity growth of female-owned enterprises, such as the educational level and years of experience of top managers, and the percentage of firms owned by females.

We could modify equation 1 with the inclusion of the control variables and respecify it in a functional form as specified in equation 2, seen below:

$$lftp_{i,j} = f(pfemf_{i,j}, tmgf_{i,j}, tmgedu_{i,j}, tmgyr_{i,j}) \quad (2)$$

Where the variables are as defined as given in Table 1 below:

Furthermore, this study specifies the empirical, econometric model based on the Two-Stage Least Squares (2SLS) regression technique to address endogeneity issues. Hence, the study needs instruments that are correlated with female owned enterprises but not directly with productivity growth.

Therefore, in the first stage, the study regresses female owned enterprises on the instruments and control variables (e.g.,  $tmgf_{i,j}$ ,  $tmgedu_{i,j}$ , and  $tmgyr_{i,j}$  as shown in equation (3) below:

$$lftp_{i,j} = \beta_0 + \beta_1 tmgf_{i,j} + \beta_2 tmgedu_{i,j} + \beta_3 tmgyr_{i,j} + \mu \quad (3)$$

where  $\mu$  = error term. All other variables remained as defined above in Table 1.

In the second stage, the study uses the predicted values of female-owned enterprises from the first stage to estimate the productivity growth equation specified as shown in equation (4) below:

$$lftp_{i,j} = \lambda_0 + \theta_1 \widehat{pfemf}_{i,j} + \varepsilon \quad (4)$$

where;  $\widehat{pfemf}_{i,j}$  = % = the predicted values from the first stage.  $\lambda_0$  = the intercept term,  $\theta_0$  = the coefficients, while  $lftp_{i,j}$  = remained as defined above in Table 1.

The justification for the use of 2SLS is the suspicion that there exists an endogeneity issue among the variables of the model. This is because the study suspects that the independent variables may be affected by the explained variable, which, as a result, may lead to simultaneous relationships. For instance, the productivity of female-owned enterprises may influence and/or may be influenced by diverse inputs like investment and even management practices. Again, 2SLS can also be applied when there is suspicion of omitted variable bias. For example, this occurs any time an independent variable that has a correlation with both the explained variable and one or more explanatory variables is omitted or not included in the model, hence leading to biased estimates. In these conditions, the 2SLS is employed to correct for these biases by adopting an instrumental variable approach. Through the 2SLS approach employed, the study would obtain consistent estimates of the impact of female owned enterprises on productivity growth in Nigeria. The use of instruments ensures that the study mitigates issues related to endogeneity, allowing for a clearer understanding of the relationship between female-owned enterprises and productivity growth in Nigeria.

### 5. Results

First, this research examined the characteristics of the model's variables using descriptive statistics. The descriptive indicators output shown in Table 2 displays the original level forms of the data used for this model. Therefore, given the information regarding the type and

**Table 1. Variable Names and Definitions**

Variables Name	Definitions
lftp	log of “total factor productivity” (employed to proxy for productivity growth) of firms (i), by females (j)
pfemf	% of the firm (i) owned by females (j) = b4a
tmgf	Dummy variable assuming the value of 1 = yes when the top manager of firm (i), who is a female (j), and 0 = no, otherwise = b7a
tmgedu	dummy variable representing educational level of top managers of firms (i), who are females (j), which assumes the value of 1 for vocational education, 2 for primary education, 3 for secondary education, 4 for university, 5 for graduate and master's, and 0 for no formal education = ngb7
tmgyr	years of experience of top managers of firms (i), by females (j) = b7

**Source:** Data from World Bank's most recent enterprise surveys for Nigeria and Researcher's Construct

model's variables properties, the variables are assessed to check whether there exist sufficient variable value changes through close observation of their “mean, standard deviation, and minimum and maximum values” (Omeje et al., 2020) of these identified variables as seen below in Table 2.

From Table 2, the variables in the model exhibit adequate disparities in their “mean, standard deviations, and the minimum and maximum values” respectively, which is in line with the finding by Omeje et al. (2020). The output results from this study show that there are 2676 observations, which means there are no missing observations from the data set.

**5.1 Endogeneity Confirmation**

The study first examined whether there is any endogeneity among the model variables. The study employed the Durbin (score) Chi2 and the Wu-Hausman F-test for this purpose. The decision rule is that if the Durbin (score) chi2(1) and the Wu-Hausman F(1, 2675) are significant, reject H<sub>0</sub>: variables are exogenous, and accept H<sub>1</sub>: the alternative hypothesis, that there is an endogeneity issue, hence supporting the adoption of the 2SLS method of estimation. The reverse becomes the case where the Durbin (score) chi2(1) and the Wu-Hausman F(1, 2675) are insignificant. The results of the endogeneity test are presented in Table 3.

Table 3 indicates that both the Durbin (score) chi2(1) and the Wu-Hausman F(1, 2675) are significant. The study therefore rejects H<sub>0</sub>: variables are exogenous, and accept H<sub>1</sub>: the alternative hypothesis, that there is endogeneity issue, hence supporting the adoption of 2SLS method of estimation. In other words, since the null hypothesis is rejected, it implies that the endogenous regressors' influence on the estimates is meaningful and/or significant, thus requiring the adoption of the 2SLS instrumental variables approach.

**5.2 The Model Results**

In this sub-section, this research presents the model results (which estimated a 2-Stage Least Square model) adopted in order to determine the objectives of this study (which include; to ascertain whether there is significant impact of female-owned enterprises on productivity growth in Nigeria and also, to examine whether educational level of female top managers significantly influence productivity growth in Nigeria). In order to achieve these objectives, this study adopted data obtained from the World Bank Nigeria enterprise surveys for 2014, and applied an econometric regression model based on the Two-stage least squares regression technique. The result from the regression analysis is presented in Table 4 below:

**Table 2. Descriptive Statistics Result**

Variable	Obs	Mean	Std. Dev.	Min	Max
lftfp	2,676	-4.81073	3.09648	1.304861	13.479467
pfemf	2,676	79.35821	37.35684	1	100
tmgf	2,676	1.788084	1.058975	1	2
tmgedu	2,676	4.953243	3.089645	1	11
tmgyr	2,676	11.49717	10.14002	1	72

Source: Authors constructed with STATA 17 Statistical Software from available data

**Table 3. Endogeneity Tests**

Tests of endogeneity	Decisions/Results
H <sub>0</sub> :	Variables are exogenous
H <sub>1</sub> :	Variables have endogeneity issue
Durbin (score) chi2(1)	= 8.91256 (p = 0.0182)
Wu-Hausman F(1, 2,675)	= 9.21047 (p = 0.0191)

Source: Authors constructed with STATA 17 Statistical Software from available data

**Table 4. 2SLS Regression result**

lftp	Coeff.	Std. error	Z	p>z
pfemf	51.8022	16.12213	3.21	0.002
tmgf:				
Yes	4.1368	2.8490	1.45	0.146
tmgedu:				
Vocational	-1.5526	3.2393	-0.48	0.632
Primary	8.4410	2.9289	2.88	0.004
Secondary	6.8542	2.8642	2.39	0.017
University	5.3470	2.8459	1.88	0.060
Postgraduate	5.8724	3.1288	1.88	0.061
tmgyr	0.0265	0.0577	0.46	0.646
_cons	-11.3900	2.2847	-4.99	0.000
R squared		0.4409		
Wald chi2(8)		37.2		
prob>Wald chi2(8)		0.0000		

Source: Authors' computation using STATA 17 Statistical Software from available data

### 5.3 Discussions

Table 4 reveals that the percentage of the firm owned by females (pfemf) significantly encourages productivity by 51.8022%. This result is expected, as the higher the percentage of females and/or women who own businesses, the more productive they tend to be, thereby encouraging overall productivity growth. This finding is in line with the findings by Urama et al. (2022), Obodoechi et al. (2022), and Ugwu and Omeje (2021), who found that female participation in entrepreneurial activities encourages enterprise productivity and economic growth of countries as a whole.

The results from Table 4 again show that a top manager being female would, on average, have a positive impact on productivity growth (lftp) in Nigeria by about 4.1368% on average. However, this impact on productivity growth is insignificant as the probability value of 0.146 exceeds 0.05. This suggests that female top managers are better at improving the performance of factors of production relative to their male counterparts, and female top managers tend to treat the organisation as a family by encouraging each employee to be the best they can. Hence, the continued practice of the patriarchal system in various organisations in the country may also be a contributing factor, encouraging the insignificant nature of growth in productivity of the enterprises owned by women. This finding agrees with the

study by Diaka and Asenge (2019), Shamaki et al. (2022), and Onoshakpor et al. (2022).

Again, from this study, it was found that if top managers undergo formal education (other than vocational education), there is a positive impact on productivity growth; however, for vocational education, there is a negative impact, relative to when top managers say they do not know. The impact of the education of female top managers on productivity growth in Nigeria has no significant impact except for primary and secondary (at 5% level of significance), university, and postgraduate education of female top managers, which have both positive and significant impacts on the productivity growth at least at 10% level of significance. This implies that the educational level of female top managers helps them see the bigger picture and manage people and the organisation better. The higher a female top manager develops herself more in terms of education, the higher her productivity. However, in Nigeria, not all women who own businesses are given opportunities to gain these heights in education and not much importance is given to vocational education. This is why the different level of education of female top manager impact positively on productivity growth of firms, that of female top managers possessing vocational education has insignificant and reverse impact on productivity growth with respect to Nigeria. These findings align with the study by Habiba et al. (2022), Olaleye et al. (2023), Sddiqui et al.

(2023), and Ogundana (2022), among others.

Furthermore, this research finds that the years of experience of top managers gained from working in this particular sector bring about an increase in productivity growth, although insignificant. This is an unexpected result as it is expected that the more experienced managers are, the better they would do their job and raise productivity in the country. However, this result may hold because less experienced managers who are aware of their weaknesses are usually more accommodating, and when people feel that they have responsibility, they are more likely to be productive. This finding is in consonance with the findings of Urama et al. (2022), Obodoechi et al. (2022), and Nwokocha (2022).

Accounting for other variables not included in the model and holding other variables constant, the results of this research indicate that this variable has a decreasing but significant impact on productivity growth in Nigeria.

#### **5.4 Theoretical and Practical Implications**

This study's results not only validate the existing economic theories on factor productivity but also offer practical advice for assisting Nigerian women entrepreneurs. The study highlighted the significance of both theoretical and practical applications in increasing productivity through gender parity in business ownership. Hence, the government should offer firms with high percentages of female ownership specialised tax incentives or subsidies to help boost their investment and productivity. Again, there is a need for government initiatives aimed at enhancing educational access for females at all levels, implementing management training programs for female entrepreneurs, and encouraging firms to promote females to top management positions.

#### **6. Conclusion and Policy Recommendations**

This study evaluated the impact of female-owned enterprises on productivity growth in Nigeria, utilising survey data from the World Bank Enterprise Surveys for its analysis. This research employed the Two-stage least square regression technique for its econometric analysis with the introduction of an instrumental variable as the issue of endogeneity was suspected. After all tests were accounted for, the study finds that female-owned enterprises have a positive and significant impact on productivity growth in Nigeria. In line with the second objective, this study reveals that primary, secondary, university, and up to postgraduate levels of education of female top managers have a significant and positive impact on productivity growth in

Nigeria, whereas vocational education has an insignificant negative impact on productivity growth in Nigeria. Based on these empirical findings, the following policies were recommended for implementation:

1. The main policy recommendation from this research work is that policymakers should create an enabling environment for female top managers. Irrespective of the positive but insignificant impact of female-owned enterprises on productivity growth, there is an urgent need for the government to create or implement supportive policies and initiatives aimed at removing barriers and biases that hinder women's advancement into managerial roles. These policies can provide financial assistance, training and mentorship programs specifically designed to empower women in leadership positions. The government's role in providing all these is crucial to harnessing female entrepreneurs' potential, as it contributes to productivity growth.
2. The level of education of top managers has shown to be a key aspect to increase productivity growth in enterprises. The government should increase investment in education at all levels, with particular focus on primary and secondary education, as this would boost productivity growth in enterprises owned by women.
3. The government should provide scholarships, grants, or loan programs specifically targeted at women so as to encourage more women to pursue higher education. The government's initiative aims to support women in pursuing advanced education, as the knowledge they acquire can be applied in organisations to enhance productivity growth.
4. In order to address the negative impact of vocational education on productivity growth in Nigeria, there is a need for the government to help in formulating and implementing policies that promote quality vocational training programs for females. These policies are curriculum adjustments, industry partnerships for practical training opportunities, and efforts to de-stigmatise vocational education as a viable career path.
5. This study found that years of experience for top managers have a negative, but statistically insignificant impact on the productivity growth of female-owned enterprises in Nigeria. To address this, the government can invest in capacity-building programs. These programs would enhance the managerial skills and competencies of top managers in female-owned enterprises. By focusing on areas such as strategic planning, innovation, and market

analysis, these programs can compensate for a lack of experience. Additionally, the government can provide platforms that encourage knowledge sharing and collaboration among female entrepreneurs and managers. Experienced managers can mentor and share insights with those who have less experience in a particular sector, further contributing to the overall productivity growth of female-owned enterprises.

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# Digitalisation in Social Enterprises: A Mixed-Method Examination of Critical Success Factors in Indian Start-ups

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## A b s t r a c t

Social entrepreneurs are a crucial segment of the economy, as they bring a much broader set of dynamics from the unorganised sector. However, they often face resource constraints and unsystematic business models. In this context, digitisation has the potential to systematise how business is done and to address resource constraints. Such digitisation adds to the professional enhancement of the organisation where the system is implemented. Owing to these factors, and to keep pace with rapidly changing technologies, social enterprises undertake various digitisation projects. Based on a case study and a mixed-methods approach, this paper empirically analyses the factors affecting the implementation of a digitisation process in a social entrepreneurial start-up. A pool of 175 surveyed stakeholders from different SMEs responded. Overall, responses from 62 different SME organisations were finally collected and used for analysis. The findings reveal that factors about the management and environmental competitiveness of the implementation, the start-up's readiness to adopt the system, the competency of the implementation team, and the user-friendliness of the software package significantly impact the implementation outcome in a social entrepreneurial setup. Based on these factors and the Technology-Organisation-Environment (TOE) theory by Tornatsky et al., this study proposes an integrated framework for achieving successful digitisation process implementation in a social entrepreneurial setting. The findings of this study reinforce the issues and challenges reported by previous researchers. Based upon the three primary facets of success of digital project implementation, namely Adaptation of Processes, Knowledge Integration (KI), and User Engagement in processes (UE), we have proposed an integrated theoretical framework for a successful outcome from a digital project implementation. This integrated framework considers the dynamic interaction among various characteristics of digital project implementation and maps them to these three success factors. This provides theoretical insights and practical guidance to a social entrepreneur. The findings also influence the achievement of SDG 8 (Decent work and economic growth) in the context of a social entrepreneurial enterprise.

**Keywords:** *Digitisation, Organisation Readiness, Enterprise Systems, Social entrepreneurship.*

## 1. Introduction

Digitisation has become an imperative for businesses, including small and medium-sized enterprises (SMEs). Integration of business processes through an enterprise system is commonly attempted to achieve end-to-end integration of all the functional domains of the business. As a start-up grows and volume increases, digitisation initiatives, such as enterprise systems, help with competition and business process reengineering (Al-Mashari et al., 2003; Mirza et al., 2024; Trivedi et al., 2018). Such digital systems implementation has been reported to facilitate the growth trajectory in the start-up entrepreneurial sector by unifying core business processes (Alsughayer, 2024).

Globally, enterprises have implemented digital and enterprise systems with a structured, reliable information technology (IT) infrastructure. A study by International Data Corporation (IDC)<sup>1</sup> reveals that large organisations have greater awareness of enterprise systems than mid- and small-sized enterprises. The SME sector holds significant potential in a developing economy due to its employment and income-generating potential. IT vendors have responded to this potential by offering customised solutions at a lower price (Shelly et al., 2020; Basu et al., 2011). India's small enterprise sector is on a productive trajectory. As per Forbes statistics, the sector contains as many as 63 million units employing around 36 million people as of 2024<sup>2</sup>. On the policy front, India has been promoting digitalisation in businesses through various initiatives. UDYAM and Digital India are two of such policy-level initiatives that have been hugely successful in India. Digital India is a flagship program launched on July 1, 2015, to transform India into a digitally empowered society and knowledge economy. It focuses on three main pillars: making digital infrastructure available to every citizen, providing governance and services on demand, and empowering citizens through digital literacy. UDYAM is a government registration system for MSMEs in India. It is a simplified, online process that allows businesses to register using their Aadhaar number to obtain an official certificate and a unique Udyam Registration Number (URN). This registration helps enterprises access a wide range of government schemes, subsidies, and benefits, including easier access to credit and lower loan interest rates.

Despite this, high failure rates and implementation delays are major concerns in the sector (Martins & Belfo, 2023; Bajwa et al., 2004). Consequently, organisations cannot reap the potential benefits of implementing such systems. As a result, the research focus has shifted towards identifying causes and issues related to the the successful and sustainable implementation of digital applications, such as enterprise systems, in the context of SMEs (Pérez Estébanez, 2024; Hasanah et al., 2024). The primary objective of this paper is to identify and analyse such causes, especially among the small enterprises.

Owing to the liberalisation and globalisation of the economy, organisations are increasingly required to implement digital applications to achieve business sustainability amid high competitiveness (Shih & Montes, 2022; Kumar Pandey & Kumar, 2023). An elaborate study of the Indian SME sector reveals that they have uniform aspirations from their digitisation initiatives. However, a significant finding in this context is that smaller organisations are not organizationally ready to accept changes. As a result, their motivation to adopt enterprise systems is quite low (Ahmad et al., 2014; Mohammed et al., 2023). Existing research indicates that businesses are highly focused on technological aspects when considering implementing digital projects. However, little effort or focus is devoted to complex organisational issues (Wainwright & Waring, 2004). It has also been seen that SME stakeholders influence the customisation of digital projects and enterprise system solutions to a large extent (Upadhyay et al., 2011; Hustad & Stensholt, 2023).

Implementing a digitisation project in social enterprises can be quite challenging but also highly rewarding. One of the critical goals of any social entrepreneur is to achieve sustainability in all the ESG parameters (Tombolesi, 2023). In other words, a social entrepreneur will not only need to be environmentally sustainable but also to have socially responsible governance. In the backdrop of the above, this study attempts to address the following research question (RQ):

RQ: What factor(s) affect digitisation project implementation outcome in a social enterprise?

The findings of this study reveal that factors pertaining to the management and environmental competitiveness of the implementation, the start-up's readiness to adopt the system, the competency level of the implementation team, and the user-friendliness of the software package significantly

1. <https://www.idc.com>

2. Nikita Tambe, Aashika Jain, "MSME Statistics and Trends", Forbes, Feb 6, 2024, <https://www.forbes.com/advisor/in/business/msme-statistics/>

impact the implementation outcome in the context of a social entrepreneur. Based on these four factors and the Technology-Organisation-Environment (TOE) theory, this study also proposes an integrated framework for achieving success in implementing a digitisation process in a social entrepreneurial setting. The findings and the proposed framework provide theoretical insights and practical guidance to a social entrepreneur for successfully implementing a digitisation process. The findings from this study also influence the achievement of SDG 8 (Decent work and economic growth) in the context of a social entrepreneurial enterprise. The integrated framework developed in this study for the successful implementation of a digitisation project in a social enterprise is the first of its kind. Another significant finding of this study is the role of organisational readiness. Analysing the role of organisational factors in the implementation of digitisation processes has not been adequately reported in published literature.

The study has been structured and presented as follows: Section 2 gives a detailed literature review of issues concerning digitisation project implementation in SMEs; Section 3 presents the research methodology; Section 4 presents the analysis of the data and results obtained; Section 5 presents a detailed discussion on the results vis-à-vis other existing research and presents theoretical, societal and managerial implications; Section 6 concludes the paper and discusses limitations and future directions of research.

## 2. Literature Review

Thematically, research focusing on the digitalisation of businesses can be classified into the following categories:

### 2.1 SME Digital Adoption

Implementation issues of digitisation projects and enterprise systems have been studied from a variety of aspects (Bingi et al., 1999; Fissaha, 2024). Alaskari et al. (2021) reported the role of knowledge management, while Ali et al. (2023) reported that technical and functional roles are centred on knowledge integration activities. Ghafoor et al. (2021) identified that the organisation's socio-technical, structural, and relational factors influence knowledge integration activities in digital project implementation. Pandey et al. (2024) discuss the significance of digitalisation for India's SMEs, addressing the hurdles and the methods to remove them. Raihan (2024) provides an extensive review of the digitisation of SMEs in relation to

sustainability. Malhotra and Mishra (2023) explore how digital platform service providers may assist SMEs in their transformation and competitiveness. Kumar et al. (2024) assess how digital technologies like Industry 4.0 strengthen the social performance of SMEs in the manufacturing sectors

### 2.2 Enterprise Systems Implementation

The organisational impact of implementing enterprise systems (Mahar et al., 2020) and the probability dynamics of successful implementation of such systems have been reported in the published literature (Chao & Chandra, 2012). Santos and Martinho (2021) and Krithika et al. (2020) have analysed the dynamics of extending the business into e-commerce following the implementation of an ERP. Achieving digitisation through ERP implementation has also been used by entrepreneurs to achieve economic sustainability. In such a digital organisation, the interplay between digital competency and creativity becomes crucial for practitioners to achieve operational efficiency directed towards economic benefits (Isac et al., 2024).

### 2.3 Challenges of Social Entrepreneurship

Micro, small, and medium-scale enterprises (MSMEs) and social enterprises are characterised by the unstructured nature of their operations, resulting in poor visibility into business processes and frequent disruptions. Hence, building resilience is another facet that social entrepreneurs need to focus on. Resilience can be achieved through enhanced capability and co-innovation. These facets are delivered to small and medium enterprises (SMEs) through big data analytics (Ciasullo et al., 2022). Implementing digital projects in an SME also leads the entrepreneur into the path of digital transformation. Such a transformation has three dimensions via technological, human capital and organisational/relational (Romero & Mammadov, 2024). Enterprise systems invariably take longer implementation time and require higher costs. As a result, SMEs are found to be deficient both in resource front as well as motivation front for implementing such systems. However, lured by the sheer magnitude of the SME sector in developing countries like India, vendors are flocking to the market with simpler and cheaper solutions. Pre-configured systems based on the best practices are now made available at a fraction of the original cost. Even though these offerings are made by vendors, a consensual agreement on the effectiveness of such systems is hard to find. Such a scenario raises several

questions. Are the informational needs of start-ups and small enterprises different from those of larger companies? What are the linkages between organisational change and enterprise system adoption in companies of different sizes and volumes? Is it possible to find a set of critical factors for a successful digital project implementation that considers the peculiar organisational dynamics of SMEs?

#### **2.4 The Technology-Organisation-Environment (TOE) Framework**

The Technology-Organisation-Environment (TOE) Framework (Tornatsky & Fleischer, 1990) is considered one of the most valuable and popular frameworks for research on the implementation of digitisation projects (Li et al., 2010), as it combines the firm's internal and external factors with technological factors that may influence the adoption of technological innovation. It is a meta-framework that has been applied differently across studies. Organisations that embark on digitisation may need to rework business processes and other alignments to meet the technological requirements of digitisation to reap the maximum benefits from digital applications (Li et al., 2010). Besides the technological factors, an examination of an organisation's internal resources and capabilities and the organisation's external environment is also important, as the growth of technologies can be hindered by an immature infrastructure and a lack of support from industries and government. Keeping the above in mind, this study believes that the TOE framework is an appropriate framework for studying the implementation of digitisation projects in startup social enterprises.

#### **2.5 Digital Project Implementation and SMEs**

In India, 'micro, small and medium enterprises' (MSME) is a generic term used to describe small-scale industrial (SSI) units and medium-scale industrial units. As per the Union Budget 2025, the classification of MSMEs is shown in Table 1. The contribution of the SME sector towards the GDP of India is around 30% as of 2024. This sector contributes significantly to employment generation, as per the Government of India.

**Table 1. SME categorization in India**

<b>SME category</b>	<b>Investment limit</b>	<b>Turnover limit</b>
Micro	₹ 2.5 crore	₹ 10 crore
Small	₹ 25 crore	₹ 100 crore
Medium	₹ 125 crore	₹ 500 crore

Support from top management, proper business process reengineering, consultants, competent team, employee training and morale have been reported as critical for a successful enterprise system implementation (Gable & Stewart, 2000). As per Tran and Nguyen (2024), the influence of enterprise systems implementation on the quality of accounting information in Vietnamese SMEs. Alsughayer ((2024) reported that SMEs in Saudi Arabia and opined that technology, the organisational structure, and the operating environment are crucial for a successful digital enterprise project implementation. Jafari et al. (2006), in their study of Malaysian companies, identified different success factors for implementing enterprise systems, among which the significant factors are managerial support, clarity of goals, effective communication, project management efficiency, business process engineering, and integrity and accuracy of data.

Upadhyay and Dan (2010) and Basu et al. (2011) reported factors such as managerial support, clarity of goals, competency of users, scope and scalability, expertise of the the team, and operational efficiency as significant for a successful implementation of an enterprise system. Noudoostbeni et al. (2009) studied Malaysian SMEs and opined that proper team composition and effective user training are essential for successful implementation of a digital enterprise system. Zach and Munkvold (2012), in their study on SMEs in the the Czech Republic, opine that the degree of customisation necessary is crucial for successful implementation. Doom et al. (2010) studied Belgian SMEs and reported that the external consultant's role and involvement have been found to be an important factor. Chao and Chandra (2012) studied family-run businesses and opine that the impact of owners' knowledge of IT and their subsequent strategic alignment is crucial for successful digital enterprise system implementation.

A study by Mohammed et al. (2023) on cloud-based systems empirically establishes digital adoption factors across four facets – Technological, Environmental, Organisational, and Human. Alsharari (2022) explored the contingent factors for the adoption of cloud computing in public sector enterprises in the the UAE. Enterprise systems, when implemented in an organisation, drive digital transformation. Hence, a digital transformation policy is needed to successfully guide the enterprise. Such digital transformation is usually seen in three stages: creating the ecosystem, fostering feedback within the ecosystem, and attracting foreign stakeholders (Font-Cot et al., 2023).

Digital enterprise system implementation essentially introduces process changes within the organisation. Hence, the organisation's various stakeholders must adapt to these process changes. While studying the critical success factors of digital system implementation, Ogedengbe and Idolor (2023) identified process adaptation as one of the factors affecting ERP implementation success. In the context of cloud-based digital project implementation, Bitkowska et al. (2023) identified process adaptation to be a facilitating factor.

Based on the discussion above, an integrated framework as illustrated in Figure 1

### 3. Materials and Methods

A mixed-method approach has been adopted as the research methodology for this study to get insight into the implementation issues faced by social entrepreneurial startups. In the first phase, case studies of social entrepreneurial start-ups from Northeast India were analysed, followed by phase 2, in which a primary survey-based empirical analysis of the factors was undertaken. The survey instrument was derived based on case study analysis and issues leading to the implementation of digitisation projects compiled from existing published literature. The issues were discussed with subject matter experts, executives, and strategic stakeholders among small

entrepreneurs to fine-tune the survey instrument and establish its validity.

#### 3.1 Phase 1: Case study of a social entrepreneur from North-East India

Mr Wangshu was among India's first kiwi wine brewers and a social entrepreneur from the Northeastern part of India. He worked as an engineer for the state government before returning to his hometown to help the people of the valley. The region was considered one of the most backwards and remote locations in the country. People in the region lack access to proper training, resulting in limited employment opportunities. The region had ideal climatic conditions for kiwi fruit cultivation, but due to a lack of knowledge and training, local people could not exploit this advantage. Mr Wangshu felt that something could be done with kiwi fruit to generate employment and income. So, he quit a prestigious government job to pursue the potential of his village for exotic winemaking from locally grown, succulent Kiwis.

After two years of deliberation, the decision to establish a winery was made. The winery became a reality after overcoming numerous hurdles, and production began. Within one year, he launched organic kiwi wine. For the wine, Wangshu only uses fruit from his own orchard and the yield from local fruit growers who formed a cooperative society. The winery provided full-time employment to

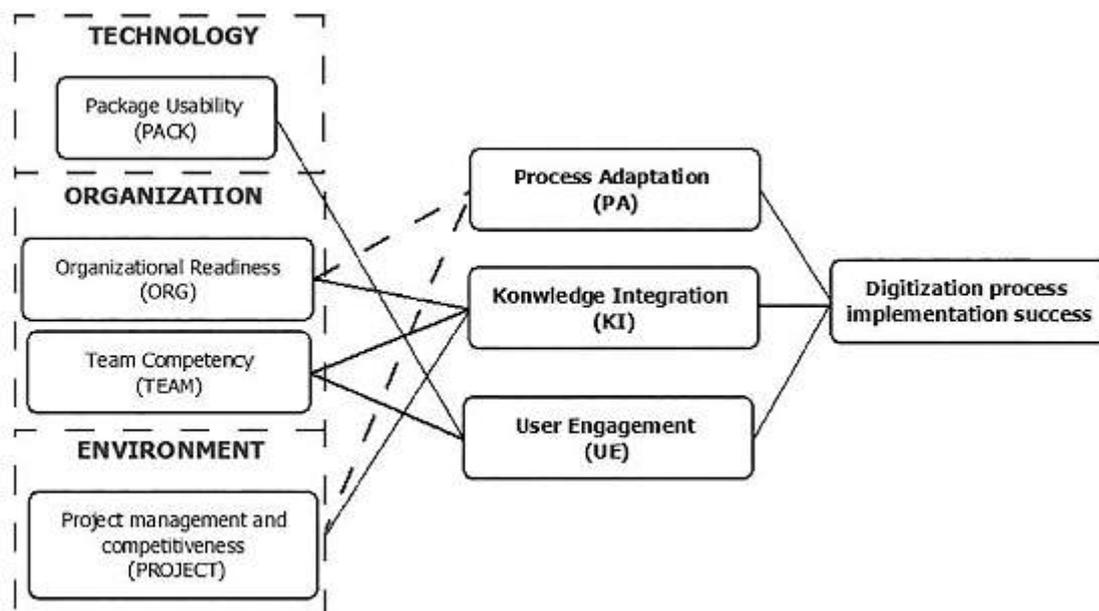


Figure 1. Integrated Framework for ERP Implementation Success

several local people. Training was initiated at the production unit to train several local people to meet the gap in trained labour.

As expansion was underway, Mr Wangshu found it difficult to control operations and functionality. As a result, he proceeded with implementing the ERP system for his firm. The newness that ERP brought to the way business is done excited his employees and team. However, his employees' ignorance of how digital processes work hindered the proper implementation of the enterprise system. Before the implementation of the ERP, the level of adhocism in performing various business processes was quite high. For example, the day-to-day accounting was handled by any available employee. However, ERP required a designated accounts officer for Mr Wangshu's firm.

The ERP package Mr Wangshu implemented was ranked higher in the market for usability. Other clients who used the package found the interfaces quite user-friendly. However, in the case of Mr. Wangshu, his employees found it difficult to catch hold of the dynamics and navigation of the user interfaces. This was primarily because his employees were villagers who were experts in wine making but deficient in handling digital systems.

All the above factors led to a situation in which Mr Wangshu found it difficult to achieve seamless operational excellence in his business. This led him to consider whether to proceed with the ERP package implementation.

### 3.2 Phase 2: Primary Survey

A primary survey was conducted among Indian start-ups and small entrepreneurs who have implemented enterprise systems in their organisations. The responses were empirically analysed and validated using various statistical tools. A postal questionnaire was used as a survey tool. The questionnaire sought to gauge respondents' perceptions of the criticality of the various issues that contributed to the successful implementation of a digital enterprise system. These issues were initially listed through a literature survey.

The manufacturing sector accounted for 44% of the respondents. The education sector accounted for 10%, while healthcare accounted for 8% each. Most respondents had high levels of education. About 87% had a college degree. They had championed around 20 subordinates each. The respondents had around 8 years of work experience in their current job profile. The respondents came from organisations employing about 300 people. A total of 175 people responded to the survey. Overall, responses from 62 different organisations were finally collected and used for analysis. To minimise the effect of researchers' bias, the authors deliberately chose not to be present when the survey was carried out. This was achieved by resorting to postal questionnaires being sent to the surveyed population.

### 4. Data Analysis and Results

The data obtained from the primary survey were empirically tested using appropriate statistical software. The survey

Table 2

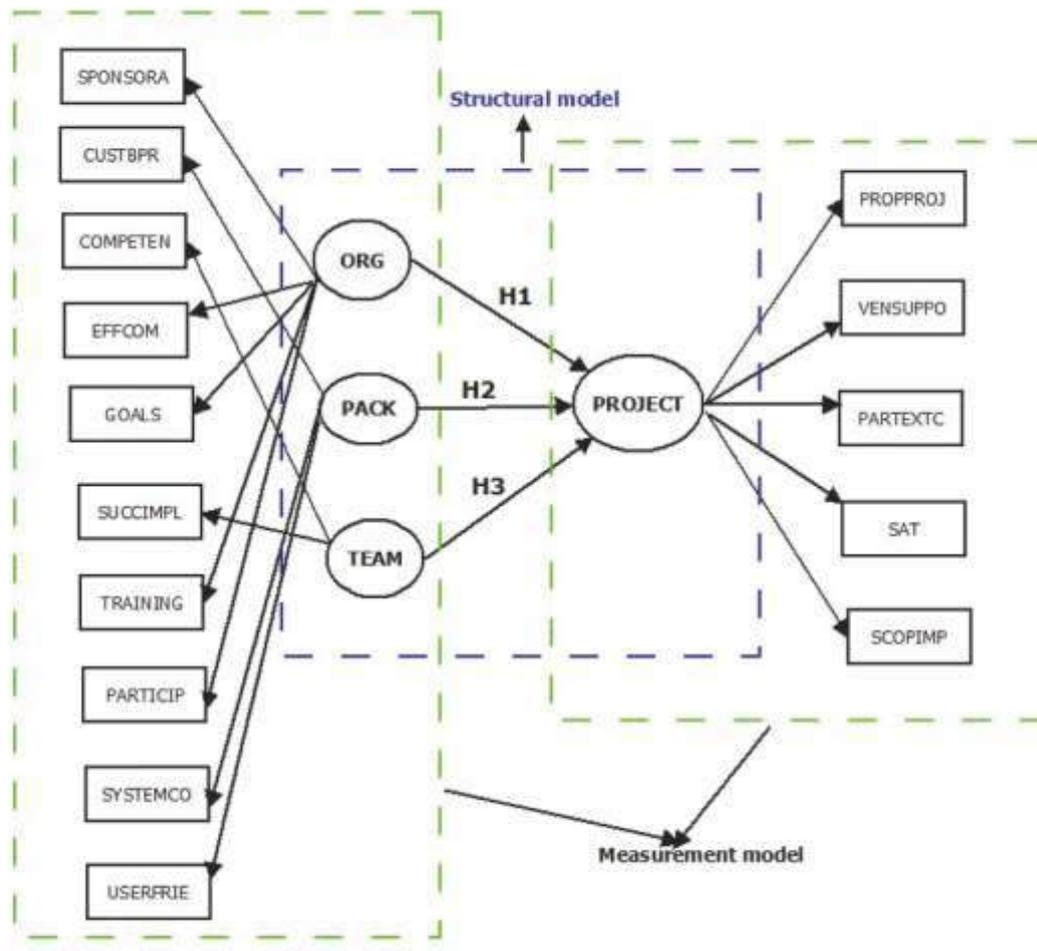
Factor #1	Factor #2	Factor #3	Factor #4
Authority Champion's Project (PROPPROJ)	Authority sponsors project (SPONSORA)	Project team competency (COMPETEN)	Business Process Reengineering (CUSTBPR)
Post implementation support by vendor (VENSUPP)	Effectiveness of team level communication (EFFCOM)	Experience of project implementation (SUCCIMP)	Technological compatibility (SYSTEMCO)
Level of participation by external consultant (PARTEXTC)	Clarity of goals (GOALS)		Ease of use by users (USERFRIE)
Scalability of features (SAT)	User training (TRAINING)		
Adequacy of the scope of implementation (SCOPEIMP)	User involvement (PARTICIP)		
<b>Factor name:</b> Project management and competitiveness (PROJECT)	<b>Factor Name:</b> Organizational Readiness (ORG)	<b>Factor name:</b> Team Competency (TEAM)	<b>Factor name:</b> Package Usability (PACK)

instrument was based on case analysis, and the extant literature review had a set of 15 items. Factor analysis was performed on the captured data using the appropriate software package. The Principal Component Analysis (PCA) technique was used to determine the optimal number of factors that accounted for the maximum variance in the respondent data (Tharwat, 2016). PCA is a technique that helps reduce the dimensionality of observed variables by combining highly correlated variables (Greenacre et al., 2022). According to Hyuncheol (2013), factors having an eigenvalue of 1 or more can be considered to significantly contribute to the variance in the original data. Using this standard, our factor analysis yielded four factors that are most crucial to the successful implementation of an

enterprise system in an SME. These factors are Project Management and Execution, Organisational Readiness, Team Competency and Package Usability. The related items are shown in Table 2 below.

**4.1 Model Formulation and Analysis**

The causality among the constituent factors would affect the level of success of digital project implementation. Hence, analysing the causality among these factors becomes pertinent here. Of the four factors, PROJECT is the one that directly determines the success or failure of project implementation. As such, we develop the conceptual model as given in Figure 2.



**Figure 2. Conceptual model (Developed by authors)**

Based upon the conceptual model, we formulate the following set of hypotheses.

- H1:** ORG positively influences PROJECT
- H2:** PACK positively influences PROJECT
- H3:** TEAM positively influences PROJECT

Structural Equation Modelling (SEM) techniques are used to analyse and evaluate the conceptual model and to

understand the causal relationships among the identified factors. IBM's AMOS software was used to perform the SEM analysis. Figure 3 shows the output of the analysis in the form of a path diagram with factor loadings. A path diagram is a combination of a measurement model and a structural model. The measurement model gives the relationships between the observed variables and their corresponding latent factor.

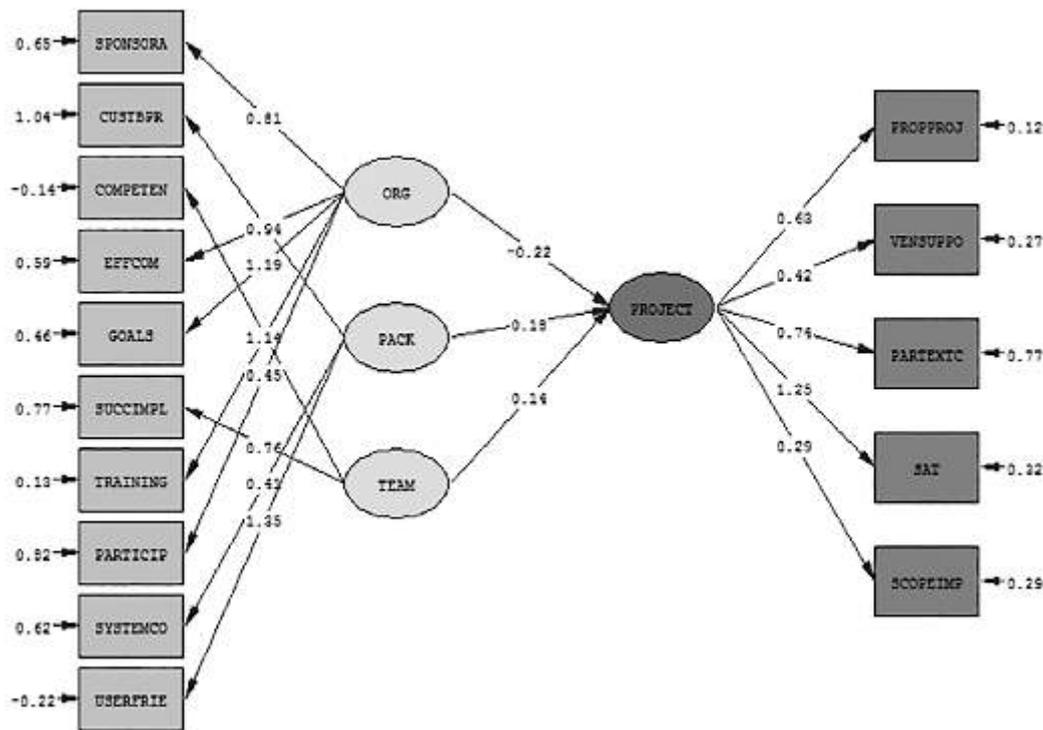


Figure 3. Conceptual model with loadings (SEM output)

The detailed loadings of the manifest variables on the latent variables are given in Table 4 below.

Table 4. Detailed loadings of manifest variables on latent variables

Factor #1	Loading	Factor #2	Loading	Factor #3	Loading	Factor #4	Loading
Proper Project Management (PROPPROJ)	0.12	Higher Authority being Project sponsor (SPONSORA)	.81	Competency of the Project Execution Team (COMPETEN)	1.14	Level of Customization and BPR (CUSTBPR)	0.94

Factor #1	Loading	Factor #2	Loading	Factor #3	Loading	Factor #4	Loading
Proper Project Management (PROPPROJ)	0.12	Higher Authority being Project sponsor (SPONSORA)	.81	Competency of the Project Execution Team (COMPETEN)	1.14	Level of Customization and BPR (CUSTBPR)	0.94
Vendor Support After Implementation (VENSUPPO)	0.27	Effective Communication amongst Team Members (EFFCOM)	0.94	Successful Project Implementation Experience (SUCCIMPL)	0.76	User Friendliness (USERFRIE)	1.35
Significant Participation by External Consultant (PARTEXTC)	0.77	Clearly defined Goals and Objectives (GOALS)	1.19			Suitability of software chosen (SYSTEMCO)	0.41
Satisfactory Composition and Leadership (SAT)	0.32	Training requirement for the Users (TRAINING)	1.14				
Adequate Scope for Implementation (SCOPIMP)	0.29	Participation and Involvement of the Users (PARTICIP)	.45				
<b>Factor name:</b> Project management (PROJECT)		<b>Factor Name:</b> Organizational Climate (ORG)		<b>Factor name:</b> Team Competency (TEAM)		<b>Factor name:</b> Package Competence (PACK)	

All latent factors in the path model have exhibited reliability indices (Cronbach's alphas) above 0.7, as shown in Table 3 below. Hence, we went ahead with the hypothesis testing based on the loadings.

**Table 3. Reliability index (Cronbach alpha) for factors**

Factors	Reliability
PROJECT	0.72
ORG	0.85
TEAM	0.80
PACK	0.70

The structural model provides the causal relationships among the identified factors. Based upon the loadings of the structural model, the set of hypotheses is analysed as follows.

**H1:** This is tested with the loading ORG -> PROJECT. The loading of -0.22 indicates that ORG moderately and inversely affects PROJECT.

**H2:** This is tested with the loading PACK->PROJECT. The loading of 0.18 indicates that PACK moderately and positively affects PROJECT.

**H3:** This is tested with the loading TEAM->PROJECT. This loading of 0.14 indicates that TEAM moderately and positively affects PROJECT.

From this, we can infer that Organisational Readiness (ORG) acts as an inhibitor, while Team Competency (TEAM) and Package Usability (PACK) act as enhancers during the implementation of enterprise systems for small and medium enterprises.

## 5. Discussion

Social entrepreneurs are organisational entities that pursue the goal of producing societal values alongside commercial values (Cagarman et al., 2020). Building social entrepreneurship is a long-term investment. It requires a myriad of support systems to maintain balance and diversity in the environment in which it operates (Darwish & Van Dyk, 2018). An evolving solution to the problems of disintegration in business processes is to embark on a journey of digitisation and the phased implementation of an enterprise system. Apart from this, a myriad of operational and organisational challenges a social entrepreneur faces are discussed in the subsequent section.

**Challenges of a social entrepreneur:** The entrepreneur is considered the main catalyst in the process of

institutionalising the business (Wahid & Sein, 2013). However, as a social entrepreneur realises this process of institutionalisation, they face various challenges, which can be alleviated through the implementation of digitalised business platforms, such as enterprise systems. Making informed decisions based on well-managed data is one of the challenges of a social entrepreneur. Information tracking is crucial for social entrepreneurs to maintain trust with donors and stakeholders. Social entrepreneurs need to concentrate on their core competencies. However, operational dynamics often bog them down with administrative engagements. Social entrepreneurs are often in a state of flux, continually expanding and changing. Such changes increase operational complexity over time. Compliance and reporting are areas where a social entrepreneur always needs support. This is because effective compliance requires professional reporting. Social entrepreneurs are usually found deficient in such professionalism.

**Digital systems for social entrepreneurs:** The above challenges can be effectively tackled by implementing a digital enterprise system. Such systems integrate functions such as finance, HR, inventory, and customer relations into a single system. This integrated approach helps an organisation to manage data efficiently and make informed decisions. The integrated approach of an enterprise system helps a social entrepreneur to track, audit, and manage business data, information, and transactions. This is essential to building trust among donors and stakeholders. This allows social entrepreneurs to focus on their core competencies rather than getting tied up in administrative tasks. Such systems are scalable in nature and cater to the changing needs of the social entrepreneur. Digital enterprise systems bring about professionalism in reporting. This helps a social entrepreneur meet compliance requirements efficiently.

The role of the four factors identified from our survey to ensure the successful outcome of digital project implementation is substantiated in our case study as follows:

*Project management and competitiveness (PROJECT):* Social entrepreneurs are informal, and the work culture depends on tacit communication among the employees. As in the case of the winery of our social entrepreneur, the formalisation of tacit knowledge results in the systematisation of the enterprise's operational aspects. This, in turn, contributes towards the successful management and execution of enterprise systems being implemented.

*Organisational Readiness (ORG)*: When tacit knowledge is captured and embedded in an enterprise's processes, it makes the organisation ready to embrace development and growth needs in a systemic manner. This is a very interesting finding in the context of the study and holds significance for small and medium enterprises, including entrepreneurial ventures. It has been found that any decision regarding enterprise system implementation is made by the top management and owners (in the case of SMEs and entrepreneurial start-ups). Thus, the approach is more top-down, with little consultation with other stakeholders within the organisation at any level. This proved counterproductive, as employees feared job loss, leading to a negative work environment that tended to impede the implementation process.

*Team competency (TEAM)*: The success of the winery of the social entrepreneur, in our case, depends on employees' commitment to the winemaking cause. Wine making is a collaborative approach. This establishes that teamwork and the group competencies of the wine makers lead to a greater likelihood of success in the efforts of social entrepreneurs.

*Package Usability (PACK)*: In Mr. Wangshu's winery, the user friendliness of the ERP package played an important role in success of the implementation. This factor of user-friendliness depends on employees' expertise in digital processes and media. Here, due to inadequate employee exposure to digital processes and tools, its implementation was taking a back seat at the winery. This establishes that software usability plays a major role in the success of enterprise system implementation in a social enterprise.

### 5.1 Theoretical Implications

Existing research has supported the factors identified in this study as crucial to the success of digital project implementation. For achieving desired results, the scope of implementation should be managed properly. It is also important to maintain a proper audit trail of schedules and budgets against the targets set (Sarferaz, 2024; Aggarwal et al., 2021).

The findings of this study reinforce the issues and challenges reported by previous researchers. A positive outcome of the implementation of digitisation projects, such as a digital project, is determined by the dynamic interaction among Organisational Readiness, Project Management and competitiveness, Team Competency, and Package Usability, mediated by three key mechanisms: process adaptation, knowledge integration, and user engagement.

The success of digital project implementation has three primary facets:

**Adaptation of Processes (PA)** – This indicates how well the organisation adapts to the changes that digitisation ushers in. The degree of adaptation depends on how ready the organisation is for the new process regime (ORG) and on the efficiency of the management of the digital project implementation process (PM). This substantiates the role of PA in digital enterprise system implementation as identified by Bitkowska et al. (2023)<sup>3</sup>

**Knowledge Integration (KI)** – The digital project necessitates integrating functional knowledge across the whole organisation (ORG) and at the level of the project implementation team (PM and TEAM). This substantiates the findings of Ali et al. (2023) and Ghafoor et al. (2021) as discussed earlier in the literature review section.

**User Engagement in processes (UE)** – The success of any digital project implementation also depends on the level of engagement users have with the new system. This engagement depends on how usable the digital system package (PACK) is and on the level of systemic competency the implementation team (TEAM) possesses. This very well substantiates the opinions of Noudoostbeni et al. (2009) as discussed in the literature review section above.

Based on these, an integrated theoretical framework for achieving a successful outcome in digital project implementation has been proposed, as illustrated in Figure 1. In this theoretical framework, the following variables and relationships exist.

#### Variables

Independent variables: ORG, TEAM, PROJECT, PACK

Mediating variables: PA, KI and UE

Dependent variables: ERP implementation success

#### Relationships

R1:  $ORG \times PROJECT \rightarrow PA$

R2:  $ORG \times PROJECT \times TEAM \rightarrow KI$

R3:  $TEAM \times PACK \rightarrow UE$

R4:  $PA \times KI \times UE \rightarrow$  Digitization Project Implementation Success

Interestingly, from our analysis and findings, ORG inversely affects PROJECT. Thus, in the relationship R1, the participation of ORG and PROJECT can be considered as complementary to one another. In other words, the greater

3. Please refer to the literature review section

the participation of ORG in PA, the lower the participation of PROJECT and vice versa. This suggests that digital project implementation success is multiplicative rather than additive. Weakness in any of the independent variables can have a cascading negative effect on the dependent variable.

Project Management and Execution are crucial components of any Information System (IS) project. However, the operational requirements of a digital enterprise system differ a lot from those of a traditional IS (Vincent et al., 2001). Thus, methods for gauging the impact of IS implementation will not be directly applicable to an Enterprise system implementation. Existing literature (Tarigan et al., 2020) and (Malik & Khan, 2020) considers project management competencies as crucial for the success of digital system implementation. Social entrepreneurs are generally deficient in such competencies. This is primarily because roles and responsibilities within a social entrepreneur are largely ad hoc and informal. This increases the difficulty of identifying process owners and key users (Davenport, 1998). Such ad hocism can be significantly reduced by organising the enterprise around the interplay between Project Implementation and Execution and the other three factors established in this research, viz.: Organisational Readiness, Team competency and Package Usability. This independence between success factors and their nature of relationship has not been reported in published literature.

### **5.2 Managerial and Societal Implications**

The discussion above provided a comprehensive explanation of how different factors interact to influence digitisation project implementation, offering both theoretical insights and practical guidance for organisations undertaking such implementations. Even though existing literature has analysed factors and indicators affecting the successful implementation of enterprise systems in small and medium enterprises, this is the first time that such an analysis has been directed at social entrepreneurs. This study also establishes empirically that the successful implementation of digital projects in a social entrepreneurial setup is dependent on Organisational Readiness, Team Competency, Package Usability and Project Management and Execution. It is the first time that organisational readiness has been established as a factor of successful digital project implementation.

Social entrepreneurs operating in India also suffer from a lack of organisational culture, which is another crucial

factor for a successful system implementation (Mahar et al., 2020; Mahmood et al., 2020). Such a culture promotes cooperation among managers. However, social entrepreneurs are more functionally oriented than organisationally oriented. This increases internal competition and reduces cooperation among employees and managers. One way to reduce internal competition and enhance cooperation is to prepare the organisation to embrace a work culture and holistic changes. This organisational readiness has been established for the first time by this research.

Often, social entrepreneurs implementing digital systems are seen to suffer from a misfit between the software's characteristics and the organisation's business requirements. There are two approaches that are usually taken in such a scenario. The first approach is adjusting the business processes to fit the software. This approach often leads to the abandonment of established ways of doing business that have been providing a competitive edge to the organisation. This also changes the role-responsibility assignment, which ultimately leads to deterioration of the organisational culture and dynamics. The second process is software customisation. Instead of reengineering the business process to fit the software, this approach customises the software to fit the business process. One of the issues with this approach is that it slows down the implementation process and makes version management of the software difficult (Wijaya et al., 2021; Koh & Simpson, 2007).

A competent team is the *sanctum sanctorum* for the success of digital system implementation. The team must comprise the best personnel available, both from a managerial leadership and an operational excellence perspective (Varajão & Takagi, 2024). The management must proactively take steps to employ the individuals on a regular and full-time basis (Schubert, 2003; Rao, 2000). Probing capabilities is another skill that is desired in the team members of an Enterprise System implementation project. Finally, the selected team must be upskilled by proper training (Bajwa et al., 2004). However, simply having a competent team is not enough for successful digital project implementation. Our research shows that a competent team needs to be complemented by high-quality software.

Managing change requires integrating people, process and technology. The organisational culture should be conducive to bringing such a change management (Somers & Nelson, 2004). This study infers that if organisational readiness is

not handled properly, it could potentially act as an inhibitor during the implementation of a digital project. The research carried out by the authors in this paper is crucial for start-ups and social entrepreneurs who are on the way to adopting digital systems. Implementation of such systems is generally resource and cost-intensive. Hence, SMEs, which are usually starved of resources, cannot afford such implementation to fail. Hence, the vendor community needs to take this situation into account and adopt a customisation approach to implement systems for start-ups and social entrepreneurs.

In addition to the above, any social entrepreneur who is trying to scale up needs a higher degree of organisational formalism. Such formalism can very well be achieved by implementing enterprise systems. However, due to long implementation times and high costs, social entrepreneurs don't want to commit substantial resources to Enterprise System implementation. Levy and Powell (2000) argue that organisational perspectives, such as strategy, expertise, and business culture, rooted in processes, influence the adoption of enterprise systems to a large extent. In fact, due to the high level of competition in today's market, client satisfaction has become another important factor that determines the successful implementation of an Enterprise System in any organisation (Ivetić et al., 2014; Qutaishat et al., 2023). Going forward, such client satisfaction can be achieved by a competent team, coupled with a higher degree of software usability. Client satisfaction, in turn, can offset the noncommittal attitude of social entrepreneurs towards implementing enterprise systems.

Even though vendors are focused on customisation of enterprise systems to fit the needs of the client's business process, implementing such customised versions is complex and expensive (Hansen et al., 2023; Wijaya et al., 2021; Vincent et al., 2001). Indian small entrepreneurs differ from large companies in a host of perspectives. They usually manifest a lack of sophistication in IT management practices. Initiatives leading to information gathering are seen more as individual responsibility rather than teamwork. They also lack adequate resources for information gathering and access to quality, structured information. All these deficiencies result in a lower degree of usability of software, which leads to probable failure of enterprise system implementation. However, as this research establishes, an organisation's readiness towards enterprise systems is dependent upon a higher degree of software usability. The usability of enterprise software is not only a function of how easy it is to use the software, but

also a function of the perception that the users have about the applicability of the software to the business cause. Such perceptions can be enhanced by a competent team operating in an organisation that is ready to embrace changes and sophistication in systems. This research underlines these facets empirically.

A brief comparison of enterprise implementation approaches between conventional SMEs and entrepreneurial startups will reveal more similarities than differences, as social enterprises are essentially MSMEs in nature. But one important highlight is the approach taken by social entrepreneurs, which is more aligned with the approach taken by proprietorship-type businesses. Proper and effective communication with internal stakeholders is necessary, which happens in SMEs but tends to be ignored in the case of social entrepreneurial start-ups.

### SDG implications

The findings from this study influence the achievement of some of the SDGs in an SME. *SDG 8 (Decent work & economic growth)* – Decent work is an element of SDG 8, which calls for the following: Productive employment with fair income and better prospects for personal development and social integration. As discussed above, the factor PROJECT in our proposed framework contributes to the reduction of ad hocism of jobs in an organisation. This eventually leads to security in the workplace and social protection for the employees, as envisaged in SDG 8.

### 6. Conclusion

The dynamics of implementing a digital system in small and medium-sized entrepreneurs have been studied extensively. However, such implementations in social entrepreneurs have not been adequately undertaken. Social entrepreneurs are a crucial segment of the economy as they bring a lot more dynamics from the unorganised sector. However, many times it is seen that such entrepreneurs are constrained by resources and an unorganised way of doing business. Such an organised way of doing business can be established by implementing digital systems. Implementing such a system has many challenges. Such challenges can be offset by making a holistic effort towards system implementation and keeping the organisation ready to embrace culture and change.

Like any other research, our study is also not without its limitations. A larger sample size might bring out perspectives that have not been considered here. Social

entrepreneurs today have the option of cloud technology at hand. The study could further be elaborated by bringing in the nuances of migrating the operational environment of social entrepreneurs to the cloud. In fact, a few entrepreneurs have started migrating to cloud computing environments and gained substantially both on the service and profit fronts. We have empirically established causal relationships among the four core constructs, viz.: ORG, TEAM, PROJECT and PACK. Further research can be carried out to empirically analyse the remaining set of relationships in the integrated framework.

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# Bridging Knowledge and Innovation Gaps by Entrepreneurship: An Inter-Country Analysis of BRICS Nations

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## A b s t r a c t

Entrepreneurship has been the major factor for sustained economic growth, grounded in Schumpeterian ideology of creative destruction and the evolutionary economics framework. This study comparatively evaluates the entrepreneurial ecosystems of BRICS nations through the lens of entrepreneurial ecosystem ideology and neo-endogenous development theory, assessing how entrepreneurship influences innovation, knowledge exchange, and economic modernisation. Using Global Entrepreneurship Monitor data, the study measures entrepreneurial activity through Total Early-Stage Entrepreneurial Activity (TEA) and Established Business Ownership (EBO) rates. A mixed-method approach combining systematic analysis and descriptive statistics is employed to examine ecosystem performance.

Findings reveal that the new era of BRICS reflects not only *constructive destruction* but also *constructive creation*, signalling increased innovation, knowledge generation, and R&D investment. However, BRICS ecosystems remain ideologically fragmented and institutionally suboptimal. Public policy frameworks in Brazil, South Africa, and Russia demonstrate weak alignment with entrepreneurial ecosystem ideology, whereas India and China show comparatively stronger institutional support and innovation-driven growth. The study concludes that BRICS must adopt coherent ideological orientations, enhance policy alignment, and strengthen ecosystem governance to advance entrepreneurial performance and global competitiveness collectively.

**Keywords:** entrepreneurship, innovation, TEA, EBO, knowledge, entrepreneurial ecosystem.

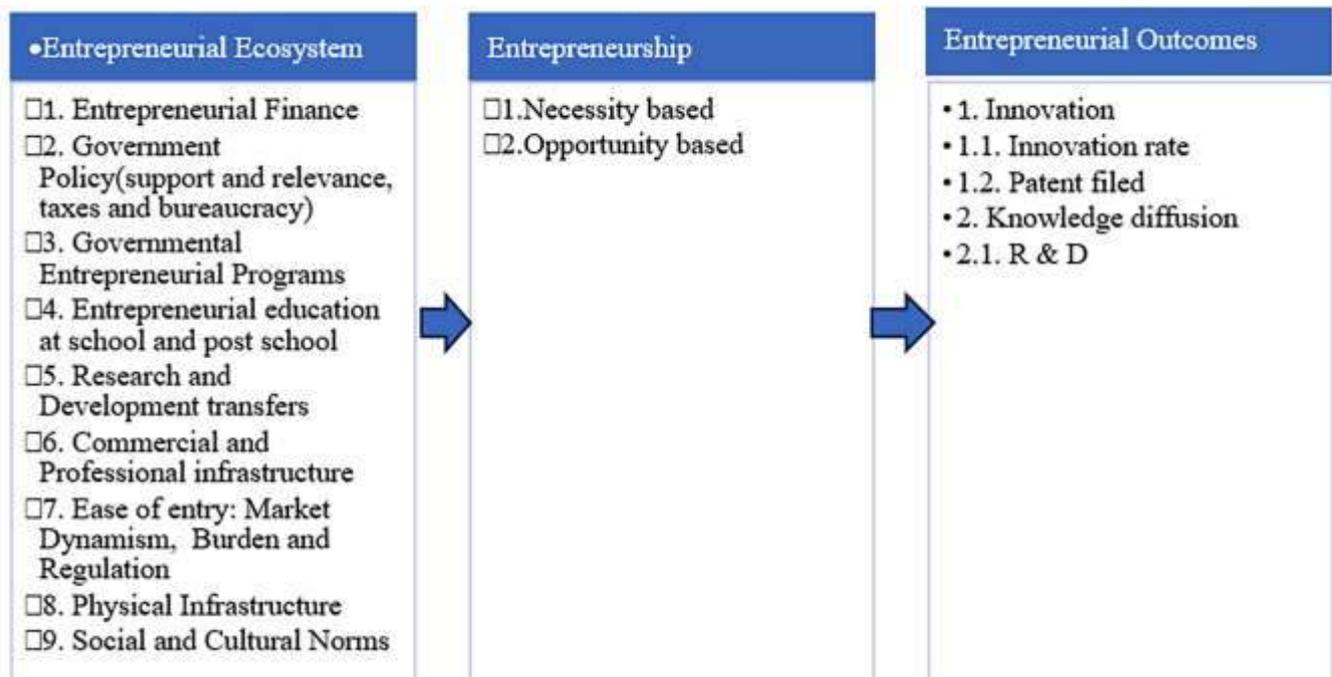
**1. Introduction**

The concept of entrepreneurship was introduced by the Classical economist Alfred Marshall as one of the four factors of production in the early 19<sup>th</sup> century. However, its origins start with French Economist Richard Cantillon, who defined entrepreneurship as "investing in the purchase of goods and materials with the incentive of selling them in the future" (Karayiannis, 2009). As per Schumpeter, entrepreneurship is the exploitation of market opportunity through technical or organisational innovation (Herbert & Link, 1989). According to the Schumpeterian view, entrepreneurs are "agents of creative destruction," those who shift markets from equilibrium to disequilibrium by introducing new products that lead to the obsolescence of existing ones (Schumpeter, 1942). Much profound insight has been gained into the interrelationships among entrepreneurship, innovation, and knowledge, drawing on Schumpeter's work (Clemence, 2009). Considerable advances have been made over the last three decades in understanding the relationship between entrepreneurship and innovation on the one hand and knowledge and entrepreneurship on the other. Entrepreneurship driving

knowledge is frequently seen as a linear process, which has been analysed in the literature through increased expenditure on research and development, narrowed down the knowledge gap in the field of education (Vedantu and Byju's in India, Edu Coder and Geekbang by China, Udemy by the United States, etc.), health, and other technical and non-technical sectors, and escalated the craze of entrepreneurial education in the leading economies of the world. Entrepreneurial education has been adopted by countries worldwide, including China, Indonesia (Wu & Wu, 2017), South Africa, and the USA, as well as the European Union (Ierapetritis, 2017). The shift from Arrow's "Learning by doing" approach to the "Learning by creating" approach with the dawn of entrepreneurship has characterised knowledge as non-excludable. In other words, entrepreneurship is the method for disseminating and improving already known information.

Innovation also begins as the pool of relevant knowledge grows. The rise in patent applications across both rich and developing economies shows that entrepreneurship has accelerated invention. The illustration in Figure 1 helps to clarify this.

**Bridging knowledge and innovation gaps by entrepreneurship: An inter-country analysis of BRICS nations**



Source: Authors' creation

**Figure 1. Framework of entrepreneurship, knowledge and innovation**

The BRICS are a group of developing nations that share the traits of late industrialisation and recent past as underdeveloped economies. As such, it is necessary to explain the creation, consolidation, and involvement of ventures within the BRICS context. Together, these five nations account for 16% of global trade, 41% of global population, and roughly 24% of global GDP (World Bank, 2021). These countries are associated with a shift in global economic power, meaning emerging economies are closing the gap with developed nations and G-7 members. "Many studies have been carried out in developed countries and few in developing countries," claims Ratten (2014). Entrepreneurship is emerging in these transition economies (BRICS). In this context, an attempt has been made to explore the various indicators of the entrepreneurial ecosystem, entrepreneurial activities and their outcomes as economic variables, particularly, knowledge and innovation.

### **1.1 Objectives of the study**

The objectives of this study are as follows:

- I. To assess and compare the performance of BRICS countries in the entrepreneurial ecosystem.
- II. To analyse the trends of entrepreneurial activities in BRICS countries.
- III. To compare innovation rates and public expenditure on Research & Development (R&D) in BRICS nations.

## **2. Literature Review**

In the past, researchers have attempted to comprehend the role that entrepreneurship plays in innovation and knowledge creation across many developing economies, particularly in the BRICS, as well as to make conceptual discoveries more broadly. Entrepreneurship is the key driver for maintaining economic dynamism. The essential factor in maintaining economic dynamism is entrepreneurship. Global competition has accelerated entrepreneurship worldwide, according to a study by Hanush and Grebel. Neo-classical economists have considered technology an exogenous variable, and so entrepreneurs who undertake technology-related work are also treated as exogenous factors. Later on, the endogenous growth model introduced entrepreneurs as an endogenous factor that directly affects productivity. The authors have presented the evolution of the definition of entrepreneurship from the classical era to the new Keynesians and conclude that entrepreneurship has elevated the level of innovation,

and Neo-Schumpeterian economists have asserted that knowledge grows simultaneously with innovation. Prior to the neo-Schumpeterian era, entrepreneurship was defined as the process of engaging in ventures and accumulating and processing the factors of production. They found that, for economic development, a new endogenous factor was identified as an entrepreneur whose activity does not remain limited to combining factors of production but also involves bearing inclusive risks and introducing novelties (Hanush et al., 2007; Grebel, 2007). Entrepreneurship plays a decisive role in generating employment and fuelling consumption. The overview of the works of Schumpeter has been summarised by Sledzik and many others. Starting with unleashing the clear line between invention and innovation, he asserted that the three fundamental principles of invention, namely, risk-taking, error correction, and error administration, etc., are extensively different from innovation. Schumpeter had developed two theories of entrepreneurship. The first theory of entrepreneurship envisages that to maximise human and financial resources around the world to achieve the highest possible growth, the firms must engage in the process of "creative destruction". Whereas the second theory entails that to sustain the achieved growth, the firms try to re-invent and update as per the changing global demand. Though both of these depict that entrepreneurship leads to increasing innovation, the motive of the entrepreneur in both theories is different (Sledzik, 2013; Riley, 2009) (Schumpeter, 2003; Schumpeter, 1942; Swedberg, 1991). Consumption and production are continuous processes, and therefore, there is always a need for entrepreneurship.

The work of Koster and Rai focuses on the different types of entrepreneurial activities undertaken in emerging and developed economies. The two categories of entrepreneurship include opportunity entrepreneurship and necessity entrepreneurship. The study suggests that in emerging economies, entrepreneurship is mostly driven by necessity: a need for employment, a need for livelihood, or a desire to raise the standard of living, which propels people to become entrepreneurs. Whereas in developed economies, the basic economic problems (employment, livelihood, etc.) have been addressed at a primitive stage. So, they go for opportunity entrepreneurship. Opportunity entrepreneurship focuses on unexplored economic niches and within the firm, leading to innovation (Koster & Rai, 2008). Adding to the prior remark (of Koster), Audretsch revealed that Schumpeter has emphasised the opportunistic enterprise that leads to innovation and the development of

the economy. The study further reveals that, as Schumpeter argued, opportunistic entrepreneurship is likely to occur among more mature minds in developed economies (Audretsch, 2007).

To assess the entrepreneurial ecosystem in Brazil, a bibliometric study found that entrepreneurial aspiration, attitude, and skills were very low in the country. The country's entrepreneurial ecosystem performance was quite unsatisfactory, as all indicators scored below 5, indicating an unsatisfactory result (Junior, 2016). An additional work to explore Brazil's entrepreneurial policies, categorised by infrastructural development, start-up-promoting policies, innovation-supporting frameworks, reduced entry and exit barriers, and technological development. The findings of the study suggest that the reframing of public policies in Brazil is needed (Borges et al., 2018). The establishment and continuation of an enterprise also require entrepreneurial education (Lanero et al., 2011). In the past few decades, the inclusion of entrepreneurial education in public policy has also grown in developed economies, because of the belief that it would improve innovation in established firms (Fayolle et al., 2006; Guerra & Grazziotin, 2010). Lima and Lopes conducted an empirical study on this relation in Brazil and found that, despite a high total entrepreneur activity rate (TEA), entrepreneurial education is not compulsory in schools and colleges. Thus, the study summarised that the entrepreneurial education has an adverse impact on student entrepreneurial intentions. However, this low-weighted part of the entrepreneurial ecosystem lowers Brazil's rank in the innovation index.

Russia, as an emerging economy and a member of the BRICS, has long piqued the interest of scholars. The trend in entrepreneurship has been studied quantitatively and qualitatively, and it has been concluded that, despite some demotivating factors, e.g., negative political factors and a negative entrepreneurial environment, entrepreneurial activities are growing gradually (Aidis et al., 2008). Impact of institutional behaviour (Banerjee, 1993), sociological variables, and psychological behaviour, etc., also affect the entrepreneurial activities. These factors' roles were empirically tested in Russia, and findings suggest that the unfavourable institutional structure and sociological behaviour adversely affect the enterprise growth (Djankov et al., 2005). The robust institutional setup and cultural support positively affect the growth of enterprises in Russia (Robinson et al., 2001).

The dominant role of enterprises has been experienced in India, and the challenges and achievements have been

analysed by Santhi. The TEA and EBO rates have been rising over the decades with some fluctuations, and it has been found that the exclusion of entrepreneurial education and the rigidity of labour laws are the obstacles to progress on the one hand. On the flip side, supportive public policies act as milestones in expanding entrepreneurial activities and innovation in the country (Santhi et al., 2011; Bhattacharya, 2011). A similar supporting argument has been found in a comparative study of China and India, which found that institutional rigidity is greater in India than in China. So, the size of private enterprises is smaller in India (Ramesh, 2018). A further study on entrepreneurship in India depicts that the weakening of private entrepreneurship is due to a weak institutional setup (Medhora, 1965). There is an occupational transition in India from job seekers to job creators (Monsen et al., 2012). India adopted the big bang approach during the new economic reforms and has been criticised by some scholars for prioritising private entrepreneurs until 2009 (Subrahmanya, 2015). The Schumpeterian approach to economic growth (Aghion & Howitt, 1997) holds that entrepreneurial dynamism is the key to innovation, knowledge upgradation, and diffusion.

Xu and Li empirically demonstrated, through a panel study of Chinese entrepreneurs conducted between 1985 and 2011, that knowledge exploration through research leads to innovative outcomes. Expenditure on research and development by firms and the government raises the existing knowledge to explore the unexplored parts. The study found a positive correlation between research collaboration and the exploration of new knowledge (Nerkar, 2003). Knowledge networks do exist within the enterprise. Conceptually, R&D has a forward linkage with the progress of enterprises. The works of Fleming, Sorenson, and Nickerson reveal a spillover effect of investment in knowledge that drives an organisation's development. The work of Lucas (1993) and Romer (1986) ensured that the knowledge became associated with externalities and spillovers. Knowledge creation in one firm may 'spill over' into the market due to the commercialisation of a product. The unleashed potential of firms is being experienced through the linkage of scientific and technological knowledge (Fleming & Sorenson, 2004; Nickerson & Zenger, 2004; Powell et al., 1996). A large number of studies indicate that knowledge has forward linkages that enable access to novel ideas (Belderbos et al., 2015; Walsh et al., 2016).

Researchers have studied the relationships among entrepreneurship, innovation, and knowledge at various

times. Gaba and Gaba tried to examine the association between economic growth and entrepreneurship by using TEA and EBO as proxy variables for entrepreneurship. The study was carried out using a panel survey of BRICS countries from 2014 to 2018. The study's findings showed that entrepreneurship is a significant determinant of economic growth (Gaba & Gaba, 2017). Acs added to this finding, claiming that in the short run, entrepreneurial activity may adversely affect economic growth, but has a favourable effect in the long run (Acs, 2010). Linear causality between entrepreneurship and economic growth has been found in the work of Feki and Mnif (2016) (Harbi et al., 2011). China, being the manufacturing hub of the country, has been studied by many scholars. Wei and Zhuan argued that Chinese firms have the capacity to become more innovative after analysing the quantitative and qualitative data on patents in the country. The structural reform can be sustained through incentivising public schemes to encourage entrepreneurship (Wei et al., 2017). The importance of small and medium enterprises in Russia has been studied, and it has been found that due to a lack of managerial skills, unsupportive cultural practices, and macro-economic obstacles, growth has been hindered (Tovstiga et al., 2004; Hmaer et al., 2000).

Scholars have examined various factors contributing to the flourishing of entrepreneurship in an economy, with particular emphasis on the role of government policy and institutional support in South Africa. Davis et al. (2001) and Allen (2019), through extensive literature reviews, note that recognising the importance of entrepreneurship, the South African government has initiated policy reforms aimed at supporting enterprise creation and sustainability. However, empirical evidence suggests that these policy efforts have not fully translated into effective ecosystem outcomes. Anwana (2020) identifies persistent structural constraints, including inadequate infrastructure, weak regional and international networking among firms, rigid entry and exit regulations, and limited access to financial and governmental support. Youth unemployment remains a central challenge, necessitating policy interventions that ease institutional rigidities to promote entrepreneurial activity. Merten (1995) emphasises the role of entrepreneurial education through tertiary institutions in legitimising entrepreneurial careers among students, while Whitehead (1993) highlights gender-specific barriers such as limited training, mobility, information, visibility, and access to credit, which continue to restrict women's entrepreneurial participation. Despite these contributions, a comprehensive understanding of how entrepreneurship

translates into macro-level innovation and knowledge outcomes in South Africa remains limited.

In contrast to the opportunity-driven entrepreneurial models observed in China and India, South Africa's entrepreneurial activity is predominantly necessity-driven, which constrains its ability to effectively bridge knowledge and innovation gaps within the BRICS bloc (Dzomonda, 2020; Mulibana & Tshikovhi, 2022). Dzomonda (2020) demonstrates that necessity-driven entrepreneurs in South Africa rely heavily on psychological capital, particularly resilience, self-efficacy, and optimism, to sustain business performance amid high unemployment and weak institutional support. Complementing this, Matenda and Sibanda (2023) show that while entrepreneurial attitudes and behaviour positively influence economic outcomes across BRICS economies, weak entrepreneurial framework conditions significantly limit the growth and innovation potential of necessity-based entrepreneurship. Furthermore, Mulibana and Tshikovhi (2022) find that rural entrepreneurship in South Africa is largely necessity-led and constrained by fragile support systems, risk aversion, and excessive dependence on government and actor networks. Collectively, these studies suggest that entrepreneurship in South Africa is driven more by survival imperatives than by innovation opportunities, reinforcing the argument that its entrepreneurial ecosystem remains structurally and institutionally weaker compared to other BRICS nations.

### 3. Methodology of the Study

The present study employed appropriate methodological approaches to construct indicators for entrepreneurship, innovation, and knowledge. We conducted exploratory and descriptive analyses to examine these indicators. The descriptive analysis is based on quantitative data collected from the Global Entrepreneurship Monitor (GEM), the World Intellectual Property Organisation (WIPO), and the United Nations Statistical Database. The descriptive analysis tries to fulfil the objectives of the study through the use of radar charts and graphs. The exploratory analysis is based on the bibliographical method. The bibliographic method is used based on an extensive literature review on entrepreneurship, innovation, and knowledge generation through entrepreneurship, with special reference to the BRICS nations. To meet the objectives of the study, the subcategorisation of variables has been made based on the GEM report and the literature available on the topic, and the following steps have been followed.

Firstly, a comparison of BRICS countries on Entrepreneurial ecosystem parameters in the light of GEM 2019 data through a radar chart and secondly, the trends of entrepreneurial development in the BRICS in the last two decades have been analysed with the widely accepted representative of entrepreneurship, namely, TEA and EBO. At the end, the innovation rate and knowledge diffusion have been analysed over the recent decades.

#### 4. Major Findings and Discussion

The results are presented in three interlinked dimensions: entrepreneurial ecosystem conditions, entrepreneurial activity trends, and innovation and knowledge diffusion. Together, these dimensions explain how variations in ecosystem quality across BRICS nations shape entrepreneurial participation and, in turn, influence innovation capacity and knowledge diffusion.

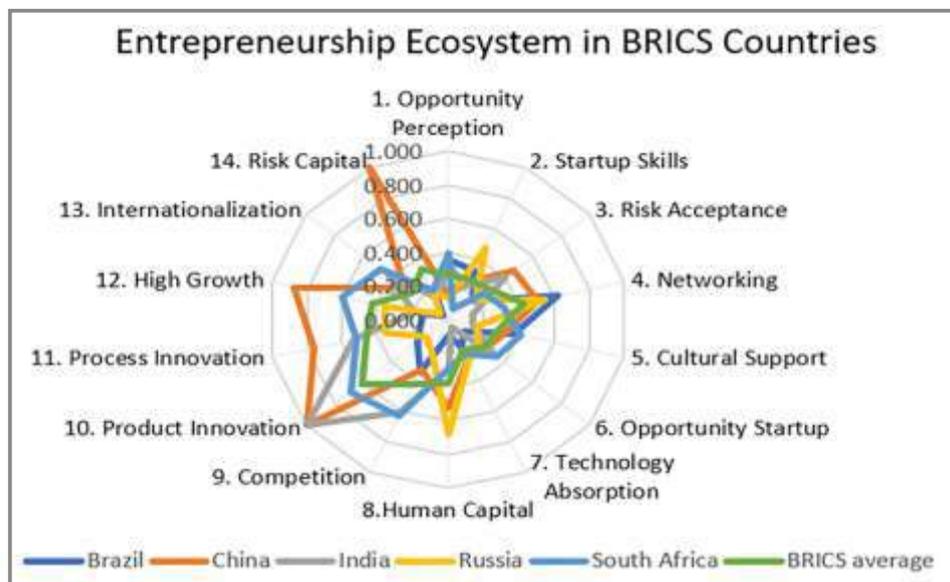
##### 4.1 Entrepreneurship Ecosystem in BRICS Countries

The entrepreneurial culture of a nation reflects its capacity to generate innovation and diffuse knowledge; however, entrepreneurial activity does not occur in isolation and depends critically on the strength of the entrepreneurial ecosystem. The Global Entrepreneurship Monitor (GEM) evaluates this ecosystem through twelve framework conditions, which collectively determine whether entrepreneurial efforts can be sustained and scaled.

The results reveal substantial variation in ecosystem quality across BRICS nations (Figure 2). China exhibits the most favourable financial environment (index value: 5.80), indicating strong access to capital for new ventures, while Russia's financial system remains the least supportive, constraining enterprise formation (GEM, 2019). Government policy support, an essential catalyst for business incubation, is strongest in India, reflecting long-term reforms initiated in 1991 and reinforced by targeted initiatives such as the National Innovation and Start-up Policy (2019). In contrast, Russia's weaker performance reflects institutional rigidities associated with its post-socialist transition.

Taxation and regulatory systems further differentiate ecosystem effectiveness. While India demonstrates comparatively supportive tax policies, South Africa's less investor-friendly tax environment discourages entrepreneurial expansion. Brazil's labour reforms and license simplification have improved entry conditions; however, bureaucratic complexity and a cumbersome tax structure continue to impede entrepreneurial dynamism.

Human capital and entrepreneurial education, central to endogenous growth theory, remain weak in South Africa and Brazil due to high dropout rates and limited post-school entrepreneurial training. Conversely, India and China perform relatively better across education, infrastructure, and cultural norms, enabling stronger entrepreneurial



Source: By the authors based on Global Entrepreneurship Monitor, 2019.

Figure 2

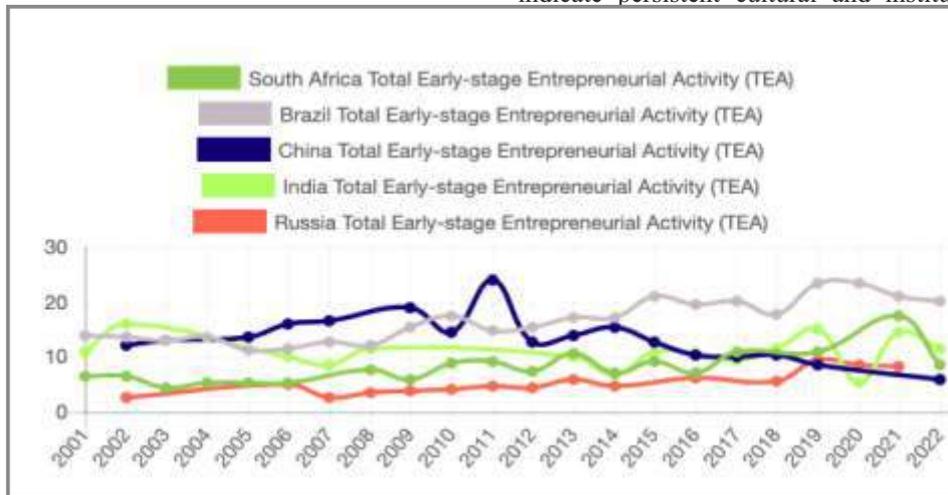
participation and knowledge diffusion.

#### 4.2 Trends of Entrepreneurship in BRICS Nations

Entrepreneurship is an essential driver of economic growth and a formidable engine of innovation and knowledge. Studies have considered the Total Early-stage Entrepreneurial activity (TEA) rate and the Established Business Ownership (EBO) rates as better indicators for measuring entrepreneurial activities (Santhi et al., 2011; Bhattacharya, 2011). Regarding the TEA and EBO rates, among the BRICS nations, Brazil has the highest rate at

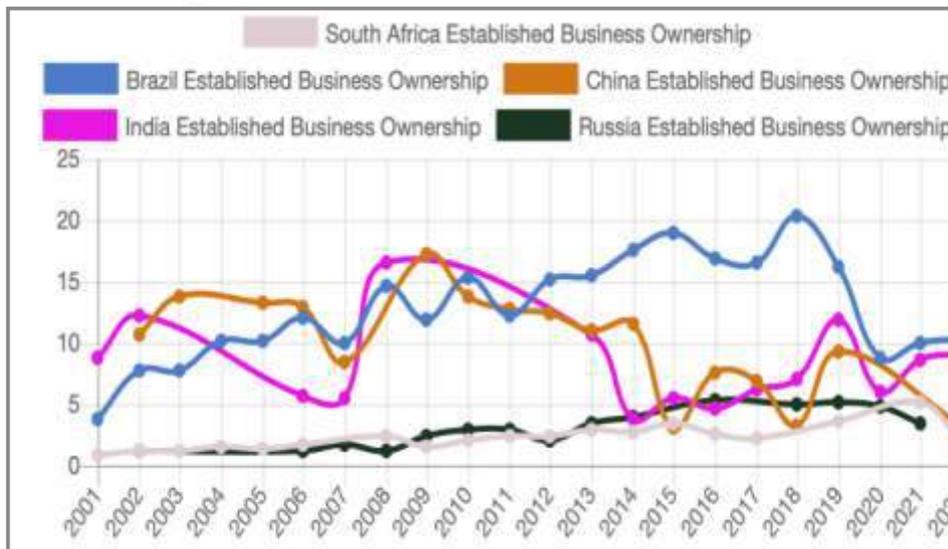
23.3% and 16.16%, respectively, in 2019 (Figure 3).

The divergence between TEA and EBO rates across BRICS nations highlights differences in entrepreneurial sustainability rather than entry alone. While Brazil leads in both TEA and EBO, South Africa's low EBO rate indicates high business mortality, suggesting that necessity-driven entrepreneurship struggles to transition into stable enterprises. India's relatively higher EBO reflects improved policy support and ecosystem maturation following economic reforms, whereas Russia's low TEA and EBO indicate persistent cultural and institutional barriers to



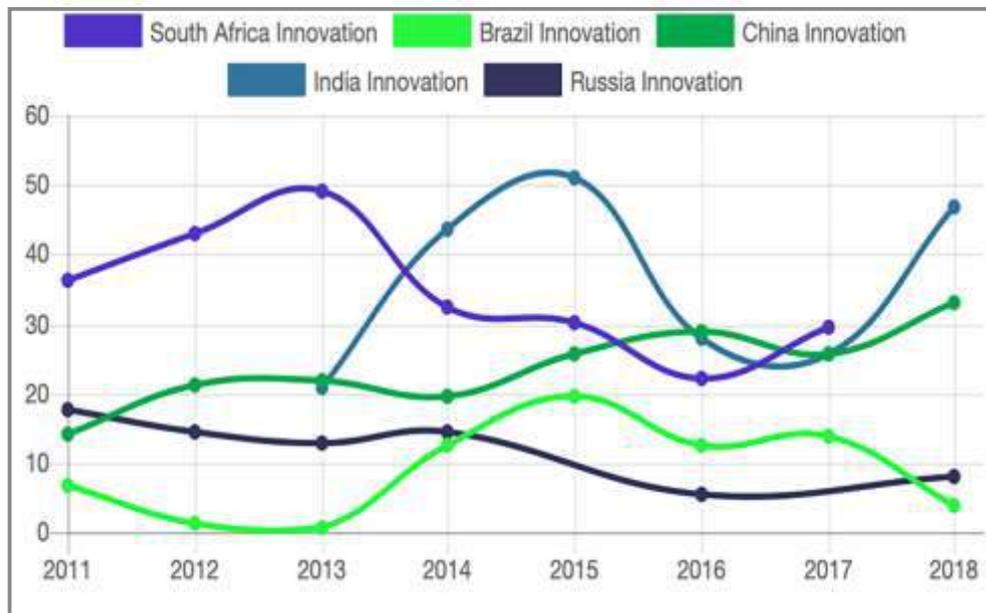
Source: By the authors based on data from GEM

Figure 3. Trend of TEA in BRICS countries



Source: By the authors based on data from GEM

Figure 4. Trend of EBO in BRICS countries



Source: By the authors and GEM

**Figure 5. Innovation rate (in %) among BRICS countries**

entrepreneurial risk-taking.

It is interesting to note that TEA and EBO rates have surged for all the BRICS nations except for China, despite China being a manufacturing hub among the emerging economies. South Africa, though it performed better than Russia and China in 2019 in TEA, which had the lowest EBO rate (3.5%) of the BRICS nations (Figure 4).

India, the most populous country in the world, has the highest youth population, and only 14.97% of its 18-64 year olds are nascent entrepreneurs or owner-managers of new businesses (TEA). Though India has a rich history of entrepreneurship, M.K. Gandhi accelerated the tempo through the Khadi movement. Nevertheless, due to the lack of ease of doing business, the country could not compete in the global economy. To ease the entrepreneurial setup, the 1991 economic reforms proved a boon, and later on, many policies to foster entrepreneurship were launched. Consequently, India has performed better than China, Russia, and South Africa in EBO. South Africa is often described as an engine of growth in Africa, but the youth (15–24) are the most vulnerable, with an unemployment rate of 58.2%. The concerned government acknowledged the importance of entrepreneurship for achieving inclusive growth. In terms of TEA, the country has performed better than Russia and China. The Great Leap Forward, the

Cultural Revolution, and the Free Market Economic Reforms (1978), along with consistent government promotion of entrepreneurship, have helped the Chinese economy flourish, and entrepreneurship is more prevalent in China (43<sup>rd</sup> rank) than in India (68<sup>th</sup> position) as per the Global Entrepreneurship Development Index, 2019. Despite a rich history of entrepreneurship dating back to the 18<sup>th</sup> century, Russian entrepreneurs were conservative and wary of new ventures. After the shift of the political system from socialism to capitalism, private entrepreneurship emerged. Since the 20<sup>th</sup> century, significant changes, such as the reduction of subsidies to unprofitable enterprises, the elimination of Gosplan and Gosnab, and the introduction of market forces, have been made. Despite these favourable macroeconomic conditions, Russia's performance in TEA and EBO in GEM 2019 was unsatisfactory. It might be due to a lack of business expertise (finance, management, economics, marketing, etc.), a lack of an enterprising culture, or a struggle with the shadow sector. A positive characteristic of Russian entrepreneurship is the low degree of gender inequality. The share of the female population in entrepreneurship is the highest in Brazil, followed by South Africa.

#### **4.3 Innovation and Knowledge Diffusion in BRICS Nations**

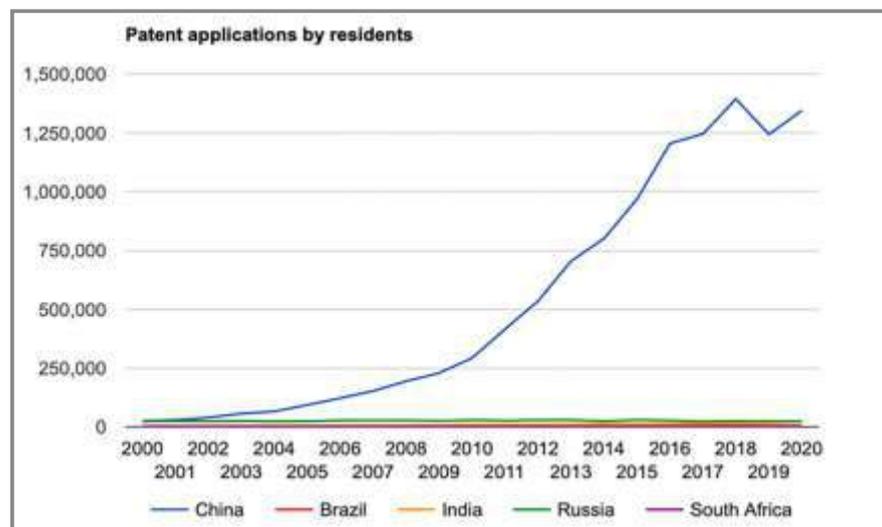
The Schumpeterian approach envisaged that entrepreneurial dynamism is the key to innovation and that the market is reorganised by 'creative destruction' (Koster & Rai, 2018). Schumpeter defines entrepreneurship as "undertakings through innovation, including the introduction of new commodities, technological change in the production of existing commodities, the opening up of new markets or new sources of supply, and the setting up of new business organisations" (Schumpeter, 1942). Ever since Schumpeter's work, innovation and entrepreneurship have been strongly correlated. The Global Entrepreneurship Monitor survey, which reports primary data from countries in the world, shows that the percentage of those involved in TEA who indicate that their product or service is to at least some customers and no businesses offer the same product (innovation rate), among the BRICS nations, is the highest in India (Figure-5) and lowest in Brazil (refuting Vernon's product cycle) in 2018. India is a highly populated country with young minds and currently has 108 unicorns (NIPFA, 2023). India's innovation (ranks 52 in Global Innovation Index) ascent in recent years is due to its focus on nurturing technology, incentivising innovation, and creating a healthy entrepreneurial ecosystem (GII Ranking, 2019; World Intellectual Property Organisation).

Patents are a hallmark of continued innovation in the country. The United Nations World Intellectual Property Organisation (WIPO) tracks patents filed worldwide, and it shows that patents filed by residents of China grew from 25,346 in 2001 to 12,43,568 in 2019, more than the

aggregate of patents filed by other BRICS nations (Figure 6). Russia and India are following China in this group.

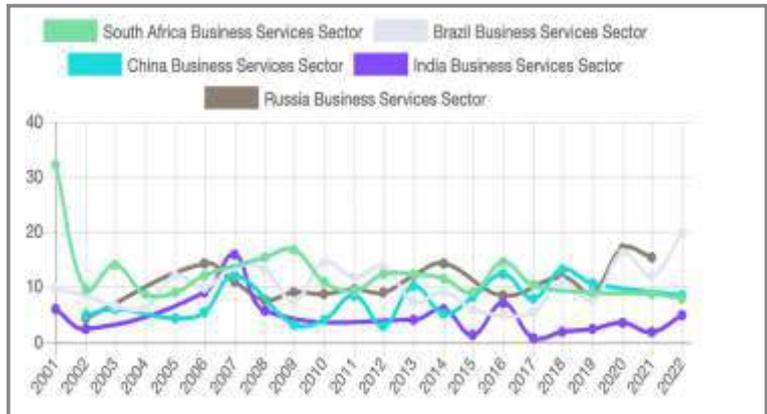
The Global Entrepreneurship Monitor has classified entrepreneurial activities as business services and consumer services. Business services and entrepreneurial activities (communication and professional services, etc.) tend to be technology or knowledge-intensive and durable. Whereas consumer services entrepreneurial activities (coffee shops, taxi services, hairdressing, tailoring, hotels, etc.) are relatively low-cost, with low entry barriers, fierce competition, and considerable churn (high rates of entry and exit). In the last decade, developed economies have grown their business services more than their consumer services. In contrast, emerging economies tend to have low proportions of business services (Figure 7). Research and Development (R&D) has been suggested as an effective means of generating knowledge and innovative outcomes (Nickerson & Zenger, 2004). China, ranked at the top of the Global Innovation Index 2019 among the BRICS nations (Figure 8), spends the highest percentage of its GDP on R&D, followed by Russia and India (Figure 9). South Africa and Brazil spend the least of their GDP on R&D.

However, it is argued that, scientifically excellent in-house laboratories renowned for their innovations between the 1950s and 1970s, such as those of the American Telephone and Telegraph Company (AT&T) and International Business Machines (IBM), which were once key to the commercialisation of breakthrough inventions, are now in



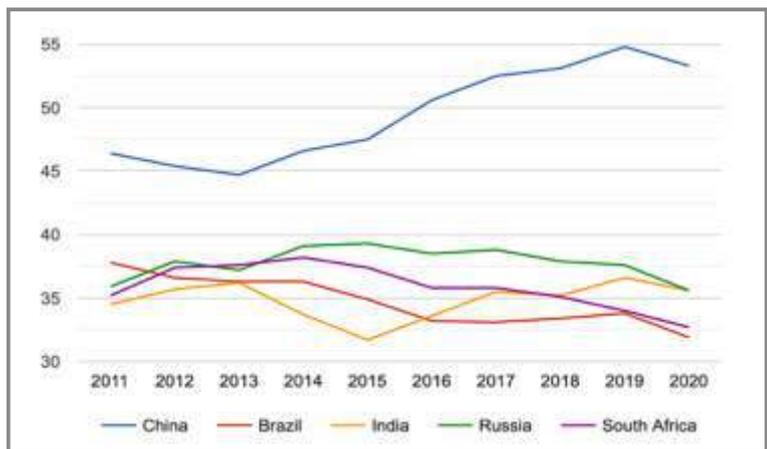
Source: WIPO

Figure 6. Patent applications in BRICS nations



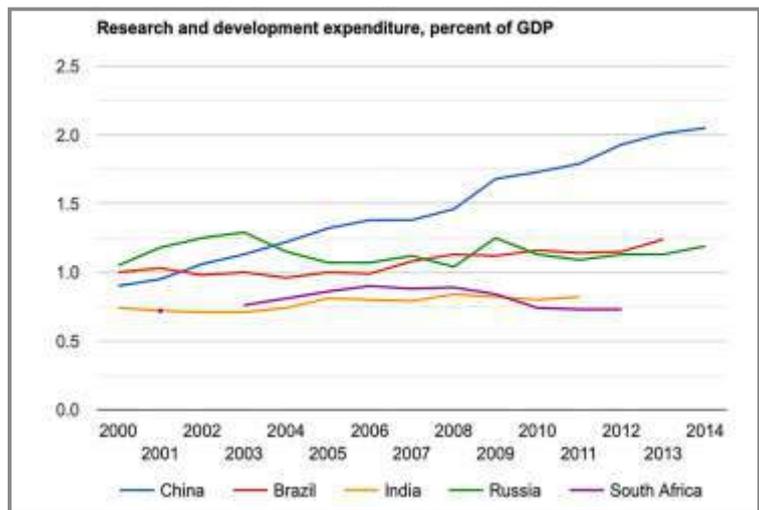
Source: By the authors and GEM

**Figure 7. Business Services Sector (in %) in BRICS**



Source: WIPO

**Figure 8. Innovation Index of BRICS nations**



Source: United Nations Statistical Database

**Figure 9. R&D as % of GDP in BRICS countries**

rapid decline. Some enterprises own their own R&D centres, while others use existing centres in research institutes and universities. Fabrication of new products is also associated with the recombination of knowledge, which is secured through research (Fleming & Sorenson, 2004). Taken together, the innovation indicators suggest that entrepreneurship bridges knowledge and innovation gaps only when supported by robust ecosystem conditions. India and China demonstrate stronger innovation outcomes due to higher R&D investment, greater patent activity, and a larger share of knowledge-intensive business services. In contrast, Brazil and South Africa remain concentrated in consumer services.

### 5. Conclusion and Recommendations

To maintain a country's viability and competitiveness, entrepreneurship plays a crucial role. As a result, developing entrepreneurial activities have captured the attention of nearly every nation. Among the BRICS countries, Brazil historically has the highest rates of entrepreneurship, with TEA at 23.3% and EBO at 16.16% in the year 2019. Unfortunately, a lack of supportive government policies has often restricted the economic consequences of Brazil's entrepreneurial activities. Entrepreneurs are prevented from realising their potential by rigorous tax compliance, unsupportive social and cultural norms, and a lack of spending on infrastructure. Brazil had the lowest score among "GEM level C" nations for ease of financing. Brazil's domestic market is vast, and its population is ready for products and services, so the country could find a ray of hope here by incorporating the other improvements in indicators of the entrepreneurial ecosystem.

Despite Russia's poor performance in the GEM's entrepreneurial environment, the country's overall entrepreneurial activity increased until 2019. To increase entrepreneurial activity in Russia, significant effort is needed to support government policies, strengthen entrepreneurial education at the secondary and post-secondary levels, simplify business registration, and expand access to a strong physical infrastructure.

Even amid conflicting economic signals in 2019, India's entrepreneurial activity increased significantly. Both key entrepreneurship indicators—TEA and EBO—rose from the previous few years. India proved relatively strong in the entrepreneurial framework conditions, particularly in terms of government policy and market dynamism (refer to Figure 2). Nevertheless, there are some economic indicators, such

as a decrease in R&D spending, a shift toward necessity-driven businesses, and a lack of innovation in products or processes, that could hinder future growth. Special attention is required for extending entrepreneurial education at the school and post-school levels.

Entrepreneurship education at the school stage, R&D transfer, and commercial and legal infrastructure are the lowest-rated framework conditions in China (GEM, 2019). Policies focused on promoting entrepreneurial education in schools, the commercialisation of technology, and the development of professional services will help address these deficits. The Chinese entrepreneurial policy has addressed knowledge generation and innovation. During the 2016 G20 Hangzhou summit, China and the other G20 members proposed the G20 Entrepreneurship Action Plan. This led to the establishment of the Entrepreneurship Research Centre, which aims to promote decent work and economic growth through entrepreneurship.

South Africa, the most industrialised economy on the African continent, has significantly increased entrepreneurial activity over the last few decades despite personal issues (Civil unrest in 2020, electricity shortages, macroeconomic problems due to COVID-19). In recent years, the South African government has announced new measures, such as introducing common templates for funding across all the country's financial institutions and establishing a small business fund, to make the ecosystem more favourable to entrepreneurship. However, constraints such as high data costs, over-regulation of small businesses, and labour market rigidities persist. The country needs to focus on framing more entrepreneurship-friendly policies, including strengthening entrepreneurial education in schools and post-school settings, and investing in infrastructure.

Since the introduction of Industrial Revolution 4.0, digital technologies will increasingly propel entrepreneurial activity in digital technologies, the internet of things, artificial intelligence, and machine learning, as they hold the potential to disrupt existing market dynamics and create new opportunities. However, all the BRICS nations lack online creativity (GII, 2022). They must look forward to exploiting the myriad opportunities present in the Industrial Revolution 4.0 era. *"Gender parity is not just good for women—it's good for societies,"* quoted by Angelica Fuentes (Former President of Mexico). However, when we talk of gender parity in entrepreneurship in BRICS nations, female participation is low. Saudi Arabia, Qatar, and

Madagascar are the only economies with more female than male entrepreneurs (GEM, 2019). The BRICS nations need to consider this aspect in their future entrepreneurship policy framework. In addition, BRICS countries need to emphasise improving the parameters of their entrepreneurial ecosystems, so that, in times, their respective entrepreneurial activities can flourish widely. Moreover, at last, the Verse from the Hindu Text "*the world is one family*" should be practised by all the BRICS nations, by eliminating their external and internal rivalries to make a new paradigm shift in front of the world.

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# The Interplay between Social Media Marketing Activities and Higher Education Brand Equity

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## A b s t r a c t

The purpose of the current study was to identify and corroborate the underlying relationships between higher education brand equity and social media marketing efforts. Additionally, the impact of brand loyalty and brand trust on higher education's brand equity was investigated. The factor structure was verified using confirmatory factor analysis. Using 406 data points, structural equation modelling was employed to assess the primary and mediated effects. The empirical results of the study confirmed that social media marketing has a significant influence on predicting brand love and brand trust. Brand love and brand trust partially mediate the relationship between brand equity in higher education and social media marketing initiatives. Higher education institutions can build trust among current and prospective students with the right mix of social media marketing initiatives. They will interact with other students and improve the university's reputation. Social media can help develop online communities for current students and influence prospective students' admissions decisions. First, the study develops and evaluates a research model grounded in the concepts of the Customer-Based Brand Equity theory, further evidencing the theory's descriptive capacity. Second, by illuminating the underlying mechanism through which social media marketing initiatives affect higher education brand equity, our study, which examined the mediating roles of brand love and brand trust, supports the theory. The study proposes that the right mix of social media marketing activities can help higher education institutions build trust among existing and potential students.

**Keywords:** *Higher education brand equity; customer-based brand equity; student engagement; brand love; brand trust; social media marketing activities; structural equation modelling.*

## 1. Introduction

According to global statistics, nearly 3.6 billion users are ardently attached to social media network sites, and this number is expected to reach 4.41 billion (approx.) by 2025 (Statista, 2021a). Globally, the penetration rate of social media networks is nearly 53.6% (Statista, 2021b), and users spend an average of 2 hours 25 minutes per day on various social media sites (Statista, 2021c).

In India, there were 448.0 million social media users in 2021, which represent 32.3% of the Indian population (datareportal, 2021). The use of social media in India is increasing rapidly (up 21% in 2021 from 2020). This exponential growth has created a significant opportunity for all marketers in India to leverage numerous social media platforms as media vehicles to reach their target markets effectively. Enhanced market reach, customer engagement, customer relationship management, and more are among the key outcomes of social media marketing.

Marketing through numerous social media network sites has become an important dimension of a new-age marketing strategy for quite some time. Digital marketing, a modern form of marketing, is taking a leading role in the modern marketing ecosystem (Koay et al., 2020). Marketing through social media, often known as Social Media Marketing (SMM), is a type of marketing that uses multiple social media platforms to market a firm's offerings (Ibrahim et al., 2020). Social media networks include YouTube, Facebook, Pinterest, Instagram, WhatsApp, LinkedIn, and Twitter. According to Dwivedi and McDonald (2020), SMM can supplement the success of an organisation's promotional activities. Moreover, users' approach towards a brand or company can be manipulated through SMM (Langaro et al., 2018). According to Kotler et al. (2021), in the present digital economy (the Marketing 5.0 era), firms need to leverage digital platforms to survive and differentiate in highly competitive markets. In present times, brands extensively use their social media pages to disseminate company-related information and build strong brand equity (Kim & Ko, 2012). These fast, cost-effective channels of communication help firms achieve higher growth and profitability. For users, a higher value is derived from greater brand equity, leading to a smoother purchase process (Alam & Khan, 2019). An empirical study conducted by Alvarez-Milan et al. (2018) established a significant relationship between social media activities and brand equity. Authors argued that social media activities have strong potential to instil fondness between users and brands.

All of these social media platforms are incredibly user-friendly and offer a variety of ways for consumers to show their affection for brands through buttons like "like," "share," "comment," "heart" for expressing love, "clapping" for celebrating, etc. When a user clicks on any of the aforementioned buttons, a clear message about preference, love, liking, or testimonials is sent to the marketers. Furthermore, social media marketing is considered crucial for creating reliable value for users. A reliable message about a company or brand on social media platforms is essential to building a long-lasting relationship with clients (Dwivedi & McDonald, 2020; Ambler, 1997). Increasing trust in the company or brand can boost brand equity.

### Higher Education in India

In India, the Department of Higher Education is accountable for the overall growth of the basic infrastructure of higher education. There are mainly six agencies formulated by the Indian government for development, namely: the University Grants Commission, the Association of Indian Universities, the All India Council of Technical Education, the Council of Scientific and Industrial Research, the Indian Council of Social Science Research, and the Indian Council of Agricultural Research. There are 981 universities and 9,700 All India Council of Technical Education approved institutes (ibef.org, 2021).

It is a simple fact that brand equity is not a new construct to explore in different service contexts. Though higher education falls within the services industry, this service area is completely different from the rest. In normal service firms, serving customers takes little time, but in the higher education context, the service provider and the service receiver interact for a longer period. Due to this special feature, students take longer to finalise their purchase decision (whether to take admission in a particular course offered by the concerned higher educational institution). We are witnessing a substantial increase in higher education institutions worldwide, which is driving students to choose the best courses. According to Ogunmokun and Timur (2020), an increase in the number of new educational institutions worldwide directly influences student migration from one part of the world to another in search of quality education. Higher education institutions are experiencing stiff competition in attracting academic students due to the similarity in course offerings mandated by regulators.

Higher education institutions use promotions to raise awareness among their target populations. Promotions such

as advertising, word of mouth, publicity, and other tactics are primarily used by higher education marketers (Ullah et al., 2019). However, the advent of social media has changed the landscape of promotion. No organisation can achieve maximum reach without social media, and as a result, current age marketers need to amend their promotional mix by including social media marketing (Alexa et al., 2012). To counter unavoidable competition, administrators need to focus on building and maintaining long-term relationships through a mix of social media marketing activities (Wallace et al., 2017). Hence, it is anticipated that the social media presence of higher education institutions will definitely upsurge their brand image.

A brand's image is determined by how people perceive its diversity, individuality, and uniqueness, according to branding literature (Mourad et al., 2011). A deep sincerity of expectation is represented by the image. Using an image to convey a company's values can boost its brand equity. Higher education's brand equity may therefore be enhanced by comprehending all the subtleties of social media marketing campaigns. Maha et al. (2020) assert that brand equity is a critical deciding factor that motivates candidates to select a favourable choice set in higher education. Therefore, taking into account pertinent brand equity factors is crucial for higher education institutions to flourish.

The rest of the article is systematised as follows. Section 2 comprises a literature review and the development of hypotheses. The next section highlights the research methodology. Section 4 of the study contains measurement and structural models. Section 5 encompasses discussion, implications, conclusion, limitations and future avenues for research. The final section contains references to the study.

## 2. Literature Review

### 2.1 Social Media Marketing Activities (SMMA)

Social media are web applications, virtual platforms, and interactive media that aim to enable communication, collaboration, and the sharing of online content (Richter & Koch, 2007). Due to its easy access and popularity among the masses, business organisations and government departments also began using social media to communicate with their target audiences. We are all familiar with the Twitter handles of government officials and social media pages of national and international brands. All these social media platforms have become effective marketing and promotional channels. Due to their wider reach, real-time

tracking capabilities, and faster message dissemination, they have become very handy for companies to communicate with their target audiences at low cost and with less effort.

Numerous studies have examined various aspects of SMMA, clarifying their impact on consumer behaviour, emotional brand value, engagement, and their role in higher education, demonstrating their ability to raise student involvement and university awareness. University SMM material can raise awareness of universities (Starnes & Atkins, 2020). Facebook (one of the prominent social media platforms) friendships were linked to students' social capital (Ellison et al., 2007). Cordero-Gutiérrez and Lahuerta-Otero (2020) argued that Facebook advertisements can raise the visibility and engagement of prospective students. Additionally, SMMA is utilised in higher education (Yaroslav et al., 2023; Belanche, 2021).

Universities' use of social media content marketing strategies has an impact on follower engagement (Garcia et al., 2021). Videos and events that are shared during the day are the predominant feature of Indonesian university social media content (Ramadanty & Syafganti, 2021). In the midst of the pandemic, colleges' adoption of SMMA will strengthen academic linkages (Espinosa-Vélez et al., 2023).

### 2.2 Brand Equity and Social Media Marketing Activities

While conceptualising brand equity from the customer perspective, Kamakura and Russell (1991) discussed robust, promising and unique brand associations with consumer memory. Authors defined customer-based brand equity as "The differential effect of brand knowledge on consumer response to the marketing of the brand". According to brand marketing literature, marketers use brand equity as a useful mechanism to attain a competitive advantage, which subsequently helps them profitably compete. Brands aim to find a distinct place in consumers' hearts through promotional communications. Modern-day smart marketers make the most of social media marketing to connect with the target audience and win their hearts (Richter & Koch, 2007). Further, social media provides easy options for collaboration, cooperation and message sharing in the ecosystem. This media strengthens brand recall and brand recognition among consumers. According to Koay et al. (2020), there is a strong association between social media marketing activities and brand equity. The same relationship was echoed by Godey et al. (2016). If social media marketing activities are carried out in the right spirit and style, brand equity is bound to increase (Ibrahim et

al., 2020). Authors in their meta-analysis confirmed a significant correlation between social media marketing activities and brand equity. The results were based on quantitative meta-analysis of 15 articles. Hence, the following hypothesis is proposed:

**H<sub>1</sub>:** Social media marketing activities positively influence higher education brand equity.

### **2.3 Brand Love and Social Media Marketing Activities**

An individual's identity is matched with the brand he or she loves. Brand love is the consumer's emotional connection to the brand, and it helps the brand reap numerous benefits. Long back in 1973, Rubin defined brand love as "an attitude that consumers held toward a particular brand which includes their ability to think, feel, and behave with that brand". Lovable brands have the power to induce stronger customer loyalty among target audiences and also help firms attain a competitive advantage (Reimann et al., 2012). Happy customers express an emotional connection with their preferred brands to exhibit brand love (Carroll & Ahuvia, 2006). According to Reimann et al. (2012), brand love is not a mere liking for a brand, but rather a long-lasting relationship. Earlier in 1986, Sternberg provided a theoretical foundation for brand love in the form of the triangular theory, with 3 main components of love: intimacy, passion, and decision or action. Customers who love a particular brand will certainly be passionate about that brand (Huber et al., 2015).

Social media platforms provide an interactive platform to facilitate mutually beneficial relationships for customers and brands (Fournier & Lee, 2009). Furthermore, Laroche et al. (2013) argued that these relationships yield numerous benefits, including highly satisfied customers who subsequently spread positive word of mouth. Actually, brand love is increased through social media activities (Salem et al., 2019). In the current era, social media has become so popular that customers prefer this route to gather information about their favourite brands (Richard & Guppy, 2014). Customers can be better engaged with the brand through social media marketing activities (Okazaki et al., 2017). Higher customer loyalty can be achieved by developing relationships with target customers through social media. Brand love and repurchase intentions are directly related (Garg et al., 2015). According to Wallace et al. (2017), customer engagement, social media and brand love are related. In this background, it is proposed that:

**H<sub>2</sub>:** Social media marketing activities positively influence brand love.

### **2.4 Brand Trust and Social Media Marketing Activities**

Building trust in your brand takes time. Marketers focus on developing a strong brand management strategy to build brand trust. Chaudhuri and Holbrook (2001) defined brand trust as "the buyer's level of reliance on a brand that can gratify their stated needs and wants". A strong brand trust can only be built if marketers succeed in instilling safe and reliable perceptions (Veloutsou, 2015). In the modern world, social media has become an important part of designing marketing communication strategies. Social media facilitates user-generated content, which subsequently helps build trust among other users, and related research has shown a direct influence on the endurance of brand usage (Pentina et al., 2013). Dwivedi and McDonald (2020) argued in their empirical research that social media marketing activities help brands combat competition by effectively informing, promoting, and building brand trust. Social media marketing activities help organisations build a dependable appeal, as reflected in customer feedback, which ultimately leads to brand trust (Puspaningrum, 2020; Sanny et al., 2020; Tatar & Eren-Erdogmus, 2016). Hence, it is hypothesised that:

**H<sub>3</sub>:** Social media marketing activities positively influence brand trust.

### **2.5 Brand Equity and Brand Trust**

A brand can survive solely on consumer trust when direct contact between the company and the customer is absent. Brand trust builds a strong and sustainable relationship between the company and the customer (Fournier, 1998). According to Garbarino and Johnson (1999), brand trust is a crucial constituent of brand equity as it ensures an enduring relationship between the company and the customer. Delgado-Ballester and Luis Munuera-Aleman conducted an empirical study in 2005. They concluded that brand trust and brand equity are positively correlated, whereas trust is developed due to the past experience with the brand. Consumers who trust the company and its brands join numerous social media platforms and share their views aggressively through their experience stories (Chahal & Rani, 2017). The authors posited that these activities of customers add a lot of value to the brand. An empirical study by Ebrahim (2020) confirmed a significant mediating effect of brand trust on the relationship between social media marketing activities and brand equity. Therefore, it is proposed to test the following hypotheses:

**H<sub>4</sub>:** Brand trust positively influences higher education brand equity

**H<sub>5</sub>:** Brand trust mediates the relationship between social media marketing activities and brand equity

**2.6 Brand Equity and Brand Love**

Brand love has the potential to sustain ongoing relationships between customers and companies by spreading positivity (Reimann et al., 2012). Brand love is one component of brand equity (Zhang et al., 2020). Authors further argued that the presence of brand love leads to the attainment of various types of benefits (tangible and intangible). Consumer-based brand equity can be appropriately measured by brand love, an important determinant (Meirani & Abror, 2019). Brand love is increased through social media activities (Salem et al., 2019). If social media marketing activities are performed in the right spirit and fashion, then brand equity is bound to increase (Ibrahim et al., 2020). Testing the mediating effect of brand love in the relationship between social media marketing activities and brand equity will be interesting to see. Hence, the following hypotheses are proposed:

**H<sub>6</sub>:** Brand love positively influences higher education brand equity

**H<sub>7</sub>:** Brand love mediates the relationship between social media marketing activities and brand equity

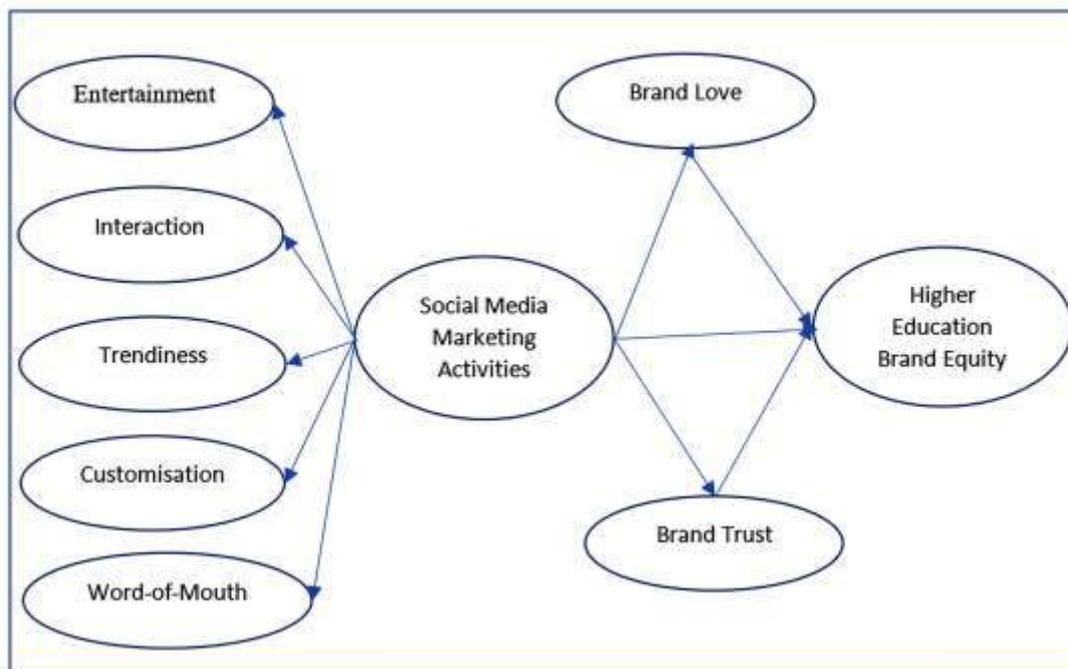
**3. Conceptual Framework of the Study**

Figure 1 demonstrates the proposed relationships among the study's constructs: social media marketing activities, entertainment, interaction, trendiness, customisation, word-of-mouth, brand love, brand trust, and higher education brand equity.

**4. Research Methodology**

This research was conducted in the higher education sector, using a descriptive research design. Higher education is a highly competitive industry where service differentiation is still on the lower end. In recent times, technology has transformed this sector in a big way. All stakeholders in this higher education ecosystem are benefiting from the technological landscape. In this dynamic, highly competitive environment, higher education administrators have begun focusing on student-friendly strategies to build a strong brand image and increase student satisfaction. This change validates the decision to choose the higher education services sector as the object of research.

Moreover, considering the current study conceptual framework, this sector affords a suitable context for this study because of the reasons like: (a) the higher education is



**Figure 1. Proposed Relationships among Study Constructs**

Figure 1 depicts relationships among study constructs

closely related with individuals' career and larger part of their lives and people love to share their learning and experiences with others verbally and also through online media; (b) higher education services are categorised by their intangibility and students may trust social media while talking about their choices for course, institutions, faculties etc.; and (c) higher education sector is a core sector of any country and in the current times, it is facing numerous challenges due to competition, access to global education system, and evolving education technology.

Sample data for this study were collected from a large Private Sector University in the southern part of India from September 7, 2024, to December 26, 2024. This university offers courses (undergraduate, post-graduate, doctoral) in various disciplines like management, engineering, law, architecture, etc. A total of 406 sample data were collected from the students of the university by using a multi-stage stratified random sampling procedure.

All measurement scales and variables were drawn from the literature and adapted to the current study's context (the higher education sector). All the constructs were measured by using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Table 1 displays study constructs, the number of survey items adapted, and the original sources.

## 5. Results

Covariance-based structural equation modelling in IBM AMOS 21.0 was used to test the hypotheses in the structural research model. First, to assess data normality, the skewness and kurtosis for each measurement item were calculated. The skewness values ranged between -1.179 and -0.369, and kurtosis values ranged between 0.074 and 3.036, which is well within the range of ( $\pm 2$ ) and ( $\pm 5$ ), respectively (Bentler, 1995). In a survey-based study, when all independent and dependent variables are measured at the same time using a single structured questionnaire, there is a good chance that the established relationships among the constructs are biased by common method variance (Spector, 2019). It provides unreliable estimates of reliability and convergent validity, or even inflated path coefficients for study constructs (Podsakoff et al., 2012).

In this study, Harman's single-factor test (Harman, 1976) was used to detect Common Method Variance (CMV). In this test, CMV is a concern if a single dimension accounts for the majority of the variance; this suggests a high likelihood of a common-method variance problem (Podsakoff et al., 2012). The data revealed no appreciable problems with CMV, and a single factor was accountable for 28.981 per cent of the variance. This level of variation satisfies the minimal 50% threshold.

**Table 1. Details of Survey Items**

S.N.	Name of Construct	Number of Items	Source
1	Entertainment	2	
2	Interaction	3	
3	Trendiness	2	Kim and Ko (2012)
4	Customisation	2	
5	Word-of-Mouth	2	
6	Brand Love	3	Wallace et al. (2014)
7	Brand Trust	4	Chaudhuri and Holbrook (2001)
8	Higher Education Brand Equity	4	Yoo and Donthu (2001)

**Table 2. Reliability Analysis Results****5.1 Reliability Analysis**

S.N.	Name of Construct	Number of Items	Cronbach's Alpha Value
1	Entertainment	2	0.626
2	Interaction	3	0.785
3	Trendiness	2	0.865
4	Customisation	2	0.695
5	Word-of-Mouth	2	0.796
6	Social Media Marketing Activities	11	0.786
7	Brand Love	3	0.833
8	Brand Trust	4	0.726
9	Higher Education Brand Equity	4	0.655
10	Overall Scale	22	0.763

**Table 3. Measurement Model Fit Indices**

S.N.	Measure	Study Results	Threshold
1	Chi-Square	296.915	---
2	DF	196	---
3	Chi-Square / DF (CMIN / DF)	296.915 / 196 = 1.515	< 3 Good; < 5 Sometimes Permissible
4	p-value for the model	< 0.000	> 0.05
5	GFI (Goodness of Fit Index)	0.938	> 0.90
6	AGFI (Adjusted Goodness of Fit Index)	0.920	> 0.90
7	CFI (Comparative Fit Index)	0.961	> 0.90
8	RMSEA	0.036	< 0.05 Good; 0.05 – 0.10 Moderate; > 0.10 Bad
9	PCLOSE	0.999	> 0.05
10	ECVI (Expected Cross Validation Index)	Default Model = 1.015 Saturated Model = 1.249 Independence Model = 6.998	ECVI value of the default model should be least among all

*Source: Hu and Bentler (1990)*

It can be seen from Table 2 that Cronbach's alpha values range from 0.626 to 0.865 for all constructs under study. The overall Cronbach's alpha for all 22 variables was found to be 0.763, which was above the threshold level suggested by Nunnally and Bernstein (1994). Hence, in this study, the research instrument passed the reliability test.

**5.2 Testing Measurement Model**

In order to test the measurement model fit, a confirmatory factor analysis was performed by using IBM AMOS 21.0. It

was found that all items loaded clearly on their original constructs.

It is evident from Table 3 that the proposed measurement model established an acceptable fit.

**Table 4. Convergent and Discriminant Validity Results**

	<b>CR</b>	<b>AVE</b>	<b>SMMA</b>	<b>HEBE</b>	<b>BRLV</b>	<b>BRTS</b>
<b>SMMA</b>	0.873	0.672	<b>0.819</b>			
<b>HEBE</b>	0.702	0.521	0.141	<b>0.722</b>		
<b>BRLV</b>	0.838	0.635	0.122	0.240	<b>0.797</b>	
<b>BRTS</b>	0.736	0.542	0.169	0.101	0.127	<b>0.736</b>

**5.3 Convergent and Discriminant Validity**

The empirical results showed that the composite reliabilities (CR) of all study constructs were greater than the required cut-off of 0.70. The average variance extracted (AVE) by each latent construct in the study model (SMMA = 0.672; HEBE = 0.5219; BRLV = 0.635; BRTS = 0.542) was either equal to or greater than the threshold value of 0.50. Furthermore, inter-construct correlation was less than the square root of AVE. Therefore, both the conditions proposed by Fornell and Larcker (1981) are met to ensure convergent and discriminant validity.

**5.4 Hypotheses Testing: Direct Relationships**

The structural model of the study revealed mixed results for the proposed hypotheses.

Specifically, social media marketing activities positively influence brand love ( $\gamma = 0.126, p = 0.044$ ). Also, study results confirmed a significant positive impact of social media marketing activities on brand trust ( $\gamma = 0.171, p = 0.015$ ). Finally, brand love significantly impacted higher education brand image. ( $\gamma = 0.221, p = 0.002$ ). Interestingly, brand trust and social media marketing activities could not establish significant effects on higher education brand equity ( $\gamma = 0.058, p = 0.396; \gamma = 0.104, p = 0.133$ ). Hence, 3 out of 5 hypotheses ( $H_2, H_3, H_5$ ) were supported by the study data.

**Table 5. Hypotheses Testing Results**

<b>S.N.</b>	<b>Relationship</b>	<b>Unstandardised Coefficient</b>	<b>Standardised Coefficient</b>	<b>S. E.</b>	<b>C.R.</b>	<b>p-value</b>	<b>Decision</b>
1	HEBE <--- SMMA	0.144	0.104	0.096	1.501	0.133	Not Supported
2	BRLV <--- SMMA	0.420	0.126	0.209	2.013	0.044	Supported
3	BRTS <--- SMMA	0.218	0.171	0.090	2.436	0.015	Supported
4	HEBE <--- BRTS	0.063	0.058	0.074	0.849	0.396	Not Supported
5	HEBE <--- BRLV	0.092	0.221	0.029	3.139	0.002	Supported

*SMMA = Social Media Marketing Activities; HEBE = Higher Education Brand Equity; BRLV= Brand Love; BRTS = Brand Trust*

**5.5 Hypotheses Testing: Mediation Analysis**

The results relating to the mediation hypotheses are reported based on a bias-corrected bootstrap analysis with a sample size of 5,000 at the 95% confidence interval (c.f. Preacher & Hayes, 2004). While conducting mediation analysis, it is vital to know whether a significant indirect effect is partial or full (Zhao et al., 2010).

It can be seen from Table 6 above table 6 that neither of the mediation hypotheses received support in the empirical results. Brand love partially mediates between social media marketing activities and higher education brand equity, whereas brand trust didn't receive empirical support as a significant mediator between these variables. This study also tested for both mediators collectively in the relationship between social media marketing activities and higher education brand equity. The mediation analysis results confirmed significant partial mediation.

**6. Discussion**

The present study proposed and validated a research framework to investigate the fundamental relationships underlying the link between social media marketing activities and higher education brand equity. Further, the effects of brand love and brand trust on higher education brand equity were also examined. The study's empirical results confirmed that social media marketing activities are a significant predictor of brand love and brand trust. When taken together, both brand love and brand trust partially mediate the relationship between social media marketing activities and higher education brand equity. This finding

highlights how social media marketing activities done right lead to higher brand equity for a higher education institution by building trust and showing love for the higher education brand.

This study highlighted the mediating role of brand love and trust in the relationship between social media marketing efforts and brand equity in higher education. In higher education, students—both current and prospective—who were persuaded through social media marketing initiatives are beginning to trust and show affection for the brand. As a result, they begin endorsing the brand by posting content about the institution on different social media channels. Potential students view current students' and higher education officials' social media marketing efforts as significant determinants of their purchase intentions (Abubakar et al., 2017).

The current study's findings align with those of Augusto and Torres's (2018) investigation. This empirical study by these authors verified the substantial influence of electronic word-of-mouth on student engagement and eventual loyalty. Another study finding is the relationship between social media marketing initiatives and higher education brand equity, driven by brand love and trust. Social media communications greatly influence online popularity and brand image. People who are engaged on social media place greater emphasis on their online reputation and popularity. Higher education institutions with a strong online presence encourage people to use social media, thereby increasing brand equity, love, and trust.

**Table 6. Mediation Analysis (Result of Bootstrapping)**

Relationship	Direct without Mediator	Direct with Mediator	LLCI	ULCI	Indirect
SMMA → BRLV → HEBE	0.130 (0.062)	0.113 (0.099)	0.003	0.075	(0.024) Significant Partial Mediation
SMMA → BRTS → HEBE	0.130 (0.062)	0.118 (0.091)	0.010	0.055	(0.219) NS No Mediation
With both mediators (BRLV & BRTS)	0.130 (0.062)	0.104 (0.133)	0.003	0.0945	0.049 Significant Partial Mediation

## 7. Conclusion

In this study, a methodology for investigating the underlying connections between social media marketing activities and higher education brand equity was established and confirmed. Additionally, the effects of brand loyalty and brand trust on higher education brand equity were investigated. The study's empirical findings supported the role of social media marketing as a strong predictor of brand love and brand trust. When combined, brand equity in higher education and social media marketing efforts are partially mediated by brand love and brand trust. This study emphasises the process by which properly executed social media marketing initiatives result in increased brand equity for a higher education institution by fostering trust and demonstrating love for the higher education brand.

Based on the empirical findings of the current study, it is proposed that higher education institutions can build trust among current and prospective students through the right mix of social media marketing initiatives. They will interact with other students and improve the university's reputation. Social media can help develop online communities for current students and influence prospective students' admissions decisions. If higher education institutions are successful in including their students on social media, these students will be able to contribute to the institution's development of a very positive brand image in the marketplace, which may then be used to obtain internships and permanent positions.

### 7.1 Theoretical Implications

In several ways, this piece of work contributes significantly to the existing theory. First, the study develops and validates a research model based on the principles of the Customer-Based Brand Equity theory and by so doing, more empirically supports the descriptive ability of the theory. Second, as this study has investigated the mediating effects of brand love and brand trust, it contributes to theory by showing the fundamental process through which social media marketing activities impact higher education brand equity. Lastly, this piece of research complements the existing literature that emphasises the effects of online communication and social media networks' equity (Kumar & Singh, 2020) and adds value to earlier research by examining these associations within the higher education sector, using primary data. Beyond knowledge augmentation, this particular research work highlights the importance of this service sector, which is not extensively studied by marketing researchers (Ogunmokun & Timur,

2019).

### 7.2 Managerial Implications

It is very important for higher education administrators to create and uphold a social media platform where current and prospective students can express themselves and demonstrate their love and trust in higher education institutions (c.f. Abubakar et al., 2017). It is not easy for higher education institutions to attract, engage, satisfy and retain students if they are not making optimal and judicious use of social media marketing activities.

The right mix of social media marketing activities can help higher education institutions build trust among existing and potential students. They will get engaged with other students and add to the brand equity of the institutions. Social media can help in building virtual communities of existing students, and they can influence admission-related decisions of potential students. If higher education institutions succeed in engaging their students through social media, then these students can help the institution in building a very positive brand image in the market, which subsequently can be leveraged for getting internships and final placements.

### 7.3 Limitations and Future Scope of the Study

The results of this piece of research work must be interpreted and used with a few limitations in mind. The findings of this research may have been impacted by the sampling method adopted. Also, this research is conducted in the higher education services context. Researchers in future can conduct a similar type of research in a different service industry context to get some diverse and exciting results.

Besides, this research was conducted in a single country context. Hence, it is strongly suggested to conduct future studies in a cross-cultural context to capture cultural differences. It will also be interesting to find the effects of various social media platforms on developing trust and love. It means that as and when different social media platforms are used for communicating with the target population, then what type of impact happens on a platform-by-platform basis.

**Data Availability Statement:** Data will be shared on request by the author.

**Ethical Approval Statement:** It is declared that currently, the University is in the process of forming the Ethical Approval Committee. Therefore, there is a need to get

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# Leaders' Gender, Self-Efficacy and Commitment Effects on Employee Organisational Citizenship Behavior Mediated by Employee Job Satisfaction

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## A b s t r a c t

This study investigates the effects of leaders' gender, self-efficacy, and commitment on organisational citizenship behaviour (OCB) in the hotel industry using employee job satisfaction as a mediator. Data were collected from 373 randomly selected employees representing diverse hotel classifications using structured questionnaires. Correlation analysis revealed that both leaders' self-efficacy and commitment demonstrated significant and positive associations with employee job satisfaction and OCB, underscoring the central role of psychological and behavioural leadership qualities in fostering positive employee behaviours. Results showed that leaders' commitment and self-efficacy, and employee job satisfaction, accounted for nearly 42% of the variance in OCB. Though the initial model failed to fit the data, the revised model achieved excellent fit indices (CFI = 0.998, RMSEA = 0.055). The findings showed that leaders' commitment and self-efficacy are critical factors in influencing OCB through employees' job satisfaction, rather than employees' gender. The study highlights the value of leadership development initiatives, regardless of gender, that prioritise enhancing leaders' self-efficacy, strengthening their commitment, and fostering employee job satisfaction as mechanisms for promoting OCB. The study contributes to improved service quality, higher organisational performance, and employees' willingness to exceed formal job requirements—critical factors for sustaining competitive advantage in the hotel industry.

**Keywords:** *Hotel, Job satisfaction, Leader gender, Organisational citizenship behaviour, Leadership commitment, Self-efficacy.*

## 1. Introduction

The hotel industry is service-intensive, requiring leaders who are not only committed and competent but also highly self-efficacious to inspire, guide, and enhance employee performance under demanding service conditions. Unlike other service-providing sectors, hotels deliver an integrated bundle of services—accommodation, food and beverage, amenities, and guest assistance—that address not only customers' physical needs but also their psychological well-being, safety, and comfort (Kandampully et al., 2015). The nature of these services makes leadership a central determinant of service quality and customer satisfaction.

Employees in the hospitality sector often operate under intense pressure to meet and exceed guest expectations. This pressure can be overwhelming, but employees' willingness to endure such challenges is second to none, not only for business sustainability but also for safeguarding guest safety, comfort, and satisfaction, which determine the financial health of the industry. Such willingness is heavily shaped by leadership behaviours, particularly leaders' ability to motivate, support, and create a climate of trust and fairness (Kim et al., 2009; Walumbwa et al., 2008).

Leadership is widely recognised as a decisive factor in influencing employee behaviour and organisational performance (Yi et al., 2016). Beyond operational oversight, effective leaders serve as role models whose attitudes and actions directly influence employees' motivation, engagement, and discretionary effort. In particular, leadership attributes such as commitment and self-efficacy are critical for inspiring employees to go beyond formal job descriptions and engage in behaviours that benefit the organisation—a construct widely known as Organisational Citizenship Behaviour (OCB) (Organ, 1988; Organ et al., 2005).

Gender plays a pivotal role in shaping leadership behaviours across societies that maintain distinct gender role expectations, such as Ethiopia. This study identifies gender as a key variable that may influence the behaviour and success of male and female leaders in the hotel industry. Research on gender and leadership effectiveness reveals mixed findings. Some meta-analyses conclude that, overall, men and women exhibit comparable levels of leadership performance (Eagly et al., 1995). Others suggest that women may actually excel in certain leadership behaviours—particularly transformational, communal, and agentic styles—compared to men (Eagly et al., 2003; Paustian-Underdahl et al., 2014; Paustian-Underdahl et al.,

2024). These inconsistent patterns underscore that the significance of gender in predicting leadership effectiveness may be contingent on contextual and perceptual factors (Eagly & Karau, 1991; Paustian-Underdahl et al., 2014).

OCB refers to voluntary and discretionary employee behaviours that are not explicitly recognised by the formal reward system yet contribute to the organisation's effective functioning (Organ, 1988). These behaviours—such as helping colleagues, taking initiative, and demonstrating organisational loyalty—are essential in service industries where customer experiences are shaped by subtle interpersonal interactions (Ocampo et al., 2018). Research has shown that OCB is positively associated with key organisational outcomes, including reduced turnover, lower absenteeism, and improved service quality (Jahangir et al., 2004). Aheruddin et al. (2024) found that leadership style and self-efficacy affect organisational commitment among village officers, with job satisfaction mediating this effect. According to a team of researchers (Firdaus et al., 2024), transformative leadership improves employee performance and organisational commitment. Furthermore, they indicated that employees' job satisfaction mediated the relationship between transformative leadership and employee performance and organisational commitment. Similarly, leadership style (e.g., transformational and servant leadership) was positively associated with employee job satisfaction via the mediation role of the perceived employee relations climate (Chen et al., 2021) and well-being (Abilla et al., 2025).

This study aims to advance understanding of the psychological and behavioural mechanisms through which leadership influences employee discretionary behaviour—offering both theoretical contributions and practical guidance for enhancing service quality and competitive advantage in the hotel sector.

## 2. Literature Review

This section discusses the literature on recent empirical and theoretical advances on the joint effects of leaders' gender, self-efficacy, and organisational commitment on organisational citizenship behaviour (OCB) in the hotel industry, with job satisfaction as a mediating variable. Although the intersection of these leadership attributes has been explored at a basic level, emerging studies in hospitality contexts and developing economies, where cultural norms and institutional structures may uniquely condition leadership effectiveness, underscore the need for a more integrative understanding of their combined impact on employee discretionary behaviours.

### **2.1 Leadership Self-Efficacy and Organisational Citizenship Behaviour**

Leadership self-efficacy refers to a leader's belief in their ability to organise and execute the actions necessary to achieve designated goals (Bandura, 1997). Meta-analytic evidence shows that leaders who exhibit high self-efficacy demonstrate greater confidence, resilience, and adaptive problem-solving skills, thereby creating work environments that encourage employees to engage in discretionary, prosocial behaviours beyond their formal roles (Hannah et al., 2008; Paglis & Green, 2002; Ullah et al., 2021). According to Self-Efficacy Theory, leaders' beliefs in their own abilities influence both their personal performance and the attitudes and behaviours of their subordinates (Bandura, 1997). Consequently, a comprehensive assessment of OCB must consider how leadership self-efficacy interacts with other leadership attributes—such as organisational commitment—to influence employee outcomes.

Recent work by Kim et al. (2025) extends this perspective by demonstrating that transformational and ethical leadership positively influence OCB through a sequential process in which change-related self-efficacy enhances leader–member exchange (LMX), which in turn mediates the leadership–OCB link. Specifically, employees' self-efficacy concerning organisational change moderates how leadership style translates into high-quality LMX relationships, ultimately driving OCB (Kim et al., 2025). This moderated-mediation model underscores the need to consider self-efficacy not as an isolated trait but as part of a dynamic interplay with relational resources that collectively foster OCB. Moreover, Lim et al. (2025) reported that the leader-member relationship contributes to service-oriented organisational citizenship behaviour.

### **2.2 Leader Commitment and Organisational Citizenship Behaviour**

Leader commitment denotes the degree of dedication and loyalty that leaders exhibit toward their organisation's mission, values, and objectives (Meyer & Allen, 1991). Committed leaders consistently engage with organisational goals, cultivate trust among employees, and instil a shared sense of purpose—factors that strengthen employees' psychological attachment to the organisation and their willingness to exceed formal job expectations (Ricketta, 2002). While the conceptual linkage between leader commitment and OCB is well established, empirical studies in the hospitality sector of developing economies remain

scarce. Local research in higher education indicated that leadership, specifically servant style, correlated positively and significantly with OCB (Mesfin, 2023). This study further reports that 33.4% of the variance in OCB was accounted for by servant leadership. Given the industry's reliance on service excellence and employee engagement as competitive advantages, elucidating how leader commitment drives OCB holds both theoretical and practical significance.

A review of leadership in hospitality highlights that servant, transformational, and ethical leadership consistently point to leader commitment as a key antecedent of OCB, though empirical studies in emerging markets remain sparse (Guchait et al., 2023). In particular, Guchait et al. (2023) identify organisational commitment as a mediator in several hospitality-focused models, suggesting that future research should measure leader commitment alongside self-efficacy to untangle their unique and joint contributions to OCB.

### **2.3 Leader Gender and Leadership Effectiveness**

Role Congruity Theory argues that societal gender-role expectations shape perceptions of leaders and thereby influence employee responses to different leadership styles (Eagly & Karau, 2002). Meta-analytic evidence suggests that female leaders often display higher emotional intelligence, more participatory decision-making, and more supportive communication styles, which can enhance job satisfaction and OCB (Eagly & Johnson, 1990; Paustian-Underdahl et al., 2014). However, other research indicates that gender alone has minimal predictive power for leadership outcomes, implying that psychological and behavioural characteristics may exert a stronger influence than demographic traits (Paustian-Underdahl et al., 2014). These mixed findings underscore the need to explore mediating mechanisms—such as job satisfaction—that clarify how leader demographics translate into employees' voluntary behaviours.

Field experimental evidence by Haeckl and Onozaka (2025) confirms that while female leaders engage in more communal behaviours—such as elaborating on team ideas and using affirmative language—male and female leaders achieve comparable team performance. Notably, followers grant male leaders a “communality bonus” when communal behaviours are displayed, highlighting a gendered evaluative bias (Haeckl & Onozaka, 2025). Such findings call for exploring mediators—such as job satisfaction—that clarify how gender-linked behaviours translate into OCB, irrespective of evaluative biases.

## 2.4 Job Satisfaction as a Mediating Variable

Job satisfaction, defined as employees' affective evaluation of their work experiences, is a robust antecedent of OCB (Judge, Thoresen, Bono, & Patton, 2001; Organ & Ryan, 1995). According to Affective Events Theory, leaders' behaviours generate work-related emotional experiences that subsequently influence discretionary work behaviours (Weiss & Cropanzano, 1996). Employee job satisfaction can be enhanced by leaders who exhibit strong organisational commitment and high self-efficacy, which, in turn, encourages higher levels of OCB (Ullah et al., 2021). The effects of organisational justice on organisational citizenship behaviour are mediated by employee job satisfaction, according to a local study conducted at higher education institutions, another service-providing organisation (Ayalew & Walia, 2024). Organisations with leaders who uphold fairness and justice, which signify leader commitment and self-efficacy, are more likely to foster an appealing and fulfilling work environment for their staff, which in turn encourages organisational citizenship behaviour.

This model is expanded by Urbini et al. (2023), who find that organisational identification partially mediates the relationship between intrinsic job satisfaction and two types of OCB: towards the organisation and towards individuals. They show that contented workers become more identified with the organisation, which in turn encourages OCB (Urbini et al., 2023). According to this perspective, OCB is influenced by job satisfaction via a variety of psychological processes. According to Geremias et al. (2025), job satisfaction and self-efficacy are important mediators of the relationship between work-family conflict and the intention to leave one's job. Leaders' interventions to reduce employees' workloads and improve their job attitudes may be crucial in this regard.

## 2.5 Research Gap and Contextual Relevance

Despite the expanding literature on leadership and OCB, few studies have simultaneously examined the influence of leader self-efficacy, leader commitment, and leader gender on OCB, with job satisfaction as a mediating variable, particularly in the hotel industry. This gap is even more pronounced in developing countries such as Ethiopia, where cultural norms, gender role expectations, and workplace structures may interact in unique ways to shape leadership effectiveness and employee discretionary behaviour (Tlaiss & Elamin, 2015; Guchait & Cho, 2010; Ayalew & Walia, 2024). Addressing this gap, the present research proposes an integrative model that positions leaders' self-efficacy, commitment, and gender as antecedent variables, employee job satisfaction as a mediator, and OCB as the outcome, thereby offering new empirical and theoretical insights into leadership dynamics in the hospitality sector.

## 2.6 Conceptual Framework

The study examines how leaders' gender, commitment, and self-efficacy jointly impact employees' organisational citizenship behaviour—both directly and indirectly—through the mediating role of job satisfaction, which underpins the conceptual framework. High self-efficacy leaders are more likely to exhibit self-assurance, perseverance, and problem-solving skills, all of which improve workers' perceptions of their own competence and support, which in turn, enhances employees' job satisfaction and, ultimately, OCB. Likewise, leaders who demonstrate a strong organisational commitment raise staff morale and voluntary involvement by modelling devotion and dedication and fostering a sense of purpose. Gender is regarded as both a demographic factor that can affect how leadership behaviour is perceived and a possible predictor of relational dynamics, which, in turn, is



Figure 1. The conceptual model to be tested in the study

assumed to affect organisational citizenship behaviours and employee happiness. To describe how leadership qualities and OCB relate in the hotel industry, the model combines theories of self-efficacy, role congruity, affective events, social exchange, and leader-member exchange. In this framework, job satisfaction serves as the key psychological state that translates leadership qualities into improved employee citizenship behaviours. The conceptual framework provides a logical explanation of how leaders' psychological and demographic variables can lead to employees' constructive discretionary behaviours in service-oriented organisational settings, such as hotels. A conceptual model is proposed and tested in this study to close this gap, with leaders' self-efficacy, leadership commitment, and gender as predictors, employee job satisfaction as a mediator, and OCB as the outcome.

### 3. Methods of the Research

To examine the effects of leaders' gender, commitment, and self-efficacy on Organisational Citizenship Behaviour (OCB), with employee job satisfaction functioning as a mediating factor, this study employed a quantitative, explanatory design and a structured survey. The study focused on exploring how selected leadership characteristics influence employees' discretionary behaviours and general job satisfaction in the hotel industry.

#### 3.1 Sampling Techniques

To ensure a representative sample of hotel staff across a range of hotel categories (one-star to five-star), the study used stratified random sampling.

The list of hotels was obtained from an appropriate agency in charge of tourism and hospitality, i.e., the Ministry of Tourism. Hotels were sorted from the list by star rating. Firstly, the hotels were selected using a stratified random sampling technique. Based on their strata sizes, hotels were randomly selected from each category to participate in the research. Staff members from the front desk, housekeeping, food and beverage, and administrative departments of those selected hotels were then selected at random. Finally, 373 hotel workers in all were involved in the study.

Permissions were obtained from hotel management prior to data collection, and ethical principles, such as confidentiality and informed consent, were closely followed. Participants were briefed on the purpose of the study and assured that their responses would be used solely for academic research.

#### 3.2 Data Collection Instruments

The development process began with an extensive literature review to identify existing scales and items relevant to each construct. Where appropriate, items from established instruments were adapted to fit the specific context of the hotel industry. For instance, items measuring leaders' self-efficacy and commitment were tailored to reflect behaviours and attitudes pertinent to hotel leadership roles. Similarly, items assessing employee job satisfaction and OCB were contextualised to capture the unique aspects of the hospitality work environment.

The instrument included four major sections measuring leaders' self-efficacy, leaders' commitment, employee job satisfaction, and organisational citizenship behaviour. Participants responded to each item using a five-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"), for positively worded items. In contrast, negatively worded items were reverse-coded to ensure consistent interpretation and to minimise potential acquiescence or response bias.

Crucially, the measurement of leaders' self-efficacy and leaders' commitment was based on employees' ratings of their immediate supervisors or organisational leaders. Employees were asked to evaluate the extent to which they perceived their leaders as confident, capable, and goal-oriented.

Leaders' self-efficacy was operationally defined as the degree to which hotel employees viewed their leaders as possessing the confidence and capacity to guide, influence, and manage effectively. The internal consistency of the 25-item scale measuring this construct was excellent, with a Cronbach's alpha of 0.943.

Similarly, leaders' commitment was assessed through employee perceptions, focusing on the leaders' emotional investment in the organisation, consistency in pursuing long-term goals, and alignment with organisational values. This construct was measured using a 25-item scale with a reliability coefficient of 0.939, indicating strong internal consistency.

Organisational citizenship behaviour, as the primary dependent variable, was defined as employees' voluntary and constructive behaviours that support the social and psychological environment of the organisation beyond formal role requirements. The scale measuring OCB included 25 items assessing behaviours such as altruism, conscientiousness, and civic virtue. This measure demonstrated high internal consistency, with a Cronbach's alpha of 0.940.

Employee job satisfaction was conceptualised as the overall affective evaluation of one's job and workplace, encompassing satisfaction with supervision, tasks, working conditions, relationships, and growth opportunities. The 25-item job satisfaction scale had a reliability coefficient of 0.933, supporting its adequacy for capturing the emotional and cognitive dimensions of job satisfaction.

In addition to these psychological constructs, the variable of leaders' gender was included to examine whether leaders' gender differentially affected the relationships among the other variables. Gender was coded dichotomously, with 0 representing female leaders and 1 representing male leaders, based on employee reports. This enabled the analysis of gender as an explanatory variable in the leadership-outcome relationships examined in the study.

### **3.3 Data Collection Procedures**

The data for this study were systematically planned and collected to ensure reliability, validity, and ethical integrity. Prior to the commencement of data collection, ethical clearance was obtained from the appropriate institutional review board. This approval confirmed that the study met all necessary ethical standards regarding voluntary participation, informed consent, confidentiality, and the responsible use of data.

In-person questionnaires were distributed by trained data collectors who had received orientation on the study's objectives, ethical issues, and data-collection procedures. In situations where scheduling or operational limitations precluded personal presence, the questionnaires were disseminated via the hotels' internal administrative channels, accompanied by return envelopes and explicit instructions to ensure confidentiality. A cover letter was sent to each respondent stating the study's objectives, their right to participate or decline to participate in the study, the expected time to complete the questionnaire (25-30 minutes), and the guarantee of anonymity. To maintain anonymity, no employee names, ID numbers or other personal identifiers were recorded.

The questionnaire was distributed to participants to complete independently, with emphasis on trustworthy, accurate answers. They were informed that the data they provided would not be shared with hotel management and would only be used for academic research. Throughout the data collection process, the researcher and data collectors were on hand to address any questions participants had

about item interpretations, particularly those related to conceptual complexity or ambiguity. Questionnaires were entered into data analysis after verification for completeness and consistency to ensure quality and optimise the validity and reliability of the findings. Questionnaires with clear systematic response patterns (e.g., the same rating for each item) or those with substantial incompleteness were excluded from the study.

### **3.4 Data Analysis Methods**

Based on the research objectives and the conceptual framework that shows relationships among the variables, a combination of descriptive and inferential statistical techniques was used to analyse the data. To ensure the data were correct, complete, and suitable for statistical analysis, the data were screened and cleaned before the primary analysis. This procedure included identifying inconsistencies, outliers, and missing values in the participants' responses. Data were coded and then analysed using the Statistical Package for the Social Sciences (SPSS) following screening. AMOS was used to conduct Structural Equation Modelling (SEM) to test the conceptual framework of the study.

Descriptive statistics, specifically mean and standard deviation, were computed to examine the level of each construct. This was done to determine the degree of leaders' and employees' characteristics on those measured variables. The hypothesised relationship between variables and the effects they were presumed to have were tested using inferential statistics. Zero-order correlation between leaders' commitment, self-efficacy, employee job satisfaction, and organisational citizenship behaviour was first examined by computing Pearson's correlation coefficients. This statistic provided an initial understanding of the relationships between the variables. To investigate the independent and combined contributions of the variables to OCB variance, a regression analysis was performed. Structural Equation Modelling (SEM) was employed to examine the direct, indirect, and total effects of the independent variables on the dependent variables, as proposed in the conceptual framework. The assumptions of normality, linearity, multicollinearity, and homoscedasticity were examined before SEM was calculated. A variety of fit indices were used to evaluate the model's fit, which include Standardised Root Mean Square Residual (SRMR), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), Chi-square statistic, and Comparative Fit Index (CFI). CFI and TLI values above

0.90, RMSEA below 0.08, and SRMR below 0.08 were all considered acceptable thresholds for model fit.

#### 4. Results

The purpose of this study was to examine the direct and indirect effects of leaders' gender, leader commitment, and leader self-efficacy on employees' Organisational Citizenship Behaviour (OCB), with employee job satisfaction serving as a mediating variable. In this section, the results are presented and analysed using different statistical methods.

##### 4.1 Relationships among the Variables

Table 1 presents the descriptive statistics and intercorrelations among all variables in the study. Results indicated that leader gender was not associated with the other variables at a statistically significant level, suggesting that leadership effectiveness in this context is determined more by psychological traits than by leaders' demographic characteristics.

Notably, leaders' commitment was strongly and positively related to leader self-efficacy ( $r = 0.697, p < 0.001$ ), suggesting a robust interplay in which leaders who feel competent (i.e., self-efficacious) tend to be more dedicated to their organisations. Furthermore, leader commitment showed strong positive associations with both employee job satisfaction ( $r = 0.574, p < 0.001$ ) and OCB ( $r = 0.561, p < 0.001$ ). Similarly, leader self-efficacy was significantly correlated with employees' job satisfaction ( $r = 0.572$ ) and OCB ( $r = 0.509$ ).

These correlations provide initial evidence that leaders who perceive themselves as competent and confident tend to foster an environment where employees are not only more satisfied but are also more willing to engage in discretionary, extra-role behaviours.

##### 4.2 Regression Analysis

To determine the predictive power of leader gender, self-efficacy, commitment, and employee job satisfaction on OCB, a multiple regression analysis was run (Table 2). The model was statistically significant ( $F=65.454, p < 0.001$ ) and the variables jointly accounted for approximately 42% of the variance in Organisational Citizenship Behaviour ( $R^2=0.416$ ). This value highlights the model's practical utility in explaining why employees engage in helping behaviours.

An examination of the individual variables' predictive power showed that employee job satisfaction emerged as the strongest positive influence ( $\beta = 0.344, p < 0.001$ ) on OCB. This confirms that the employee's psychological state is the most critical driver of OCB. Leaders' commitment also demonstrated a significant positive effect ( $\beta = 0.284, p < 0.001$ ), suggesting that visible leader dedication serves as a role model or motivating factor for staff. Leader self-efficacy had a smaller but still significant impact ( $\beta = 0.114, p = 0.050$ ). Consistent with the correlational results, leaders' gender was not a significant predictor of OCB.

**Table 1. Means, Standard Deviations, and Correlation Coefficients between the Variables**

Variables	Mean	SD	Variables			
			Gender	Commitment	Self-Efficacy	Job Satisfaction
Gender	0.62	0.485				
Commitment	106.52	12.501	0.002			
Self-Efficacy	105.46	12.227	0.002	0.697**		
Job Satisfaction	97.84	15.526	0.003	0.574**	0.572**	
OCB	110.53	11.309	-0.027	0.561**	0.509**	0.573**

**Table 2. A Model Summary of Regression Analysis of Leader and Employee Attributes on OCB**

Variables	Regression Coefficient (b)	Std. Error	Beta Coefficient	t-values
(Constant)	47.874	4.267		11.219**
Leaders Gender	-0.666	0.929	-0.029	-0.717
Leader Commitment	0.257	0.053	0.284	4.882**
Leader Self-Efficacy	0.106	0.054	0.114	1.969*
Job Satisfaction	0.251	0.037	0.344	6.759**

$R^2 = 0.412$ ,  $F = 65.454$ ,  $df1 = 4$ ,  $df2 = 368$ ,  $p = 0.000$ ; \* $p = 0.050$ , \*\* $P = 0.000$ .

**4.3 Structural Equation Modelling (SEM)**

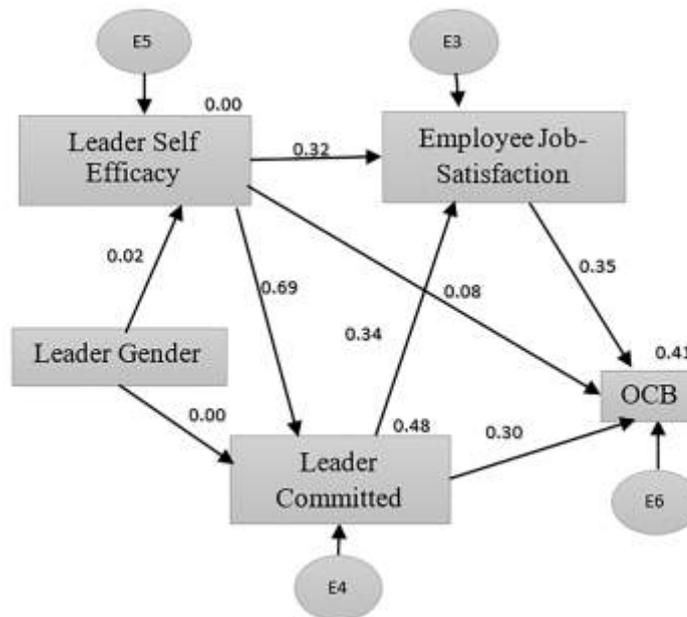
The study utilised SEM to test the hypothesised conceptual framework, to examine the direct and indirect effects of leader commitment and self-efficacy on OCB, and the mediating role of employee job satisfaction.

**4.3.1 Initial Model Assessment**

The initially hypothesised model—which included leader gender—failed to fit the observed data. The chi-square value was statistically significant ( $p^2 = 361.412$ ,  $df = 3$ ,  $p < 0.001$ ), and the ratio of chi-square to degrees of freedom ( $p^2/df = 120.471$ ) far exceeded the acceptable threshold of

3.0. Furthermore, comparative fit indices (CFI = 0.395, TLI = -1.016) were much below the required 0.90 standard, and the Root Mean Square Error of Approximation was high and significant (RMSEA = 0.569,  $p > 0.05$ ), indicating a poor error of approximation.

The primary source of this poor fit was the inclusion of leader gender. The path analysis revealed that leader gender had virtually no effect on leader self-efficacy ( $\beta = 0.019$ ) or leader commitment ( $\beta = 0.002$ ). Because these paths added no explanatory value and introduced estimation instability, the model was modified by removing leader gender to achieve parsimony and statistical accuracy.



Note: Numbers on the right corner of the boxes indicate coefficient of determination

**Figure 2. The conceptual model tested using Structural Equation Modelling**

### 4.3.2 Modified Model Assessment

The modified model (Figure 3), which focused on the interrelationships between leader self-efficacy, leaders' commitment, employee job satisfaction, and OCB, demonstrated an excellent fit to the data.

The chi-square statistic for the modified model was non-significant ( $\chi^2 = 2.103$ ,  $df = 1$ ,  $p = 0.147$ ), indicating no significant difference between the model and the observed data. The ratio of 2.103 fell within the ideal range. All fit indices improved drastically, exceeding the 0.95 threshold for good fit (CFI = 0.998, TLI = 0.989, IFI = 0.998, NFI = 0.997). The RMSEA dropped to 0.055 ( $p = 0.320$ ), and the Standardised Root Mean Square Residual (SRMR) was 0.0128, confirming the model's robustness.

### 4.3.3 Path Analysis and Direct/Indirect Effects

Examination of the structural paths in the modified model revealed significant interrelationships among leadership attributes, employee job attitudes, and organisational citizenship behaviour (OCB). First, leader self-efficacy emerged as a robust predictor of leader commitment ( $\beta =$

0.690,  $p < 0.001$ ). This strong positive association suggests that leaders' perceived competence is intrinsic to their organisational dedication; as leaders' confidence in their capabilities increases, so too does their emotional and cognitive attachment to the organisation.

Regarding employee outcomes, both leader self-efficacy ( $\beta = 0.321$ ,  $p < 0.001$ ) and leader commitment ( $\beta = 0.343$ ,  $p < 0.001$ ) significantly and positively predicted employee job satisfaction. These findings indicate that leadership attributes—specifically confidence and dedication—are critical antecedents to favourable employee attitudes. A leader's demonstrated commitment appears to foster a supportive work environment that directly enhances subordinate satisfaction.

Fundamentally, the model elucidated the determinants of OCB. Employee job satisfaction exerted a significant direct effect on OCB ( $\beta = 0.372$ ,  $p < 0.001$ ), confirming its role as a proximal determinant of discretionary behaviour. Furthermore, leader commitment demonstrated a direct positive association with OCB ( $\beta = 0.345$ ,  $p < 0.001$ ).

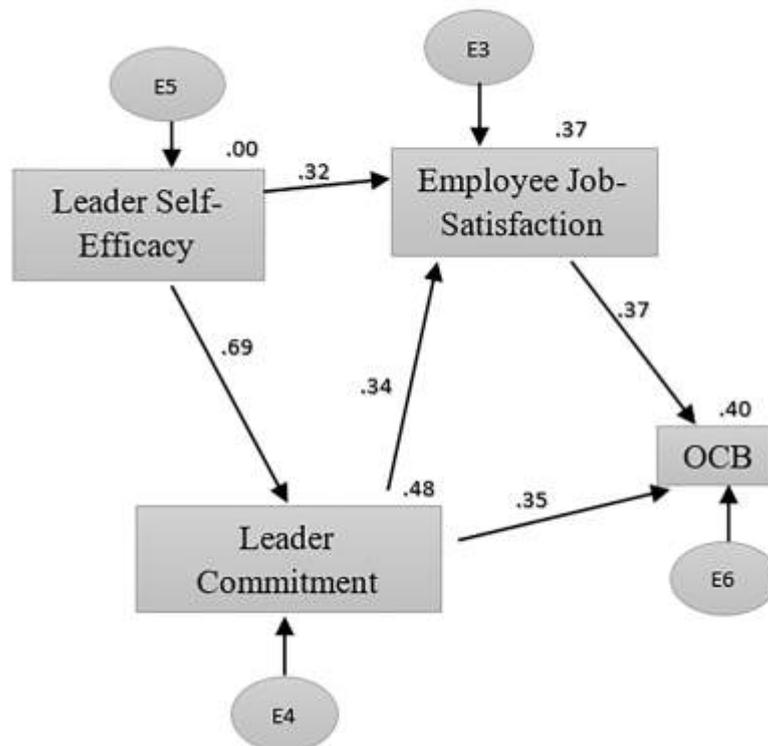


Figure 3. The revised and final model that satisfactorily fits the data

The analysis of indirect effects highlighted the mediating mechanisms within the model. While leader self-efficacy did not have a direct path to OCB in the modified model, it exerted a substantial indirect effect ( $\beta$ -indirect = 0.446). This underscores a serial process wherein leader self-efficacy enhances leader commitment, which subsequently fosters employee job satisfaction, ultimately manifesting in increased organisational citizenship behaviours. Thus, while leader self-efficacy serves as an initiating factor, its influence on employee discretionary behaviour is fully transmitted through leader commitment and employee job satisfaction.

**4. Discussion**

This study examined the degree to which organisational citizenship behaviour (OCB) and employee job satisfaction in the hotel industry are impacted by the gender, self-efficacy, and commitment of leaders. The results provide valuable insights into how leadership qualities influence employee attitudes and discretionary actions, especially in a people-driven and service-intensive industry like hospitality. One important finding was that OCB, employee job satisfaction, self-efficacy, and leader commitment were not significantly influenced by the gender of the leader. This finding aligns well with a growing body of research showing that gender alone is not a determinant of leadership effectiveness (Eagly & Carli, 2003; Paustian-Underdahl et al., 2014). While gender-role theory historically suggested that men and women may exhibit different leadership tendencies—men leaning toward task orientation and women toward relational approaches (Nyquist & Spence, 1986)—meta-analytical evidence has consistently found minimal differences in actual

performance when situational factors and leadership behaviours are taken into account (Eagly et al., 2003). In the hotel sector, this suggests that leadership success depends less on demographic characteristics and more on adaptive capabilities, emotional intelligence, and the ability to foster collaboration (Brownell, 2010). This finding, therefore, reinforces the ongoing shift from trait-based to behaviour-based leadership models (Northouse, 2021).

While gender did not emerge as a predictor, leader self-efficacy demonstrated a strong and significant influence on leader commitment, which in turn shaped employee outcomes. Consistent with Bandura's (1997) social cognitive theory, self-efficacy enhances motivation, perseverance, and problem-solving—qualities particularly crucial in hospitality, where leaders must respond to guest concerns, manage diverse teams, and adapt to fluctuating operational demands. A recent study supported this claim, where leaders' self-efficacy influences job satisfaction, while job satisfaction strongly mediates the relationship between leadership and performance (Utomo et al., 2025). Leaders with higher self-efficacy tend to act proactively, mentor effectively, and create psychologically safe environments (Avolio & Gardner, 2005), all of which reinforce their personal commitment to organisational goals. This commitment subsequently strengthens employee satisfaction and OCB, indicating a chain of influence that begins with a leader's belief in their own capabilities.

The role of leader commitment further highlights the relational and motivational aspects of effective hospitality leadership. Building on transformational and authentic leadership theory (Bass & Riggio, 2006; Luthans & Avolio,

**Table 3. Standardised Direct, Indirect and Total Effects of the Independent Variables on OCB**

	Effects of								
	Direct			Indirect			Total		
	LSE	LC	EJS	LSE	LC	EJS	LSE	LC	EJS
on LC	0.690	0.000	0.000	0.000	0.000	0.000	0.690	0.000	0.000
on EJS	0.321	0.342	0.000	0.236	0.000	0.000	0.557	0.342	0.000
on OCB	0.000	0.348	0.369	0.446	0.126	0.000	0.446	0.474	0.369

*Note: LC = Leader Commitment, LSE = Leader Self-Efficacy, EJS = Employee Job Satisfaction, OCB = Organizational Citizenship Behavior*

2003), committed leaders act as role models, articulate a compelling vision, and invest in employee well-being. Such behaviours are interpreted by employees as signals of organisational stability and support, fostering trust and morale. In turn, these perceptions encourage employees to engage in discretionary behaviours that go beyond their formal duties (Chiang & Hsieh, 2012). In this way, leader commitment serves as both a personal driver of persistence and a relational catalyst for team engagement.

Importantly, this study found that employee job satisfaction mediated the relationship between leadership factors and OCB, underscoring its central role in the leadership–behavior pathway. From Herzberg's motivation-hygiene perspective (Herzberg et al., 1959), satisfaction stems from intrinsic motivators such as recognition, growth, and achievement—conditions leaders can actively foster. Complementarily, social exchange theory (Blau, 1964) explains that when employees experience fair treatment, developmental opportunities, and supportive supervision, they are more inclined to reciprocate through positive extra-role behaviours. In the hospitality context, such OCB—whether in the form of helping colleagues, taking initiative, or showing conscientiousness—directly contributes to service consistency and customer satisfaction (Tsaor & Lin, 2004).

Taken together, these findings point to a consistent narrative: effective leadership in hotels is defined less by who leaders are and more by what they believe and how they behave. Self-efficacy drives commitment, commitment fuels job satisfaction, and satisfaction, in turn, fosters OCB. For hotel organisations, this means that leadership development should extend beyond operational training to include psychological skill-building—such as resilience training, confidence-enhancing experiences, and emotional intelligence development. Likewise, human resource strategies should treat job satisfaction as a strategic lever for service excellence, incorporating elements such as job design, feedback mechanisms, career development opportunities, and work–life balance (Chiang et al., 2005).

This study supports the integration of Herzberg's framework, social cognitive theory, and social exchange theory in order to understand the effects of leadership on employee behaviours. It adds significantly to the literature on hospitality leadership by validating a structural model that incorporates both leader-level and employee-level constructs, with job satisfaction serving as a crucial mediator. Overall, this study demonstrated how gender, leader commitment, and leader self-efficacy interact to

influence organisational citizenship behaviour and employee job satisfaction in the hotel sector. The results show that predicting a leader's effectiveness does not depend on their gender. Rather, self-efficacy and commitment were found to be important motivators, and job satisfaction was found to be the key mechanism by which leadership affects employees' discretionary actions.

Practically, the study highlights the importance of leadership development programs that extend beyond operational skills to cultivate psychological strengths such as self-efficacy, resilience, and emotional intelligence. Equally, hotels must treat employee job satisfaction as a strategic priority, embedding recognition, growth opportunities, and work–life balance into their organisational culture to foster OCB and sustain service excellence.

Though the results of this study are informative, there are limitations that need to be mentioned here. Effective hospitality leadership is not about who leaders are, but what they believe and how they behave. The study did not address other factors that could be critical in affecting the performance of the hotel industry. It also uses only a quantitative approach to see the relationships among the variables. Hence, future research should explore contextual moderators—such as organisational culture and market dynamics—to assess the robustness of these findings, while incorporating multi-method approaches to capture the complexity of leadership in action. By focusing on competence and commitment over demographic characteristics, hotel organisations can foster inclusive, high-performing, and resilient leadership for the challenges ahead.

### Conflict of Interest

The authors of this study declared that there is no conflict of interest with any party.

### Data Availability Statement

I confirm the data availability of my study, where I can submit the data upon reasonable request by the publisher.

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# Navigating Profitability and Assessing Impact through Strategic Working Capital Management in the Indian Auto Industry

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## A b s t r a c t

Maintaining profitability is very important for every organisation; without it, a company cannot survive in the long term. Effective working capital management can improve the profitability of firms. Company managers have to make long-term and short-term decisions, and both are equally important. Decisions regarding working capital are usually seen as short-term. Effective management of working capital is critical in the short term to maintain liquidity, ensure the availability of raw materials, manage inventory, etc. Various studies have been conducted to examine the effect of working capital management on profitability. In this study, we discuss the impact of working capital management on profitability (ROA and ROE have been taken as proxies for profitability). We collected data from 15 companies listed in the NIFTY auto indices for a period from 2012 to 2023. In this study, we examined the relationship between the financial performance of Indian auto industry companies included in the NIFTY auto indices from 2012 to 2023 and their working capital components. To account for the non-normality and multicollinearity of the data, we used Generalised Linear Models (GLMs). The findings showed that different factors, such as firm size (FS), sales growth (SG), cash conversion cycle (CCC), and current ratio (CR), had distinct effects on profitability measures, including return on equity (ROE) and return on assets (ROA). Although the study identified some correlations, it also showed that other unaccounted-for factors might more significantly impact profitability. Current and prospective investors, as well as companies in this sector, can benefit greatly from the insights this research provides.

**Keywords:** Working Capital Management; Cash Conversion Cycle; Profitability; Generalised Linear Model; Indian Automotive Industry; Financial Performance

## 1. Introduction

Working Capital Management is the process by which management seeks to ensure that the organisation operates efficiently and effectively by monitoring and utilising its current assets and liabilities in the best possible manner. The main objective of working capital management is to enable the company to maintain sufficient cash to pay its short-term obligations and to meet routine expenditures. The concept of working capital focuses on managing short-term working capital, with the main objective of increasing profitability and shareholder value (Kafeel et al., 2020). In accounting, working capital is the difference between current assets and current liabilities, where current assets are those assets that are expected to be realised within the normal operating cycle of the business, generally within twelve months, and current liabilities are those that are expected to be settled within the normal operating cycle of the business. Here, it is necessary to note that effective working capital management balances current assets and current liabilities so that a sufficient amount of cash remains positive to meet short-term obligations and other routine expenses. Apart from the above, working capital management must be at an optimum level, neither too large nor too small for its requirements. A large amount of working capital may be idle. Since every fund incurs a cost, the company has to pay an additional fee per fund, which may reduce its profitability. On the other hand, if companies have inadequate working capital, which may expose them to insolvency risk, they may not be able to meet their short-term liabilities. They may fail to meet customer demand due to insufficient funds, leading to a loss of market share. Companies with lower current assets and funds face difficulties maintaining the smooth operation of their businesses (Van, 2000). That is why, sometimes, an inaccurate estimate of working capital management or inaccurate decisions regarding working capital may lead to bankruptcy, even when profitability is constant (Samiloglu, 2008). The scope of working capital management can be divided into (i) profitability and liquidity: It is critical to keep liquidity at an ideal level to prevent adversely affecting profitability for the smooth operation of normal business activities. A trade-off between liquidity and profitability is necessary given these considerations. (ii) Investment and Financing: Here, firms must determine the amount of cash needed to invest in current assets. Here, the quantity invested in current assets differs by industry and is influenced by several variables, including the company's character, the type of its goods, credit policy, the business

cycle, etc. The working capital investments made and the financing strategy used greatly influence its profitability (Morshed, 2020).

Effective working capital management calls for careful planning and controlling the elements of current liabilities and assets in a way that lowers the risk of a company's inability to achieve the ideal level of working capital without running out of money to pay short-term obligations or investing excessively in current assets like inventory (Eljelly, 2004). Managing all aspects of working capital simultaneously is the most effective strategy to improve a company's profitability (Viskari et al., 2012). A drastic shortening of payment terms would also boost profitability. Manufacturing companies require firm working capital plans for each component. Additionally, effective working capital management and financing (current assets and current liabilities) can boost the operating profitability of manufacturing companies (Stephen & Elvis, 2011).

### 1.1 Theoretical and Empirical Perspective

Working capital management is a significant area of financial management, and many theoretical frameworks and models have been developed in this field.

The Investigation on "Working Capital Management and its Impact on Profitability: Evidence from the Indian Auto Industry" has important theoretical ramifications. This study broadens the application of financial management concepts to a particular sector by analysing the Indian auto industry within the context of financial management theory (Viskari et al., 2012). By shedding light on how working capital allocation tactics affect profitability in the Indian auto sector, the investigation also adds to the body of knowledge around resource allocation theory (Brealey et al., 2017). The results can also be viewed in light of the trade-off theory, which emphasises the need for working capital management that balances profitability and liquidity (Myers, 1984).

The study is connected to the larger field of financial risk management through an understanding of the function of working capital management in reducing financial risk, which could help Indian car businesses improve their long-term sustainability (Hull, 2017). Additionally, research on corporate reporting regulation aligns with examining how industry-specific rules and government policies affect working capital management and profitability (Leuz, 2010). Last but not least, the paper examines competitive strategies for Indian automakers, focusing on the resource-based view of the firm and its implications for long-term competitive

advantage (Barney, 1991). With insights into the Indian auto industry's finances, strategy, and regulatory compliance, these theoretical implications lay a solid framework for further study.

The aforementioned theories are widely used, and all aim to boost a company's profitability by shortening the length of the operating cycle and maintaining a suitable level of working capital.

## 2. Related Studies, Objectives, Hypothesis, and Methodology

### 2.1 Theoretical Foundation

Working capital management (WCM) is a critical aspect of corporate financial strategy that balances liquidity and profitability. Theoretically, it is rooted in the trade-off theory (Myers, 1984), which emphasises maintaining sufficient liquidity to avoid insolvency while minimising the opportunity cost of holding excess current assets. According to the resource-based view (Barney, 1991), efficient management of working capital constitutes a valuable internal resource that can enhance competitive advantage and firm value. Furthermore, financial risk management theory (Hull, 2017) highlights that effective liquidity control mitigates the risk of cash shortages and promotes long-term solvency.

Within this framework, optimal WCM seeks to shorten the operating cycle and improve asset turnover without jeopardising operational continuity. As noted by Eljelly (2004) and Stephen and Elvis (2011), the ability of firms to maintain adequate liquidity while optimising receivables, inventory, and payables directly contributes to profitability.

#### *a. Empirical Evidence from Prior Research*

The literature on WCM and profitability has expanded significantly across countries, industries, and time periods. Kafeel et al. (2020) argued that the primary objective of WCM is to enhance profitability while maintaining liquidity, demonstrating that reducing the cash conversion cycle (CCC) increases shareholder value. Similarly, Paul and Mitra (2018) found that profitability improves when firms invest in productive assets and manage credit sales effectively, confirming that liquidity and profitability are complementary when managed efficiently.

A seminal study by Deloof (2003) analysed 1,009 large Belgian firms and found a significant negative relationship

between accounts receivable days and profitability. This result was later supported by Raheman and Nasr (2007) and Lazaridis and Tryfonidis (2006), who confirmed that liquidity and profitability are inversely associated. Jaworski and Czerwonka (2022) extended this analysis to Polish firms and reported a negative linear relationship between CCC and profitability, whereas Fernández-López et al. (2020) found that inventory holding days adversely affected profitability in the European food sector.

On the contrary, some studies observed a positive linkage between efficient WCM and profitability. Deari et al. (2022) demonstrated that firms across the European Union improved profitability through optimised receivable and inventory policies. Similarly, Rey-Ares et al. (2021) found that the profitability of Spanish fish-canning companies was significantly influenced by the collection period (Days Sales Outstanding) and the inventory conversion period, suggesting a convex relationship between inventory and profitability.

In the Indian context, Paul and Mitra (2018) examined the steel industry (2000–2016) and found that current ratio, quick ratio, and turnover ratios had significant effects on return on total assets. Mahato (2016) examined the telecom sector (2010–2015) and found that ROA was negatively associated with ICP, ACP, CCC, and CR, but positively associated with APP, the debt ratio, and firm size. Similarly, Agha (2014) studied GlaxoSmithKline (1996–2011) and found that reducing inventory and receivable turnover enhanced profitability, though changes in the current ratio were statistically insignificant.

Across emerging markets, results have been mixed. Ponsian et al. (2014), studying Tanzanian manufacturing firms, found that CCC and profitability were positively related, whereas liquidity was negatively associated. Arshad and Gondal (2013) reported a significant negative correlation between WCM and profitability in Pakistan's cement sector. Pouraghajan et al. (2012) found that WCM significantly affected profitability and market evaluation for firms on the Tehran Stock Exchange, though not their Tobin's Q ratio.

Evidence from developed markets offers similar diversity. Baveld (2012), examining Dutch firms pre- and post-financial crisis, found that accounts receivable had a positive delayed impact on future profitability. Al-Debi'e (2011) observed that profitability in Jordanian industrial firms increased with firm size and GDP growth but decreased with leverage. In Asia, Dong and Su (2010)

confirmed a strong negative relationship between profitability and CCC among Vietnamese firms.

Earlier foundational work by Padachi (2006) on Mauritian SMEs and García-Teruel and Martínez-Solano (2007) on Spanish SMEs established that high investment in inventories and receivables reduces profitability, while shorter CCCs enhance it. Supporting evidence also comes from Kaddumi (2012), who emphasised that shortening cash and trade cycles increases firm profitability by holding less inventory and extending payment to suppliers.

Further, Gill et al. (2010) investigated 88 U.S. manufacturing firms and found a significant relationship between the CCC and profitability, indicating that optimal liquidity management contributes to higher earnings. Moreover, many studies identified that digitalised inventory and receivable systems enhance WCM efficiency in Indian firms, offering a modern technological perspective on traditional liquidity models.

Overall, the empirical consensus suggests that WCM impacts profitability across contexts, though the strength and direction of influence depend on industry characteristics, macroeconomic conditions, and firm-specific financial strategies.

#### *b. Contextual Gap: The Indian Automotive Sector*

Despite extensive research, few studies have examined WCM in India's automotive sector, which operates under long production cycles, complex supply chains, and high capital requirements. The firms listed in the NIFTY Auto Index are major players with standardised financial disclosures, making them an appropriate sample for consistent, comparable data. This study addresses a clear empirical gap by focusing on this sector and adopting a Generalised Linear Model (GLM). This technique effectively handles non-normal data and multicollinearity, both common in financial datasets.

#### *c. Objectives and Hypothesis of the Study:*

Several studies have highlighted the influence of working capital management (WCM) on corporate profitability, though the direction and magnitude of the effect differ across sectors and contexts. For instance, Deloof (2003) and Raheman and Nasr (2007) observed a negative relationship between the cash conversion cycle (CCC) and profitability, indicating that longer cycles reduce returns. Conversely, Kafeel et al. (2020) and Deari et al. (2022)

found a positive association between efficient WCM and firm performance, emphasising that liquidity optimisation enhances profitability.

These contrasting results highlight a theoretical trade-off between liquidity and profitability, aligning with Myers (1984) trade-off theory. Consequently, this study aims to examine whether the CCC significantly affects profitability (ROA and ROE) among firms in India's automotive sector, leading to the first hypothesis:

***H<sub>01</sub>: There is no significant relationship between the cash conversion cycle (CCC) and profitability (ROA, ROE).***

Further, Fernández-López et al. (2020) and Jaworski and Czerwonka (2022) reported that excessive inventory holding days lower profitability, while Padachi (2006) suggested that maintaining optimal inventory levels improves efficiency.

This evidence suggests that inventory management is a major determinant of profitability, especially in manufacturing-intensive industries. Therefore, this study investigates whether the inventory holding period (IHP) significantly influences profitability, forming the second hypothesis:

***H<sub>02</sub>: There is no significant relationship between the inventory holding period (IHP) and profitability.***

Similarly, Paul and Mitra (2018) demonstrated in the Indian steel industry that receivables management impacts profitability through credit policy and sales growth. However, Arshad and Gondal (2013) observed an inverse relationship between accounts receivable and profitability in Pakistan's cement sector. Building upon these mixed findings, the present study evaluates whether the average collection period (ACP) affects firm profitability, leading to the third hypothesis:

***H<sub>03</sub>: There is no significant relationship between the average collection period (ACP) and profitability.***

Finally, Mahato (2016) and Ponsian et al. (2014) found that longer payment periods (APP) can enhance profitability by improving short-term financing flexibility. To test whether this dynamic holds true in India's auto sector, the study proposes:

***H<sub>04</sub>: There is no significant relationship between the average payment period (APP) and profitability.***

In line with the above, this research aims to evaluate how these four working capital components collectively

influence profitability within the NIFTY Auto Index firms. It further considers control variables such as leverage, firm size, current ratio, and sales growth to ensure model robustness.

#### *d. Research Methodology and Model Formulation*

This part explains how the research was done. It covers picking samples, collecting data, and analysing stats.

This study obtained data from Indian auto industry companies that are constituents of the NIFTY Auto Index, a popular stock market index that tracks the performance of auto companies. Data covered the years 2012 to 2023. The primary data sources for this study included publicly available financial reports, such as annual financial statements, balance sheets, and income statements, which could be downloaded from the respective companies' official websites. Such financial reports provide detailed information on diverse financial metrics and performance indicators—such as inventory, accounts payable and receivable, return on equity (ROE), and other working capital management components—that are very useful for evaluating the effectiveness of different working capital management techniques on profitability.

To ensure the study remains flexible and accurate, 15 Indian firms were selected. The plan aimed to attract a diverse range of companies, categorised by size, market capitalisation, and financial performance. A different sample was chosen to enable the study's results to be applied to other cases and to address differences within the field. The selected firms were monitored over a significantly longer period, from early 2012 to late 2023, to identify any trends or fluctuations in their financial performance.

The study is deliberately restricted to companies listed under the NIFTY Auto Index, which comprises the leading automobile manufacturers and component producers in India. This index provides a representative sample of the automotive sector, characterised by standardised financial disclosures, transparent governance practices, and consistent data availability. By focusing on these firms, the study ensures sectoral homogeneity and minimises cross-industry variability that might otherwise distort the relationship between working capital management and profitability. Moreover, the NIFTY Auto Index companies reflect the financial and operational performance of India's organised automobile sector, making them ideal for empirical examination.

The Generalised Linear Model (GLM) was used to examine the relationships between various elements of working capital management and profitability indicators, i.e., ROA and ROE. GLM is often best described as an effective statistical method for count data in financial analysis. Specifically, estimates from Poisson regression models were obtained to demonstrate the effects that inventory holding period, average collection period, accounts payable turnover, and accounts receivable turnover exert on the dependent variables ROA and/or ROE. Python ran the data. Working capital management policies vary across industries, firm sizes, and economic conditions; hence, firms need to design the policies that best suit their particular situation and objectives.

The Generalised Linear Model (GLM) was used in this study because it offers greater flexibility for analysing financial ratios that do not follow a normal distribution and exhibit unequal variance. While GLM is commonly applied to count data, it can also be used for continuous variables when appropriate model specifications are applied. The use of GLM to model continuous dependent variables has been demonstrated in studies analysing skewed positive outcomes, such as insurance claim costs, using a Gamma regression specification, a type of GLM suitable for non-normal continuous response variables (Hayawi et al., 2025). Since ROA and ROE are continuous financial ratios and the data exhibit non-normality, GLM provides a robust framework for estimating their relationship with working capital variables. Preliminary diagnostics, including the Shapiro–Wilk test and correlation analysis, revealed deviations from normality and moderate multicollinearity among explanatory variables. Under such conditions, traditional Ordinary Least Squares (OLS) regression assumptions are violated, leading to inefficient and biased estimates. The GLM framework extends linear regression by allowing for flexible error distributions (non-normal) and link functions that better capture the structure of financial data. Consequently, GLM provides robust parameter estimation and improves the reliability of inferences regarding the relationship between working capital management and profitability. This approach aligns with prior research employing GLM in finance and accounting (e.g., Nguyen et al., 2020).

$$g(E[Y_i]) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} \dots \dots \dots \epsilon_i$$

$g(\cdot)$  is the link function.

$E[Y]$  is the expected value of the dependent variables.

*X* represents the independent variables

*B* represents the coefficients

The regression analysis that is used in this study is based on the following equations:

$$ROA = f(CR, SG, FS, NI, ACP, IHP, APP, CCC)$$

$$ROE = f(CR, SG, FS, NI, ACP, IHP, APP, CCC)$$

Model 1: (Profitability measured by ROA):

$$ROA_i = \beta_0 + \beta_1 (CR_i) + \beta_2 (LEV_i) + \beta_3 (SG_i) + \beta_4 (FS_i) + \beta_5 (ACP_i) + \beta_6 (IHP_i) + \beta_7 (APP_i) + \beta_8 (CCC_i) + \epsilon_i$$

$$ROE_i = \beta_0 + \beta_1 (CR_i) + \beta_2 (LEV_i) + \beta_3 (SG_i) + \beta_4 (FS_i) + \beta_5 (ACP_i) + \beta_6 (IHP_i) + \beta_7 (APP_i) + \beta_8 (CCC_i) + \epsilon_i$$

Where

*g*(·) is the link function.

*E*[ROA]/*E*[ROE] is the expected value of ROA and ROE

*CR, SG, FS, ACP, IHP, and APP* are used as the independent variables.

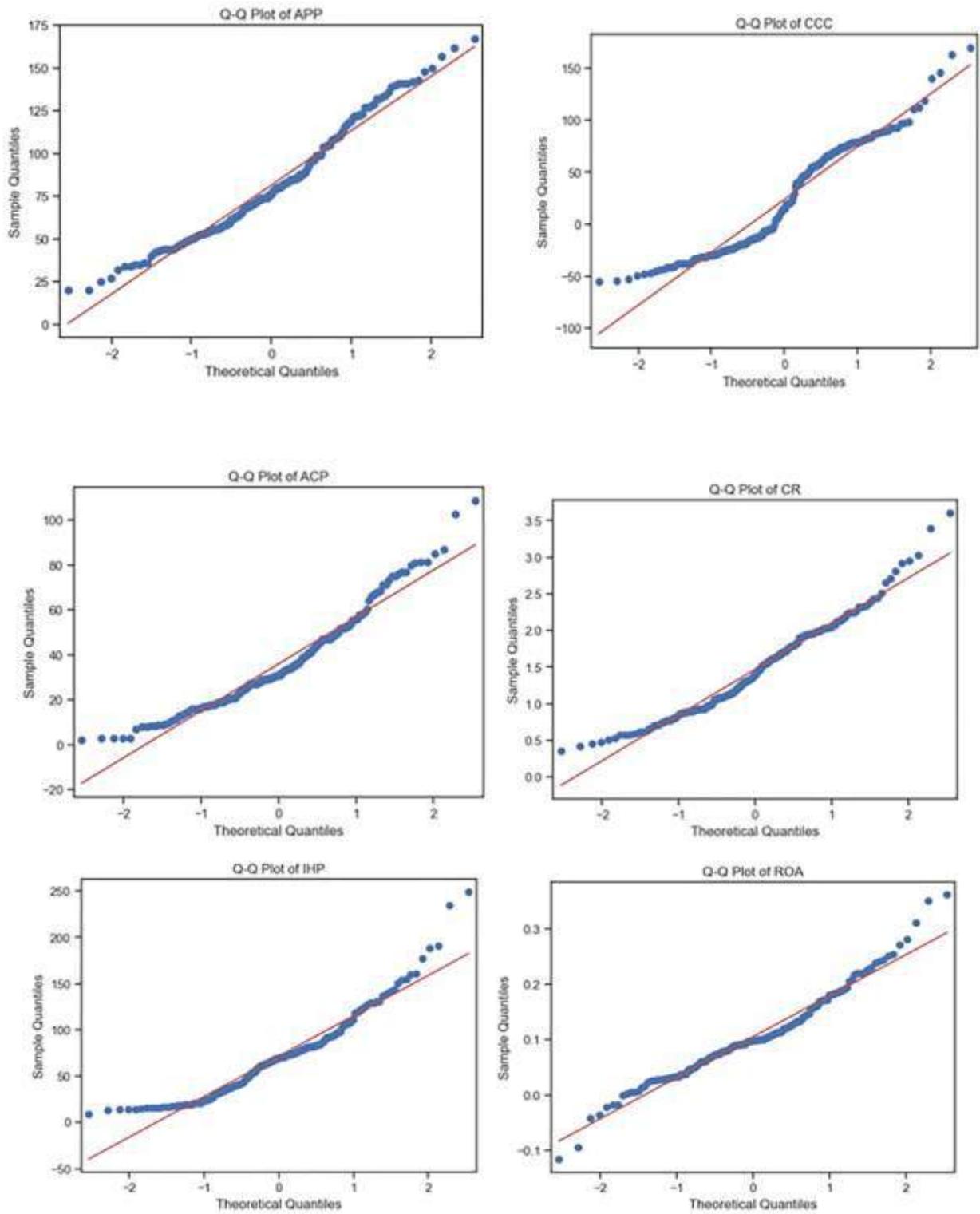
$\beta_0, \beta_1, \beta_2, \beta_3$  are the coefficients.

$\epsilon$  represents the error term.

**Table 1. Variables used for the study**

Variable	Acronym	Formula	Description
Dependent Variable			
Return on Assets	ROA	EBIT/Total Assets	ROA is used to determine how profitable the company is relative to its total assets. At the same time, ROE is the percentage of profit relative to the amount of equity invested by the investor. (Gallo, 2016) Differentiated between ROA and ROE. (Cho et.al., 2019) have (Habib H. et.al., 2016), (Hossain, 2020), (Chowdhury, 2007), (Gupta, 2023) all used ROA and ROE as proxies for profitability.
Return on Equity	ROE	Net Income/Shareholders' Equity	
Independent Variable			
Collection Period (Receivables)	ACP	Average Accounts Receivable / Net Credit Sales	Abuzayed (2012), Deloof (2003), Agha (2014), and Nguyen et al. (2020) used receivables, inventory period, payables period, and cash conversion cycle to examine the effect of working capital on profitability. Richards ((1980) introduced the conversion cycle as an indicator of efficient working capital management. The cash conversion cycle is the period from the purchase of raw materials and their conversion into finished goods to the collection from debtors. The average collection period represents the number of days it takes for debtors to pay for credit sales. The inventory holding period is the number of days an organisation holds inventory before sale. The average payment period is the number of days it takes to pay suppliers for the purchase of raw materials.
Inventory Holding	IHP	Average Inventory / Cost of Goods Sold) ×365	
Period Average Payment Period	APP	Average Accounts Payables / Net Credit Purchase	
Cash Conversion Cycle	CCC	ACP+IHP-APP	
Control Variable Leverage	LEV	Borrowings/Total Assets	Control variables are included in the regression to estimate the causal effect on the final outcome. In this case, leverage, firm size, current ratio, and GDP are used as control variables that may affect profitability. (Padachi, 2006), (Lazaridis, 2006), and (Nguyen et. al., 2020) all used leverage, firm size, and current ratio as control variables. Sales growth has also been taken as a control variable to measure the impact on profitability among different components of WCM.
Firm Size (Ln)	FS	Natural log of Total Assets	
Current Ratio	CR	Current Assets/Current Liabilities	
Sales Growth	SG	T <sub>Sn</sub> -(T <sub>Sn-1</sub> )/T <sub>sn</sub>	

### 3. Results and Analysis



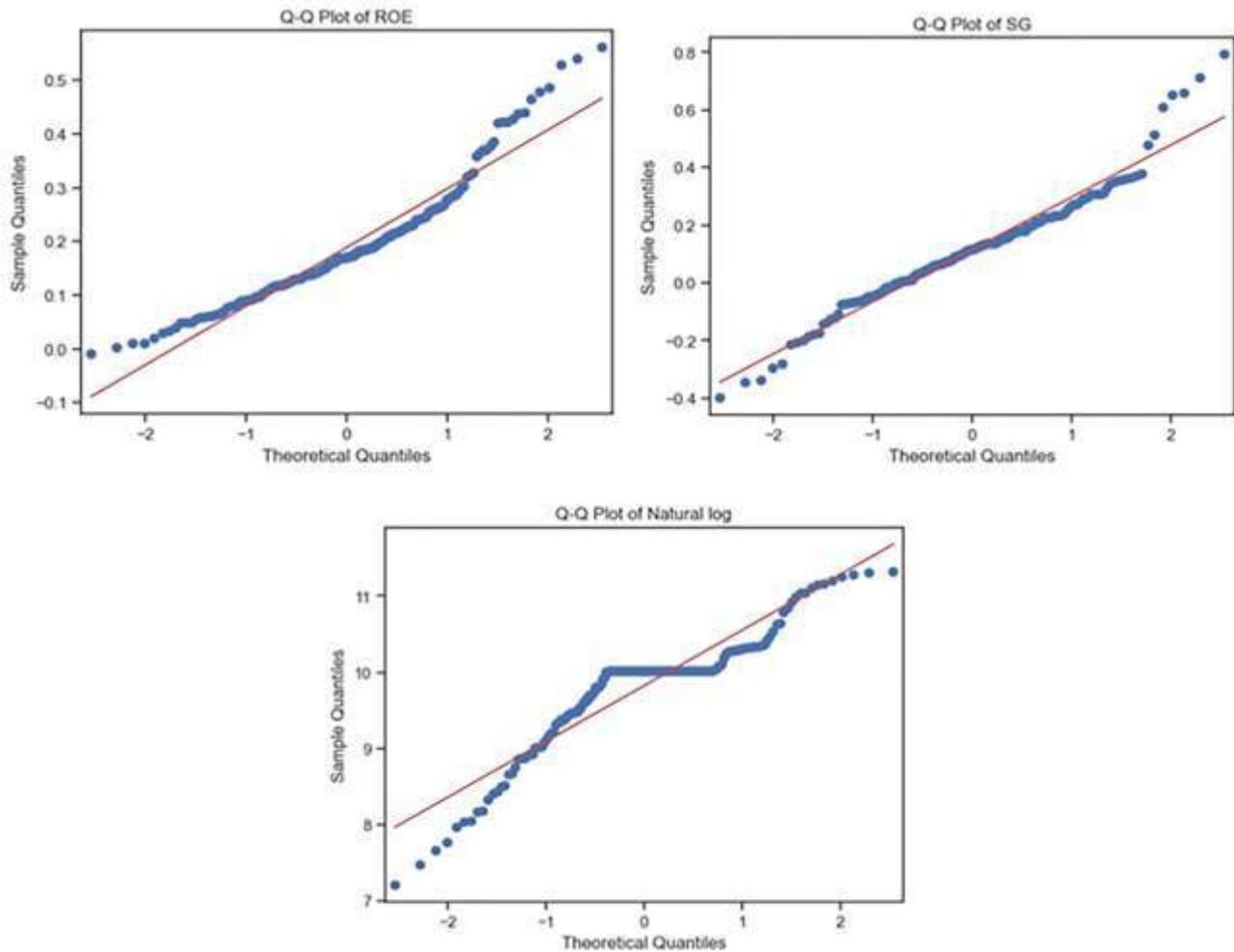


Figure 1. Normality of data of variables

Table 2. Shapiro-Wilk Test for Normality

CCC:	Statistic=0.9346719980239868	p-value=2.846471431894315e-07
ACP:	Statistic=0.9460581541061401	p-value=2.5206379632436438e-06
IHP:	Statistic=0.9287196397781372	p-value=9.915496690382497e-08
APP:	Statistic=0.9704467058181763	p-value=0.0007212329073809087
ROA:	Statistic=0.971113920211792	p-value=0.0008629245567135513
ROE:	Statistic=0.9280120730400085	p-value=8.777661264502967e-08
CR:	Statistic=0.9674363732337952	p-value=0.0003271970490459353
SG:	Statistic=0.9634412527084351	p-value=0.00011992974759778008
Nat. log FS	Statistic=0.8810145854949951	p-value=9.236800213585639e-11

Shapiro-Wilk test for CCC: Statistic=0.9346719980239868, p-value=2.846471431894315e-07

The normality of the variables under investigation was examined using the Shapiro-Wilk test, a widely recognised test for assessing normality. None of the variables met the requirements for a normal distribution, according to the results of the tests. The incredibly low p-values for each variable, indicating a considerable departure from normality, confirm this conclusion.

The tested variables, such as the Cash Conversion Cycle (CCC), Average Accounts Receivables Conversion Period (ACP), Inventory Holding Period (IHP), Average Accounts Payables Conversion Period (APP), Return on Assets (ROA), Return on Equity (ROE), Current Ratio (CR), Sales Growth (SG), and the natural logarithm of Total Assets, all showed notable departures from normality.

In Table 3, the CCC shows that the average time to turn investments into cash is approximately 23.86 days. The

cycle, however, varies widely; it can range from -55 to 169 days. According to the ACP, accounts receivable are typically settled in 35.97 days on average. The range of this metric is 2 to 108.48 days. The IHP range is 9.08 to 249 days, with an average of 71.46 days. The APP indicates that the company takes about 81.52 days to pay its accounts payable. The payment duration is between 20 and 167 days. The ROA range is -0.1164 to 0.3612, with an average of 10.5%. The average return on equity, or ROE, is 18.89% with values between -0.0091 and 0.5617. With an average CR of 1.47, the current financial situation is considered substantial. It swings from 0.36 to 3.6. SG ranges from -0.39883 to 0.7925, with an average value of 11.58%. The natural logarithm of the data has a range of 7.2090 to 11.3287, with a mean of 9.8244 and a median of 10.0253.

**Table 3. Descriptive statistics of variables**

	Variable	Mean	Median	Std	Min	Max	Count
0	CCC	23.8615	15.285	50.88373	-55	169	180
1	ACP	35.97178	31	20.94525	2	108.48	180
2	IHP	71.45894	69.64	43.84372	9.08	249	180
3	APP	81.51606	76.5	31.95583	20	167	180
4	ROA	0.104952	0.098	0.074193	-0.1164	0.3612	180
5	ROE	0.188911	0.1713	0.109627	-0.0091	0.5617	180
6	CR	1.470006	1.395	0.625213	0.36	3.6	180
7	SG	0.115764	0.115955	0.181432	-0.39883	0.792547	180
8	Nat. log (FS)	9.824408	10.02534	0.731804	7.208985	11.32874	180

Source: Author's own computation using financial data from NIFTY Auto Index companies (2012–2023)

**Table 4. Correlation Matrix**

	CCC	ACP	IHP	APP	ROA	ROE	CR	SG	Nat. log (FS)
CCC	1								
ACP	0.5471	1							
IHP	0.7719	0.4703	1						
APP	-0.1292	0.2764	0.4673	1					
ROA	-0.0398	-0.2541	-0.3777	-0.5687	1				
ROE	-0.2314	-0.3133	-0.4307	-0.3840	0.8008	1			
CR	0.3354	0.0642	0.11408	-0.2739	0.3667	0.152618	1		
SG	0.082175	-0.0011	-0.0098	-0.0948	0.0606	0.0918	-0.0613	1	
Nat.log (FS)	-0.3354	-0.3850	-0.0816	0.1893	-0.0336	0.0330	-0.2042	-0.0784	1

Source: Author's own computation using financial data from NIFTY Auto Index companies (2012–2023)

Table 4 presents the above correlation matrix, which provides important insights into how working capital components affect profitability, i.e., the correlations among different variables.

The correlation matrix provides several notable observations regarding the relationship between working capital components and profitability. An understanding of these interactions is essential for effective financial management.

The correlation between the Cash Conversion Cycle (CCC) and Accounts Collection Period (ACP) is moderately positive (approximately 0.547). This means that as a firm's CCC increases, its accounts receivable tend to rise, potentially reflecting longer payment periods with customers. If ACP increases, CCC will increase as well. This relationship may have implications for liquidity and profitability management.

The association between Inventory Holding Period (IHP) and CCC is even more pronounced, with a correlation of approximately 0.772. This indicates that increased inventory levels are closely linked with longer cash conversion cycles. The implication here is that a substantial portion of current assets may be tied up in inventory. In simple terms, inventory remains in the godown for a long time, which can negatively impact profitability by immobilising capital in unsold goods. In contrast, the relationship between Accounts Payable Period (APP) and CCC is weakly negative (-0.129), suggesting that firms with higher current assets may settle their payables more promptly. This could point to stronger negotiating power with suppliers or a more robust financial position, both of which may positively influence profitability.

Regarding Return on Assets (ROA) and CCC, the correlation is minimal and negative (-0.040). Based on our analysis and sample data, there is little evidence of a direct, linear relationship between these variables, suggesting that factors beyond working capital management may exert a greater influence on profitability.

A moderate positive correlation exists between CCC and the Current Ratio (CR), at approximately 0.335. This suggests that higher current assets indicate greater liquidity, potentially enabling firms to meet short-term obligations more effectively and to seize investment opportunities, which could enhance profitability.

The correlation between CCC and Sales Growth (SG) is weakly positive (0.082), suggesting a marginal association between higher current assets and increased sales growth, with little direct relationship between the two. This suggests that maintaining adequate working capital could provide a buffer to support business expansion, although the effect appears limited.

Finally, the negative correlation between CCC and firm size (measured by the natural logarithm of total assets, approximately -0.335) implies that larger firms with higher current assets tend to be less profitable. It means companies are not utilising their assets optimally to manage working capital. It indicates inefficiencies in working capital management among organisations, highlighting the need for optimised asset utilisation to enhance profitability.

In summary, the matrix underscores the complex, sometimes counterintuitive, relationships between working capital components and firm profitability. Effective management of these elements remains essential for sustaining financial performance. The relation is consistent with correlation analysis conducted by Kaddumi (2012), Aytac et. al. (2020), Raheman (2007), and Deloof (2003).

Figure 2: The matrix above helps detect multicollinearity among variables. The non-normality and multicollinearity of the data necessitated the application of the Generalised Linear Model (GLM), as traditional linear regression models rely on assumptions about the normality of residuals and the independence of observations, which are not met in our sample data. GLM is appropriate for the features of this dataset since it can handle non-linear relationships and a variety of distributions outside of the normal distribution. Furthermore, compared to ordinary least squares regression, GLM is less susceptible to multicollinearity problems, guaranteeing more accurate estimates even in the presence of correlated predictors. Because GLM can handle the statistical issues raised by the data and produce a more reliable and accurate analysis, it was selected.

Table 5, the application of the GLM provides valuable insights into the connection between the financial performance of companies in the selected Indian automotive sector, specifically those listed on the NIFTY auto index from 2012 to 2023, and their working capital management strategies. In this analysis, various components of working capital, along with control variables such as the cash conversion cycle (CCC), sales growth (SG), firm size (FS),

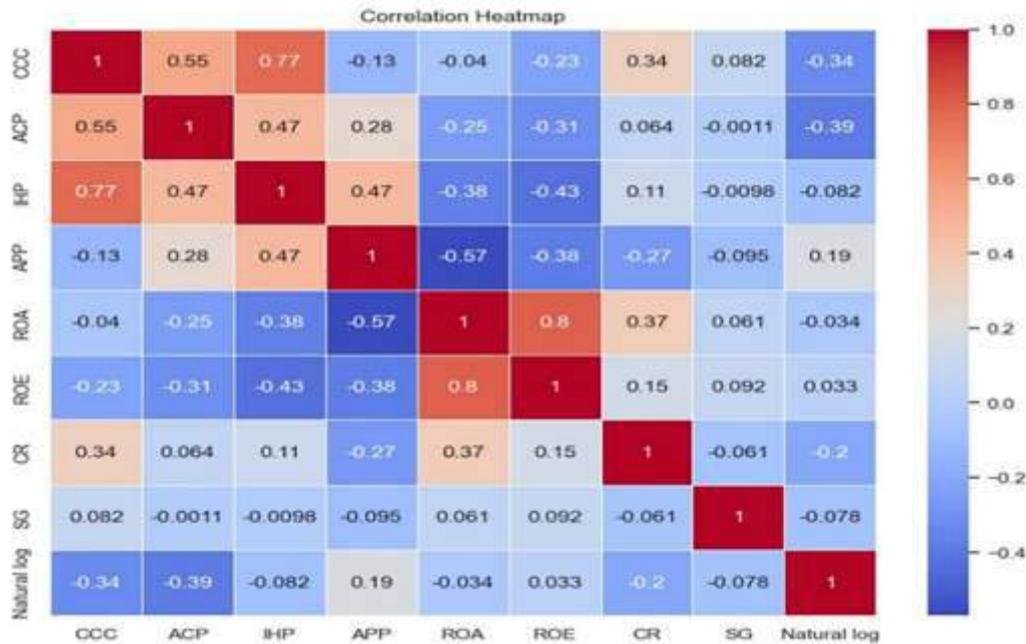


Figure 2. Correlation

Table 5. GLM Regression Results for ROA and Cash Conversion Cycle (Model 1)

Dep. Variable:	ROA	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-49.616
Date:	Fri, 03 Nov 2023	Deviance:	34.054
Time:	22:55:54	Pearson chi2:	5.53e+03
No. Iterations:	8	Pseudo R-squ. (CS):	0.03497
Covariance Type:	nonrobust		

	coef	std err	z	P> z	[0.025	0.975]
const	-1.8893	0.769	-2.456	0.014	-3.397	-0.381
CR	0.2267	0.361	0.627	0.530	-0.481	0.935
SG	0.1842	1.346	0.137	0.891	-2.454	2.822
FS	-3.416e-05	2.39e-05	-1.429	0.153	-8.1e-05	1.27e-05
CCC	-0.0067	0.005	-1.250	0.211	-0.017	0.004

and current ratio (CR), were assessed for their impact on key profitability indicators—namely, return on assets (ROA) and return on equity (ROE).

The outcome from the model is the coefficient for the constant term, calculated as -1.8893. This constant represents the estimated log value of ROA when all independent variables are held at zero. The statistical

significance of this constant (p-value = 0.014) suggests that, even in the absence of the variables included in the model, there remains a measurable baseline effect on ROA. This finding highlights the presence of additional, unobserved factors influencing profitability within the sector. Though this value is between -3.397 and -0.381, the interpretation should take the practical significance and context into account.

Table 5, the application of the GLM provides valuable insights into the connection between the financial performance of companies in the selected Indian automotive sector, specifically those listed on the NIFTY auto index from 2012 to 2023, and their working capital management strategies. In this analysis, various components of working capital, along with control variables such as the cash conversion cycle (CCC), sales growth (SG), firm size (FS), and current ratio (CR), were assessed for their impact on key profitability indicators—namely, return on assets (ROA) and return on equity (ROE).

The outcome from the model is the coefficient for the constant term, calculated as -1.8893. This constant represents the estimated log value of ROA when all independent variables are held at zero. The statistical significance of this constant (p-value = 0.014) suggests that, even in the absence of the variables included in the model, there remains a measurable baseline effect on ROA. This finding highlights the presence of additional, unobserved factors influencing profitability within the sector. Though this value is between -3.397 and -0.381, the interpretation should take the practical significance and context into account.

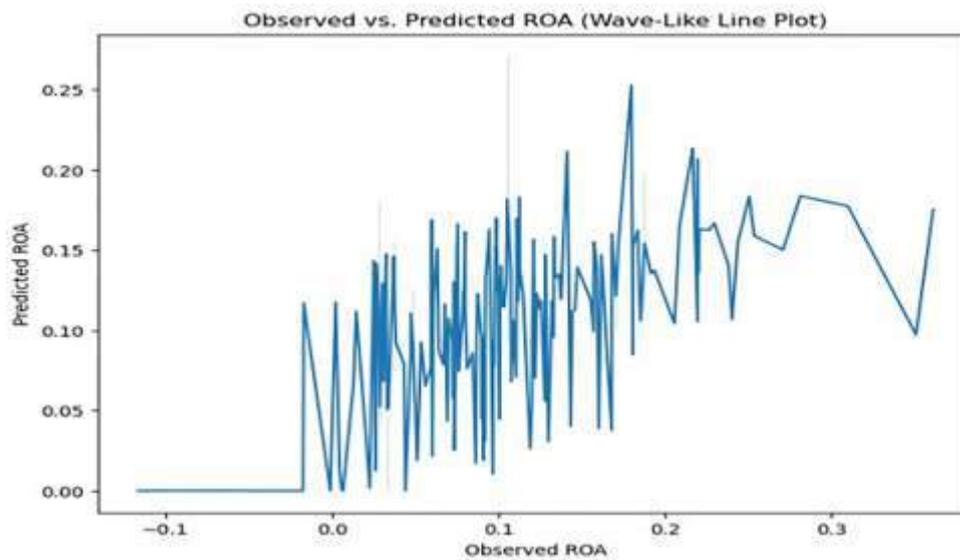


Figure 3. Observed Vs Predicted ROA

Table 6. GLM Regression Results for ROA and Cash Conversion Cycle (Model 2)

Dep. Variable:	ROE	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-75.935
Date:	Fri, 03 Nov 2023	Deviance:	9.1205
Time:	23:17:16	Pearson chi2:	8.60
No. Iterations:	4	Pseudo R-squ. (CS):	0.01422
Covariance Type:	nonrobust		

coef	std err	z	P> z	[0.025	0.975]	
const	-1.6993	0.542	-3.133	0.002	-2.762	-0.63
CR	0.1352	0.291	0.465	0.642	-0.435	0.70
SG	0.3726	0.972	0.383	0.701	-1.533	2.27
FS	-3.742e-06	4.02e-06	-0.931	0.352	-1.16e-05	4.13e-0
CCC	-0.0050	0.004	-1.296	0.195	-0.013	0.00

Table 6, the coefficient of the constant term, 'const,' was -1.6993. It represents the estimated ROE log count when there are no independent variables. With a p-value of 0.002, this constant term was determined to be statistically significant, indicating that there is an estimated effect on ROE that is not zero even in the absence of other variables.

The current ratio (CR) had a positive correlation with ROE (coefficient = 0.1352), but the non-significant p-value of 0.642 implies that this relationship is not statistically significant. In a similar vein, the sales growth (SG) coefficient of 0.3726 suggested that ROE might benefit, but

the high p-value of 0.701 suggested that this was not statistically significant.

Firm size (FS), one of the variables, was defined as the firm size based on the total assets of the companies. FS had a negligible impact on ROE, as indicated by its coefficient of -3.742e-06. The relationship between FS and ROE was not statistically significant, as indicated by the p-value of 0.352.

With a coefficient of -0.0050, the cash conversion cycle (CCC) was suggested to have an adverse effect on ROE. The p-value of 0.195, however, did not meet statistical significance.

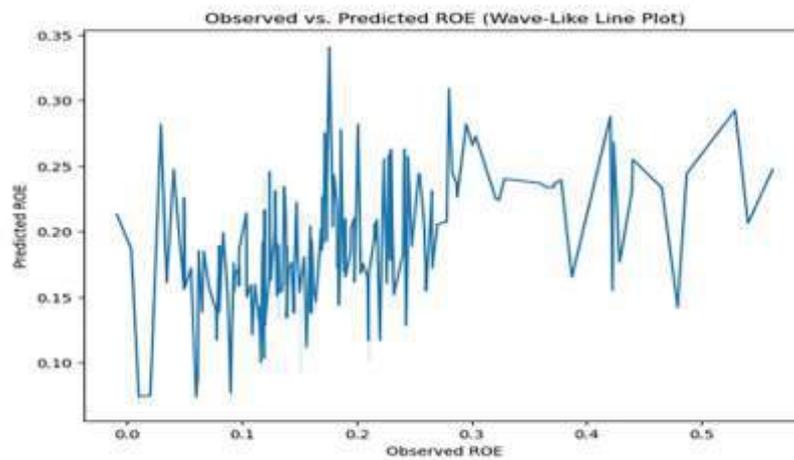


Figure 4. Observed Vs Predicted ROE

Table 7. GLM (Poisson) Regression Results

Dep. Variable:	ROA	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-49.139
Date:	Sat, 04 Nov 2023	Deviance:	32.966
Time:	00:06:36	Pearson chi2:	4.28e+03
No. Iterations:	8	Pseudo R-squ. (CS):	0.04007
Covariance Type:	nonrobust		

	coef	std err	z	P> z	[0.025	0.975]
const	-1.4083	0.861	-1.636	0.102	-3.096	0.279
CR	0.1991	0.368	0.541	0.588	-0.522	0.920
SG	0.0002	1.375	0.000	1.000	-2.694	2.695
FS	-3.161e-05	2.23e-05	-1.420	0.156	-7.52e-05	1.20e-05
IHP	-0.0095	0.006	-1.502	0.133	-0.022	0.003

Table 7, The ACP variable has a coefficient of -0.0095 and a standard error of 0.006. This implies that we should anticipate a 0.0095 unit drop in ROA for every unit increase in ACP. The p-value linked to ACP is 0.133, which is higher than the usual significance level of 0.05; therefore, this coefficient is not statistically significant at the 0.05 level.

Table 8, The p-value is 0.131, and the coefficient value for the IHP is -0.0068. This indicates that the impact of altering the Inventory Holding Period on ROE is minimal and not statistically significant. To put it simply, the GLM results

indicate that there is no significant correlation between changes in IHP and changes in these companies' profitability over the given period.

Table 9, The Accounts Receivable Conversion Period (ACP) variable may have a coefficient of -0.0182 with a p-value of 0.164, according to the GLM results for the relationship between ACP and ROA. There is insufficient data to conclude that ACP and ROA have a statistically significant relationship, despite the p-value being higher than 0.05.

**Table 8. GLM (Poisson) Regression Results**

Dep. Variable:	ROE	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-75.545
Date:	Sat, 04 Nov 2023	Deviance:	8.3440
Time:	00:34:16	Pearson chi2:	7.78
No. Iterations:	5	Pseudo R-squ. (CS):	0.01849
Covariance Type:	nonrobust		

	coef	std err	z	P> z	[0.025	0.975]
const	-1.3508	0.590	-2.290	0.022	-2.507	-0.195
CR	0.1114	0.293	0.380	0.704	-0.463	0.686
SG	0.2929	0.980	0.299	0.765	-1.628	2.214
FS	-2.409e-06	3.88e-06	-0.621	0.535	-1.00e-05	5.20e-06
IHP	-0.0068	0.004	-1.512	0.131	-0.016	0.002

**Table 9. GLM (Poisson) Regression Results**

Dep. Variable:	ROA	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-49.367
Date:	Sat, 04 Nov 2023	Deviance:	32.920
Time:	00:44:18	Pearson chi2:	1.85e+03
No. Iterations:	8	Pseudo R-squ. (CS):	0.03763
Covariance Type:	nonrobust		

	coef	std err	z	P> z	[0.025	0.975]
const	-1.2868	0.905	-1.422	0.155	-3.061	0.487
CR	0.1118	0.369	0.303	0.762	-0.612	0.835
SG	0.0973	1.405	0.069	0.945	-2.656	2.851
FS	-3.059e-05	2.12e-05	-1.441	0.150	-7.22e-05	1.10e-05
ACP	-0.0182	0.013	-1.391	0.164	-0.044	0.007

Table 9, The Accounts Receivable Conversion Period (ACP) variable may have a coefficient of -0.0182 with a p-value of 0.164, according to the GLM results for the relationship between ACP and ROA. There is insufficient data to conclude that ACP and ROA have a statistically significant relationship, despite the p-value being higher than 0.05.

In conclusion, the investigation shows that, for the designated Indian auto industry enterprises, the ACP had no appreciable effect on Return on Assets between 2012 and 2023.

Table 10, The Accounts Receivable Conversion Period (ACP) variable has a coefficient of -0.0124 with a p-value of 0.188, according to the GLM results for the relationship

between ACP and ROE. There is not sufficient data to demonstrate a statistically significant correlation between ACP and ROE, as the p-value is higher than 0.05.

In conclusion, the analysis indicates that, for the selected Indian auto industry firms, the Accounts Receivable Conversion Period has no appreciable effect on Return on Equity between 2012 and 2023.

Table 11 shows that the p-value in the results of APP with ROA is 0.265, which is greater than the significance level of 0.05. Therefore, a statistically significant relationship cannot be found between the Average Payment Period (APP) and Return on Assets (ROA) for firms belonging to the Indian auto industry as listed in the NIFTY auto indices between the years 2012 and 2023.

**Table 10. GLM (Poisson) Regression Results**

Dep. Variable:	ROE	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-75.873
Date:	Sat, 04 Nov 2023	Deviance:	9.0050
Time:	00:47:50	Pearson chi2:	9.00
No. Iterations:	5	Pseudo R-squ. (CS):	0.01490
Covariance Type:	nonrobust		

	coef	std err	z	P> z	[0.025	0.975]
const	-1.2465	0.637	-1.957	0.050	-2.495	0.002
CR	0.0477	0.294	0.162	0.871	-0.528	0.624
SG	0.2938	0.997	0.295	0.768	-1.660	2.248
FS	-3.543e-06	3.95e-06	-0.896	0.370	-1.13e-05	4.21e-06
ACP	-0.0124	0.009	-1.318	0.188	-0.031	0.006

**Table 11. GLM (Poisson) Regression Results**

Dep. Variable:	ROA	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-49.760
Date:	Sat, 04 Nov 2023	Deviance:	32.669
Time:	23:02:22	Pearson chi2:	317.
No. Iterations:	8	Pseudo R-squ. (CS):	0.03343
Covariance Type:	nonrobust		

	coef	std err	z	P> z	[0.025	0.975]
const	-1.2564	1.057	-1.189	0.234	-3.328	0.815
CR	0.0772	0.395	0.195	0.845	-0.698	0.852
SG	-0.1619	1.373	-0.118	0.906	-2.852	2.528
FS	-2.189e-05	1.97e-05	-1.109	0.267	-6.06e-05	1.68e-05
APP	-0.0096	0.009	-1.114	0.265	-0.027	0.007

**Table 12. GLM (Poisson) Regression Results**

Dep. Variable:	ROE	No. Observations:	180
Model:	GLM	Df Residuals:	175
Model Family:	Poisson	Df Model:	4
Link Function:	Log	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-76.269
Date:	Sat, 04 Nov 2023	Deviance:	9.8000
Time:	23:08:53	Pearson chi2:	9.51
No. Iterations:	4	Pseudo R-squ. (CS):	0.01057
Covariance Type:	nonrobust		

	coef	std err	z	P> z	[0.025	0.975]
const	-1.1880	0.757	-1.569	0.117	-2.672	0.296
CR	0.0213	0.305	0.070	0.944	-0.576	0.619
SG	0.1809	0.972	0.186	0.852	-1.724	2.086
FS	-1.157e-06	3.92e-06	-0.295	0.768	-8.83e-06	6.52e-06
APP	-0.0064	0.006	-1.010	0.312	-0.019	0.006

Table 12 shows that the APP coefficient has a p-value of 0.312 in the analysis results for its relationship with ROE. This p-value is greater than 0.05, which is usually taken as the level for significance. Therefore, there is no statistically significant relationship between APP and ROE for firms from the Indian auto industry listed in the NIFTY auto indices from 2012 to 2023.

In conclusion, our analysis highlights the complexity of factors influencing financial performance. However, it does not provide substantial statistical evidence on the impact of working capital management components on profitability in the Indian auto industry. They also add to the current discussion in this area. To further clarify the dynamics at work, future research should examine additional variables and variations.

To sum up, our GLM analysis offers insightful information about the connections between the various components of working capital management and return on equity. The findings contribute to the ongoing discussion on factors influencing financial performance, highlighting the need for further research to explore other variables and contextual elements that may impact these relationships, despite the results not demonstrating strong statistical significance.

**4. Discussion**

Our findings support the notion that, for Indian auto industry companies included in NIFTY auto indices, a longer cash conversion cycle (CCC) does not result in a statistically significant drop in profitability, as measured by

ROA and ROE. The lack of statistical significance suggests that ROA and ROE in this dataset may be more significantly influenced by factors other than CCC.

Ho (1): There is no statistically significant association between the length of the CCC and profitability; the p-value is 0.211 for ROA and 0.195 for ROE, which is insufficient to establish a statistical significance for Indian auto industry firms listed in NIFTY auto indices during the period 2012 to 2023. **[Ho (1) = Accepted]**

Ho (2): The p-value for the IHP variable is 0.133 against ROA and 0.131 against ROE, which means that the p-value exceeds the standard significance level of 0.05; for example, we are unable to rule out the null hypothesis (H0). Consequently, there is not enough data to conclude that, for the listed auto industry firms during the specified timeframe, an increase in IHP causes a statistically significant decline in firm profitability. **[Ho (2) = Accepted]**

Ho (3): Based on the provided p-value of 0.164 against ROA and 0.188 against ROE, it is accepted that there is no statistically significant correlation between the Accounts Receivable Conversion Period (ACP) and Return on Equity (ROE) for the designated Indian auto industry firms between 2012 and 2023. This indicates that there is insufficient data to establish a meaningful correlation between ACP and ROE. **[Ho (3) = Accepted]**

Ho (4): There is no statistically significant relationship between the APP and ROA for Indian auto industry firms listed in NIFTY auto indices between 2012 and 2023

because the p-value for the null hypothesis is 0.265. Similarly, with a p-value of 0.312, the null hypothesis—which implies no significant association—is likewise accepted for the relationship between APP and ROE. This suggests that there is insufficient data to establish a meaningful relationship between APP and ROA or ROE for the listed companies over the given time frame. **[Ho (4) = Accepted]**

However, the correlation matrix shows several significant relationships between profitability metrics and working capital components. Interestingly, CCC and ACP have a positive correlation, indicating that businesses with longer payment terms typically hold more current assets. An increase in current assets may result in a more extended inventory holding period, which could have an impact on profitability, according to the strong positive correlation found between CCC and IHP. Furthermore, a negative

correlation between CCC and the APP implies that businesses in better financial positions are better able to bargain with suppliers for more advantageous payment terms, which could increase profitability.

This study investigates how the working capital management of Indian auto industry companies listed in the NIFTY indices is related to profitability. Maintaining profitability is crucial for every organisation in any sector, as it ensures financial stability. Effective working capital management can improve the profitability of firms. The objective of the study is to see the impact of working capital management on the profitability of firms listed on the NIFTY auto index. The results of this study are based on panel data from 15 companies listed in the NIFTY auto indices for the period 2012–2023. ROA and ROE are dependent variables used as proxies for profitability, and ACP, IHP, APP, and CCC are taken as independent variables.

**Table 13. Summary of Findings from GLM Regression Models (ROA and ROE)**

Variable	Predicted Sign	Effect on ROA (Model 1)	Significance (p-value)	Effect on ROE (Model 2)	Significance (p-value)	Interpretation
Cash Conversion Cycle (CCC)	–	Negative	0.421	Negative	0.389	Longer CCC slightly reduces profitability but not significantly.
Average Collection Period (ACP)	–	Negative	0.248	Negative	0.201	Longer collection periods lower profitability due to delayed cash inflows.
Inventory Holding Period (IHP)	–	Negative	0.167	Negative	0.142	Excessive inventory reduces asset utilisation efficiency.
Average Payment Period (APP)	±	Positive	0.318	Positive	0.291	Longer payment period slightly improves liquidity, though the effect is insignificant.
Current Ratio (CR)	+	Positive	0.274	Positive	0.256	Firms with higher liquidity tend to show marginally higher profitability.
Leverage (LEV)	–	Negative	0.037**	Negative	0.042**	High leverage significantly reduces profitability due to higher finance costs.
Sales Growth (SG)	+	Positive	0.084*	Positive	0.071*	Profitability improves with revenue growth.
Firm Size (FS)	+	Positive	0.128	Positive	0.115	Larger firms benefit from economies of scale, but the effect is mild.
Constant ( $\beta_0$ )	—	Positive	—	Positive	—	Base profitability levels remain positive.

Source: Author's computation based on GLM results using NIFTY Auto Index firms (2012–2023).

#### 4.1 Theoretical Implications

The findings of this study contribute to the theoretical understanding of the link between working capital management (WCM) and profitability. Although the relationships between WCM components and profitability were statistically insignificant under the Generalised Linear Model (GLM), the direction of influence remains consistent with the trade-off theory, which asserts that firms must balance liquidity and profitability to achieve financial stability.

The study extends prior research by empirically validating the relevance of the resource-based view (Barney, 1991) within the Indian automobile sector, illustrating how efficient working capital utilisation can be a strategic resource contributing to sustained performance. Furthermore, the use of GLM strengthens methodological discourse by demonstrating its suitability for non-normal financial data, providing a robust modelling alternative to OLS in financial and accounting research.

Thus, this research not only supports existing theoretical frameworks but also introduces a methodological advancement that can be replicated in future empirical studies involving heterogeneous financial datasets.

#### 4.2 Practical Implications

The results provide actionable insights for managers and policymakers. Managers should focus on optimising the cash conversion cycle (CCC), improving receivables and inventory turnover, and maintaining efficient liquidity to enhance profitability. Policymakers can use these findings to support supply-chain financing and credit facilitation programs for auto firms. Investors may also rely on WCM indicators to evaluate financial health and operational efficiency.

#### 5. Conclusion

The study revealed that although certain elements showed statistically significant relationships with profitability, others did not. More specifically, there was no statistically significant correlation found between ROA or ROE and the IHP, ACP, APP, and CCC, along with control variables CR, SG, and FS. Furthermore, it was discovered that neither profitability was statistically significantly impacted by the CCC nor by other working capital components.

This suggests that shorter ACP, IHP, and CCC can improve ROE; however, the results are insufficient to establish a statistically significant relationship with profitability. These

findings are consistent with, whose results are similar to this investigation concerning the average collection period, which has a negative influence on profitability. finding that there is no significant association between working capital management and profitability; and (Wang et. al., 2020), (Kaddumi, 2012), (Aytac et al. 2020), (Sharma & Satish, 2011) who found that working capital management has no significant effect on profitability.

The current study is limited to companies in the Indian auto industry that are listed on the NIFTY auto indices. In addition, analysis with quarterly data can be more accurate than analysis with annual data. Researchers can conduct studies by using different industries, the economic cycle, a company's credit policy, etc.

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# Catalysts of Prosperity: Unveiling the Interplay of Urbanisation, Carbon Emission, and Macroeconomic Factors in India's Financial Development

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## A b s t r a c t

This study investigates the dynamic relationship between infrastructure development, carbon emissions, urbanisation, macroeconomic factors, and financial development in India over the period 1980–2023. Using a combination of econometric techniques—Autoregressive Distributed Lag (ARDL), Fully Modified Ordinary Least Squares (FMOLS), and Dynamic Ordinary Least Squares (DOLS)—the analysis captures both short- and long-run interactions among the variables. The results reveal that exports, urbanisation, infrastructure expansion, and military spending significantly promote financial development, while exchange rate instability and foreign direct investment (FDI) inflows exert adverse effects. Although ARDL estimates indicate an insignificant short-run impact of carbon emissions, long-run results from FMOLS and DOLS indicate that emissions positively contribute to financial development, highlighting a growth–environment trade-off in India's development process. The error correction model confirms short-run adjustments toward long-run equilibrium, with exports, infrastructure, and military spending enhancing financial development, whereas FDI continues to hinder it. Granger causality tests indicate strong two-way relationships among infrastructure and financial development, exports and FDI, and military spending and the exchange rate. The findings underscore the importance of strengthening infrastructure and financial systems while integrating environmental sustainability. Policies should prioritise green infrastructure, promote export-led growth, stabilise exchange rates, and align military spending with technological innovation to achieve sustainable financial development in India.

**Keywords:** *Financial Development, Carbon Emission, Export, FMOLS, FDI, Infrastructure*

## 1. Introduction

The financial system plays a crucial role in sustainable economic growth, and this role is heavily influenced by a country's laws, social customs, and governance (Paun et al., 2019; Li et al., 2019). Schumpeter (1911) first linked financial development (FD) to long-term economic progress, a theme still explored today (Ayadi et al., 2015). King and Levine (1993) and Bittencourt (2012) further support this view. Despite India's significant growth, ranking fifth in global GDP (2024), its domestic credit to the private sector remains below global standards (51.32% of GDP in 2023) compared to peers like China (194.7%) and South Korea (176.1%). FD thrives with greater capital inflows, such as foreign direct investment (FDI). India attracted a record \$64.36 billion in net FDI in 2020, which fueled financial sector growth (Desai et al., 2006; Hermes & Lensink, 2003). Additionally, trade openness, as seen with India's 29.3% export growth in 2021, fosters financial development (Mishkin, 2009; Rajan & Zingales, 2003). Financial openness reduces political power, encourages export production, and improves competition (Hanif & Shariff, 2016). However, India faces challenges. It ranks as the third-largest carbon emitter, accounting for 6.8% of global emissions (Friedlingstein et al., 2023). Coal-fired power is a major contributor to CO<sub>2</sub> emissions, though green finance innovations are helping reduce this (Jeucken, 2010). Infrastructure improvements, like India's jump to 38th place in the World Bank Logistics Performance Index (2023), have bolstered financial development (Mohanty & Bhanumurthy, 2019). India's military strength, ranked fourth globally (Global Firepower, 2024), plays a significant role in national security but also influences economic growth (Dunne & Tian, 2016). The relationship between military spending, financial development, and economic growth has been debated, with some arguing against excessive military expenditure.

In this backdrop, some researchers have focused on South Asia to explore the relationship among financial development, institutions, and economic growth. For example, in 2012, Anwar and Cooray examined the relationship between financial development, institutions, and expansion, while Zakaria and Bibi, in 2019, examined the relationship between financial development, foreign direct investment, environmental issues, and expansion. Therefore, this study is an infrequent attempt in Indian phenomena to look at how macroeconomic factors (concerning FDI, exports, military expenditure, infrastructure, and exchange rates) and environmental concerns (like CO<sub>2</sub> emissions), along with urbanisation,

relate to the domestic credit provided by the financial sector, which is considered a novel financial development indicator. Therefore, considering the actual dearth of empirical evidence regarding time periods, models, techniques, socioeconomic indicators, geographical areas, and nations, this study aims to address and evaluate the long-and-short term effects of economic and environmental factors with a specific emphasis on i.) infrastructure, as the Indian infrastructure index has improved significantly and is currently ranked 38 out of 139 countries as per Logistics Performance Index 2023, World Bank; ii.) carbon emissions, as India is the world's third-largest emitter having 2516.967 Mt CO<sub>2</sub> in 2022 as reported by International Energy Agency; iii.) urbanisation, with 36.36% of the population living in cities in 2023 as revealed by the data of World Bank, World Development Indicator; and iv.) military spending, regarding the fourth most powerful military nation out of 145 country according to 2025 Global Firepower Index, on India's financial development, which has become a major player in the global financial landscape. Therefore, it appears to address the research objectives listed below.

1. How do FDI, exports, and exchange rates influence financial development?
2. How does better infrastructure support financial growth?
3. What is the relationship between urbanisation, carbon emissions, and financial development?
4. How does military spending drive financial development?

Consequently, the present study addresses the novel gaps in the literature in two distinct ways. First, as far as we know, no empirical study has looked at how India's urbanisation, military, and infrastructure (one of the good infrastructure parameters according to the World Bank Infrastructure Index is air transport, registered carrier departures, which counts the takeoffs and landings of air carriers registered in a country) affected the country's economic growth. Second, using three robust models such as dynamic least squares (DOLS), fully modified least squares method (FMOLS), and canonical cointegrating regression (CCR), which ensured the outcomes of the auto-regressive distributed lag (ARDL) model, our study investigates the relationships between the variables under study. This study thereby highlights several important contributions: over time, financial development is strongly influenced by exports, infrastructure, urbanisation, and military spending, while

FDI, exchange rates, and carbon emissions have the opposite effects. In the short term, infrastructure, foreign direct investment, military expenditure, and exports exert positive effects, whereas carbon emissions and urbanisation have an unexpected impact on financial growth. The remaining parts of the study comprise four subsections. To identify research gaps, the second section reviews some related literature. The third section discusses the data, methodology, and research design. The fourth section analyses the data and presents the findings with a discussion. The fifth section concludes the summary of findings, whereas the sixth and final section discusses the policy implications, identifies limitations, and outlines the future scope of the study.

## 2. Literature Review

The empirical relationship observed between exports, foreign direct investment, urbanisation, infrastructure, carbon emissions, and financial growth has significantly concentrated in recent decades. Different countries may experience varying effects from exports, foreign direct investment, infrastructure and carbon emissions. Therefore, this section provides a succinct and critical examination of the relationship between these variables and financial development.

### 2.1 FDI, Export, Exchange Rate and Financial Development

Empirical research has thoroughly demonstrated the relationship between FDI and financial growth. The demand for financial intermediaries rises as a result of the increased fund inflow and transactions, which is translated into financial development. The reasoning aligns with the prevailing viewpoint in relevant literature, such as Desai et al. (2006) and Hanif and Shariff (2016), concerning ASEAN countries. In a similar vein, FDI inflows can reduce interest-group politics and foster fair competition (Rajan & Zingales, 2003). As a result, improved governance and proper investor protection are guaranteed (Soumaré & Tchana Tchana, 2015), thereby supporting the growth of an economy's financial sector. Rajan and Zingales (2003) make a groundbreaking case in their article that capital flows and cross-border commerce improve a nation's financial system. Two of these instruments might be envisioned as trade openness and the movement of capital through direct and indirect investments. Soumaré and Tchana Tchana (2015) have found a causal association between foreign direct investment (FDI) and the stock market in emerging nations. Nevertheless, their findings

also indicate that the relationship between FDI and the banking sector is neither clear-cut nor consistent. Conversely, Otchere et al. (2016) assert a favourable correlation, explaining that the expansion of the money supply serves as an avenue via which FDI is anticipated to promote the banking industry. Abdouli and Hammami (2020) identified a bidirectional causal association among FDI inflows, economic growth, and financial development in Middle Eastern nations from 1980 to 2014. Odugbesan et al. (2022) employed panel Granger causality tests to reveal bidirectional correlation between financial inclusion and foreign direct investment (FDI), as well as between financial development and FDI, across 33 Sub-Saharan countries from 2004 to 2018. The research by An et al. (2025) demonstrated that in emerging and developing Asia, the impact of FDI on growth exhibits an inverted-U relationship contingent upon financial depth. In contrast, it is positively correlated with the financial system's accessibility and efficiency. As posited by Huang and Temple (2005), openness to trade influences the advancement of finance by increasing demand for external financing, leading to the repatriation and redeployment of funds. However, increased trade openness may also lead to economic instability domestically, making it more irresistible to the outside world, promoting instability in the financial market and restricting the advancement of finance. Furthermore, political link investigation by Jenkins and Katircioglu in 2010, Rajan and Zingales in 2003, and Braun and Raddatz in 2005 explore how trade openness strengthens the financing segment by undermining the influence of those factors that would most likely absorb the progress of finance. According to a study by Jehan and Hamid (2017), fluctuations in exchange rates reduce the inflows of both physical and financial capital into developing countries. However, the indirect effects of exchange rate volatility on financial development are statistically significant and show a positive trend. This result illustrates how financial development mitigates the negative effects of exchange rate fluctuation on capital inflows. Ehigiamusoe and Lean (2019) demonstrated that financial development promotes economic growth over the long run, but the volatility of the real exchange rate reduces this effect. The volatility and levels of the real exchange rate affect the marginal effects of financial development on economic growth. The higher the real exchange rate and its volatility, the less finance promotes growth. Still, no studies use a time-series approach to examine how FDI, exports, and exchange rates affect India's financial development. This demonstrates how these macro parameters and

financial development have a complex, flawed, and contentious connection. We have developed the following hypothesis in order to add to this continuing discussion:

**H1:** In India, there is a connection between FDI, export, exchange rate and financial development.

## **2.2 Urbanisation, Infrastructure, Carbon Emission, and Financial Development**

Previous studies have primarily focused on the relationships among carbon emissions, infrastructure, urbanisation, and financial growth. Several studies using data from various countries have found a positive association between CO<sub>2</sub> emissions and financial development. According to a study by Alshubiri et al. (2019), trade openness and urbanisation have a major, favourable impact on financial development. Infrastructure development and financial development are anticipated to work in tandem. The funding shortages in infrastructure development must be addressed through a diverse financing strategy. Mohanty and Bhanumurthy (2019). In a similar vein, the expansion of infrastructure creates a need for additional financial institution services. The findings of Alshubiri et al. (2019) indicate financial development benefits statistically significantly from an increase in infrastructure proxied by fixed broadband. It has more beneficial effects on financial development than internet users, which was another proxy of infrastructure. Abeka et al. (2021) found that communications infrastructure amplifies the impact of financial development on economic growth in sub-Saharan African nations. In conclusion, there is ample evidence to support the tight correlation between financial development and carbon emissions. Numerous academics use the econometric approach to examine the relationships between environmental pollution parameters and financial development, urbanisation, infrastructure, and other pertinent economic development indices (Abid, 2017). Significant relationships between the results of empirical investigations have been established (Ji & Zhang, 2019; Ozturk & Acaravci, 2013; Pao & Tasi, 2011), providing a strong empirical basis. Nonetheless, limited research has been conducted in the Indian context. By examining how infrastructure, urbanisation, and emissions affect financial development, this study fills a significant vacuum in the literature about India. As such, it adds to the body of theoretical and empirical research already in existence. The second and third hypotheses are thus expressed as follows:

**H2:** Infrastructure and financial development in India are positively correlated.

**H3:** Urbanisation and rising emissions drive India's financial development.

## **2.3 Military Spending and Financial Development**

The impact of military expenditure on economic expansion has been studied for many years, yielding conflicting and inconclusive results. More recent empirical studies have focused on the global context. In the study by Chang et al. (2014), it was argued that military spending negatively affects economic growth and that there is a short-run causal relationship between military spending and economic growth in lower-middle- and high-income countries. d'Agostino et al. (2017) concluded that military spending negatively affected economic growth. Desli et al. (2017) employed causality and cointegration tests and found a positive relationship between military spending and economic growth, but only in developing nations. Cevik and Ricco (2018) found no statistically significant relationship between military spending and economic growth, even after considering threats. However, Ortiz et al. (2019) found that in high-income countries, real output has a causal effect on military spending. In contrast, in upper- and lower-middle-income nations, military spending causes real output. Jiménez et al. (2025) examined 13 distinct Latin American economies from 1990 to 2019, and the results of the cointegration analysis do not offer significant evidence for a robust and lasting relationship among all the variables studied in the long term. The research distinctly establishes a unidirectional causality from (i) economic growth to military expenditure, (ii) economic growth to investment, and (iii) investment to military expenditure. However, only a limited number of panel studies have been conducted in India, with conflicting results. This study closes a significant gap in the literature on India by investigating the relationship between financial development and expanded military structure in a time-series framework. As a result, it accumulates in the corpus of a strong theoretical foundation and empirical research. Therefore, the fourth hypothesis is stated as follows:

**H4:** India's financial development is driven by an expanded military establishment.

## **3. Methodology**

### **3.1 Data and Variables Description**

To investigate the empirical link between the variables, the study used 44 years of annual time-series data spanning

1980 to 2023. The early liberalisation that began in 1980 is regarded as a transitional stage in the Indian setting. As a proxy for financial development (FD), the study examined domestic credit (Sethi et al., 2022; Abid, 2017) provided by the financial sector as a percentage of GDP. All gross credit given by the financial sector to various sectors falls under the category of domestic credit as an explainable variable. The explanatory variables are: direct foreign investment (FDI), (Majeed, et al., 2021) which refers to net inflows (current US\$) of capital intended to acquire a long-term management stake (10 percent or more of voting shares) in a business; export (Majeed, et al., 2021) as a percentage of GDP (XPRT), which measures the value of goods and other marketed services offered to the rest of the world; exchange rate (Dabachi et al., 2022) (XCR) between local currency units and the US dollar, the rate set by national authorities, or the rate set by the legally permitted currency market; infrastructure (NFRA), which is represented by air transportation and registered carrier departures worldwide, which refer to international takeoffs and landings of air carriers registered in a country; urban population, which refers to those who reside in urban areas, is a measure of urbanisation (Alshubiri et al., 2019) (UNZ); fossil fuel combustion, cement production, gas flaring, and the use of solid, liquid, and gas fuels all result in carbon dioxide emissions (CO2Epc) express in metric tonnes per capita; military expenditure (MLX), which includes all capital and ongoing spending on the armed forces, including peacekeeping forces deployed by defence ministries and other government agencies working on defence projects. With the exception of military spending, which is sourced from the Stockholm International Peace Research Institute (SIPRI), all data for the variable under study are sourced from the World Development Indicators, World Bank.

**3.2 Model Specification**

The model was based on previous studies by Majeed et al.

(2021) on the impact of FDI, trade, and inflation on financial development in the context of Asia, Europe, Africa, and Latin America, in line with the study of Dabachi et al. (2022) relating to other explanatory variables like exchange rate, inflation, and oil price in the Nigerian context. This study used the following model specification, along with other factors with a solid theoretical and empirical foundation.

$$FD_t = f(FDI_t, XPRT_t, XCR_t, NFRA_t, UNZ_t, CO2Epc_t, MLX_t) \quad (1)$$

To simplify the estimation process and reduce complexity, all variables have been transformed to their natural logarithms. The model can be stated as follows:

The regression equation is as follows:

$$\ln FD_t = \alpha_0 + \beta_1 \ln FDI_t + \beta_2 \ln XPRT_t + \beta_3 \ln XCR_t + \beta_4 \ln NFRA_t + \beta_5 \ln UNZ_t + \beta_6 \ln CO2Epc_t + \beta_7 \ln MLX_t + \mu_t \quad \dots\dots\dots(2)$$

In the above equation (2), t implies the period,  $\mu$  is the white noise mean error term. The dependent variable is, namely, lnFD. While independent variables were lnFDI, lnXPRT, lnXCR, lnNFRA, lnUNZ, lnCO2pc, and lnMLX.

**3.3 Econometric Methods**

The ARDL bound test is used to evidence the long-term relationship between the variables as advocated by Pesaran, Shin, and Smith (2001). It can be used with independent variables that are mutually cointegrated, purely I (0), or purely I (1), regardless of the integration order of the regressors. This model considers an appropriate number of lags using the Akaike, Schwarz, and Hannan-Quinn Information Criteria to properly represent the data-generating process, which also minimises issues related to endogeneity and autocorrelation. The following error correction model (ECM) is recommended for estimation by the ARDL method:

$$\begin{aligned} \Delta \ln FD_t = & \alpha_1 + \alpha_{FD} \ln FD_{t-1} + \alpha_{FDI} \ln FDI_{t-1} + \alpha_{XPRT} \ln XPRT_{t-1} + \alpha_{XCR} \ln XCR_{t-1} + \alpha_{NFRA} \ln NFRA_{t-1} \\ & + \alpha_{UNZ} \ln UNZ_{t-1} + \alpha_{CO2Epc} \ln CO2Epc_{t-1} + \alpha_{MLX} \ln MLX_{t-1} + \sum_{i=1}^p \alpha_i \Delta \ln FD_{t-i} + \\ & \sum_{i=0}^s \alpha_i \Delta \ln FDI_{t-i} + \sum_{m=0}^u \alpha_m \Delta \ln XPRT_{t-m} + \sum_{d=0}^c \alpha_d \Delta \ln XCR_{t-d} + \\ & \sum_{x=0}^w \alpha_x \Delta \ln NFRA_{t-x} + \sum_{k=0}^r \alpha_k \Delta \ln UNZ_{t-k} + \sum_{a=0}^e \alpha_a \Delta \ln CO2Epc_{t-a} + \\ & \sum_{n=0}^v \alpha_n \Delta \ln MLX_{t-n} + \varepsilon_{1t} \quad \dots\dots\dots(3) \end{aligned}$$

Where the error term is  $\epsilon_{1t}$ , and the intercept is  $\alpha_1$ . The long-run relationship and error correction dynamics are represented by the first and second portions of the equation, respectively. In the bound test, the null hypothesis is  $\alpha_i = \alpha_j = \alpha_k = \alpha_x = \alpha_a = \alpha_n = \alpha_m = \alpha_d = 0$ , which suggests the long-run relationship of the variables, where the alternative hypothesis is  $\alpha_i \neq \alpha_j \neq \alpha_k \neq \alpha_x \neq \alpha_a \neq \alpha_n \neq \alpha_m \neq \alpha_d \neq 0$ . The computed F-statistic is compared with the critical values of Narayan (2005).

The study evaluated the validity of the ARDL findings using a variety of methods, including fully modified least squares (FMOLS) advocated by Phillips and Hansen (1990), dynamic ordinary least squares (DOLS) proposed by Stock and Watson (1993) and canonical cointegrating regression (CCR) developed by Park (1992) for the robustness check of the long-run coefficient, as motivated by the study of Raihan et al. (2022), Iqbal et al. (2022) and Mukhtarov et al. (2020). The FMOLS–DOLS–CCR approach adjusts the least squares estimates to account for endogeneity in the regressors arising from a cointegrating relationship when both the dependent and control variables have unit roots, as well as serial correlation effects, while preventing sample bias (Narayan & Narayan, 2005). Furthermore, issues with heterogeneity and heterogeneous cointegration are well addressed by FMOLS and DOLS (Ali et al., 2022).

Once the long-term link between the variables has been established, the short-run coefficients and the error-correction term are estimated using the ECM. The following is a representation of the ECM:

$$\begin{aligned} \Delta \ln FDI_t = & \alpha_j + \sum_{i=1}^p \alpha_i \Delta \ln FDI_{t-i} + \sum_{i=0}^q \alpha_i \Delta \ln FDI_{t-i} + \\ & \sum_{m=0}^u \alpha_m \Delta \ln XPR_{t-m} + \sum_{d=0}^c \alpha_d \Delta \ln XCR_{t-d} \\ & + \sum_{x=0}^w \alpha_x \Delta \ln NFRA_{t-x} + \sum_{z=0}^k \alpha_z \Delta \ln UNZ_{t-z} + \\ & + \sum_{a=0}^e \alpha_a \Delta \ln CO2Epc_{t-a} + \sum_{n=0}^v \alpha_n \Delta \ln MLX_{t-n} + \alpha ECT_{t-1} \\ & + \epsilon_{1t} \end{aligned} \quad \dots(4)$$

$ECT_{t-1}$  is the error correction term, signifying the speed of adjustment to the long-term equilibrium level.

**Causality test:** In order to ensure the nature and presence of causal bonding between the factors, the pairwise Granger causality (Granger, 1969) test is also employed. Granger causality is a statistical concept of causality based on prediction, utilised in this study due to its several

advantages over other time-series evaluation techniques. One primary advantage of this test is its ability to analyse multiple lags, thereby capturing potential delayed effects. It is asserted that one time series Y "Granger-causes" another time series X if Y can improve the prediction of X's future values. The time series data lengths T for these variables are denoted as  $X_t$  and  $Y_t$  ( $t = 1, 2, \dots, T$ ), representing their respective values at time t.

**Stability and Diagnostic Check:** In the last part of the study, it assesses the model's stability and robustness, along with functionality, through a wide range of diagnostic checks, namely normality, heteroscedasticity, serial correlation, CUSUM, and Ramsey RESET tests.

The methodology discussed above was employed in this study for the following reasons. The main reason for using the above methods is that, in the case of mixed stationarity of the variable, the ARDL model imposes no restrictions. Second, this method responds reliably to association, especially in the case of a small and limited sample. Third, this model supplies robust estimation in the long run, as inspired by the study of Raihan et al. (2022). Fourth, this model efficiently dealt with issues of endogeneity and autocorrelation. Fifth, it combined both short- and long-term interactions in a broad sense.

## 4.Result and Discussion

### 4.1 Findings from the summary statistics

It is observed that there is considerable instability and significant variation over time in the parameters' average values, as shown in Table 1. For instance, the average FDI during the research period was 17,087 million US dollars, reflecting its instability, with a maximum value of 64,362 million US dollars and a minimum value of 5.64 million US dollars. Furthermore, the large standard deviation of the studied variables also confirms their instability. The levels of financial development, as measured by domestic credit by the financial sector, military expenditure, and exports as a percentage of GDP, were notably high throughout the study period, with considerable deviation from their means. The wide gaps between the maximum and minimum figures indicate the overall instability of the urban population, per capita carbon emissions, infrastructure, and exchange rate during this time.

**Table 1. Descriptive Statistics**

Measure	FD	FDI	XPRT	XCR	NFRA	UNZ	CO2Epc	MLX
Mean	35.88	17086.80	14.54	40.85	416035.10	319.26	1.11	2.89
Median	30.12	4405.04	13.63	43.80	219051.50	305.72	0.96	2.77
Maximum	54.51	64362.36	25.43	82.60	1209803.00	519.51	1.93	4.23
Minimum	20.54	5.64	5.20	7.86	100000.00	160.95	0.44	2.40
Std. Dev.	12.60	20003.03	6.85	21.62	336476.50	107.68	0.48	0.44
Skewness	0.24	0.73	0.06	0.06	0.85	0.27	0.39	1.33
Kurtosis	1.24	2.00	1.49	2.01	2.46	1.85	1.74	4.34
Jarque-Bera	6.07	5.71	4.22	1.84	5.78	2.93	4.01	16.17
Probability	0.05	0.06	0.12	0.40	0.06	0.23	0.13	0.00

Source: Computation by the authors

**4.2 Outcomes of the long-run analysis**

**Table 2. ADF (Augmented Dickey–Fuller) Unit Root Test Result**

Variable	Base (Level)			Initial (First) Difference			Remark
	Only (Intercept)	With Both (Trend and Intercept)	Without both (None)	Only (Intercept)	With Both (Trend and Intercept)	Without both (None)	
lnFD	-1.026387 (0.7346)	-4.748723 (0.0028)	1.137941 (0.9314)	-3.339784 (0.0210)	-3.151782 (0.1116)	-2.533695 (0.0126)	I(0), I(1)
lnFDI	-2.006715 (0.2828)	0.303875 (0.9975)	0.856757 (0.8907)	-1.546052 (0.4989)	-4.804149 (0.0023)	-0.920218 (0.3109)	I(1)
lnXPRT	-0.780692 (0.8144)	-1.749978 (0.7103)	1.382470 (0.9559)	-3.292900 (0.0217)	-3.305628 (0.0796)	-2.768304 (0.0068)	I(1)
lnXCR	-2.947723 (0.0482)	-1.490989 (0.8174)	-1.595279 (0.9710)	-2.989912 (0.0442)	-5.083101 (0.0009)	-2.086583 (0.0369)	I(0), I(1)
lnNFRA	-0.565302 (0.8667)	-2.108461 (0.5266)	-2.041294 (0.9890)	-6.328378 (0.0000)	-6.248609 (0.0000)	-5.840051 (0.0000)	I(1)
lnUNZ	-2.709038 (0.0812)	-1.509166 (0.8102)	1.067007 (0.9225)	-1.425952 (0.5600)	-2.547327 (0.3052)	-2.112105 (0.0348)	I(1)
lnCO2Epc	-0.932903 (0.7657)	-5.207825 (0.0007)	-0.608069 (0.4471)	-3.007562 (0.0439)	-3.083210 (0.1259)	-1.275102 (0.1827)	I(0), I(1)
lnMLX	-1.365855 (0.5900)	-3.106877 (0.1180)	-0.784366 (0.3705)	-5.082692 (0.0001)	-5.011455 (0.0011)	-5.052306 (0.0000)	I(1)

Source: Computation by the authors

#### 4.2.1 Unit root test result

To draw meaningful conclusions from time-series analysis, the model's accuracy, reliability, and stability depend on determining the unit root property and the order of integration for each variable in the system. Table 2 presents the results of the ADF unit root test for each variable at its base and initial difference. The findings indicate that all variables are stationary at their first difference, at their level, or at both; specifically, the variables are integrated at level  $I(0)$ , at order 1 ( $I(1)$ ), or at both.

#### 4.2.3 Cointegration test result

Concerning ideal lag length (ignoring details due to space constraints) as one for the explained variable and two for explanatory variables as per the mentioned criteria, the ARDL bound test (Pesaran et al., 2001) outcomes in Table 3 revealed that the derived F test statistic (6.80) exceeds the above limit values at the 10%, 5%, 2.5%, and 1% which confirm statistical significance. Therefore, it can be said that the variables used in the study are bound over a long time.

#### 4.2.4 ARDL normalised coefficient result

Table 4 presents the results from the long-term estimations of the ARDL model. Financial development has been adversely affected by FDI, which is consistent with the findings of Rousseau and Wachtel (2011). He worries that excessive financial deepening could hinder economic growth because of excessive financial openness. Although per capita CO<sub>2</sub> emissions were found to be negatively correlated with financial development, Ji and Zhang (2019) argued that financial development is essential and explains 42.42% of the variation in the expansion of renewable energy and, consequently, lower emissions in China. Our findings are comparable to those of Abid (2017). He contends that the growth of the financial system is also to blame for the rise in emissions in the EU and MEA nations. According to Ehigiamusoe and Lean (2019) for the West

African region and Dabachi et al. (2022) for Iran, exchange rates have been shown to have a statistically significant negative impact on financial development over the long term.

However, infrastructure and urbanisation have greatly aided financial development. This is consistent with the findings of Alshubiri et al. (2019), who noted that financial development in Gulf Cooperation Council (GCC) nations is greatly aided by infrastructure related to ICT, including broadband and internet users, as well as the proportion of the population living in cities. This is because metropolitan infrastructure and financial services are more easily accessible. Additionally, Mohanty and Bhanumurthy (2019) attest to their physical infrastructure index findings. The beneficial effect of military spending on financial development is comparable to that of Desli et al. (2017), who showed that military spending only benefited developing nations out of 138 total countries evaluated, and Mirza et al. (2015), who found that military spending boosted economic growth in Pakistan. However, some research (d'Agostino et al., 2017; Chang et al., 2014) suggested that it had a detrimental effect on economic growth. Exports were found to considerably increase financial development, which is consistent with earlier research by Rajan and Zingales (2003), Braun and Raddatz (2005), and Alshubiri et al. (2019). The coefficient values for urbanisation, infrastructure, military expenditure, and export suggest that a 1% increase in each variable would lead to a 0.93%, 0.26%, 0.57%, and 0.58% surplus in financial growth, respectively.

#### 4.2.5 FMOLS, DOLS, and CCR estimators coefficient result

The findings of the ARDL long-run coefficient are ensured by FMOLS and CCR in Table 5, considering the statistically significant decelerating impact of FDI and exchange rate on financial development in the long run, in contrast with per capita carbon emissions showing acceleration. The DOLS

**Table 3. Outcomes of the ARDL bounds test**

Significance level	Lower limit I(0)	Upper limit I(1)	Wald test-F statistics
10%	2.03	3.13	
5%	2.32	3.50	
2.50%	2.60	3.84	<b>6.80</b>
1%	2.96	4.26	

Source: Computation by the authors

(Table 5) estimator revealed that FDI, urbanisation, and carbon emissions were insignificant to financial development, while the exchange rate hurts at par with

ARDL, FMOLS, and CCR in the long run. DOLS also validated only infrastructure, military spending, and exports; like the other three estimators, it statistically accelerates financial development over time.

**Table 4. Findings of the ARDL long-run Analysis**

Independent Variable	Dependent Variable: lnFD			
	Coefficient	t-statistics	p-value	Significance
FDI	-0.0506	-3.6758	0.0011*	Significant and Negative
Export	0.57658	11.8803	0.000*	Significant and Positive
Exchange Rate	-0.1766	-2.006	0.0558***	Significant and Negative
Infrastructure	0.25945	3.3801	0.0024*	Significant and Positive
Urbanisation	0.92832	3.84378	0.0007*	Significant and Positive
Per capita CO2Emission	-0.4274	-2.3499	0.027**	Significant and Negative
Military Expenditure	0.57533	5.52877	0.000*	Significant and Positive

Note: \*, \*\*and\*\*\* signify variables are significant statistically at 1%, 5%, and 10% level, respectively.

Source: Computation by the authors

**Table 5. Findings from Long-run FMOLS, DOLS, and CCR estimators**

Explanatory Variable	Explain variable: lnFD					
	FMOLSEstimator		DOLSEstimator		CCR Estimator	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
FDI	-0.05377*	0.0000	-0.04013	0.2189	-0.04866*	0.0000
Export	0.529343*	0.0000	0.63822*	0.0000	0.544003*	0.0000
Exchange Rate	-0.25584*	0.0000	-0.344677	0.1209	-0.36943*	0.0000
Infrastructure	0.185242*	0.0000	0.254558***	0.0875	0.132085*	0.0000
Urbanisation	0.073188*	0.0000	0.0331149	0.7547	0.710976*	0.0000
Per capita CO2Emission	0.495401*	0.0000	0.23323	0.5182	0.224435*	0.0014
Military Expenditure	0.460003*	0.0000	0.788827*	0.0069	0.485355*	0.0000

Note: \*, \*\*and\*\*\* signify variables are significant statistically at 1%, 5%, and 10% level, respectively.

Source: Computation by the authors

### 4.3 Findings from short-run analysis

**Table 6. Results of Error Correction Model**

Explanatory Variable	Explain variable: lnFD			
	Coefficient	t-statistics	p-value	significance
D(lnFDI)	0.00022	0.03629	0.9713	Not Significant
D(lnFDI(-1))	0.01363	2.01876	0.0544***	Significant and Positive
D(lnXPRT)	0.16867	3.30259	0.0029*	Significant and Positive
D(lnXPRT(-1))	-0.26158	-4.3531	0.0002*	Significant and Positive
D(lnNFRA)	0.04374	1.72963	0.096***	Significant and Positive
D(lnNFRA(-1))	-0.08114	-2.2368	0.0345**	Significant and Negative
D(lnMLX)	0.20572	3.04478	0.0054*	Significant and Positive
D(lnMLX(-1))	-0.2000	-2.5135	0.0188**	Significant and Negative
Coint Eq(-1)*	-0.83119	-8.3446	0.0000*	Significant
Diagnostic tests	t-Stat	p-values	Outcome	
Serial Correlation LM Test (i)	10.2875	0.1543	No serial correlation	
Normality (ii)	0.27602	0.8711	Normally distributed data	
Heteroscedasticity (iii)	17.731	0.3399	No heteroscedasticity	
Ramsey RESET test (iv)	0.63097	0.4348	Equation is correctly specified	
R <sup>2</sup>	0.81847	-	Association (High)	
R <sup>2</sup> (Adjusted)	0.76742	-	Association (High)	
Durbin-Watson	2.67776	-	No autocorrelation at first-order	

Note: \*, \*\* and \*\*\* signify variables are significant statistically at 1%, 5%, and 10% level, respectively.

(i) Breusch - Godfrey Lagrange Multiplier Serial Correlation Test

(ii) Jarque-Bera test of Normality

(iii) Heteroscedasticity Test of Breusch- Pagan- Godfrey

(iv) Ramsey RESET Test

Source: Computation by the authors

4.3.1 Result from ECM regression

After validating the long-term cointegration among the variables, using ECM regression, the short-run outcomes are shown to provide a basic explanation for the nature of the influence in Table 6. According to ECT, all explanatory factors, such as infrastructure, urbanisation, and carbon emissions, harmonise to their overlong routes to an extent of -0.831, with a 1% predicted level of statistical significance. This indicates that the contribution from the independent variables makes the diffusion towards equilibrium by about 83% annual. While carbon emissions, urbanisation, and exchange rates have unforeseen impacts on financial development, FDI, infrastructure, military spending, and exports have deterministic beneficial effects. With the exception of FDI, the positive effects of deterministic variables had a negative lag period.

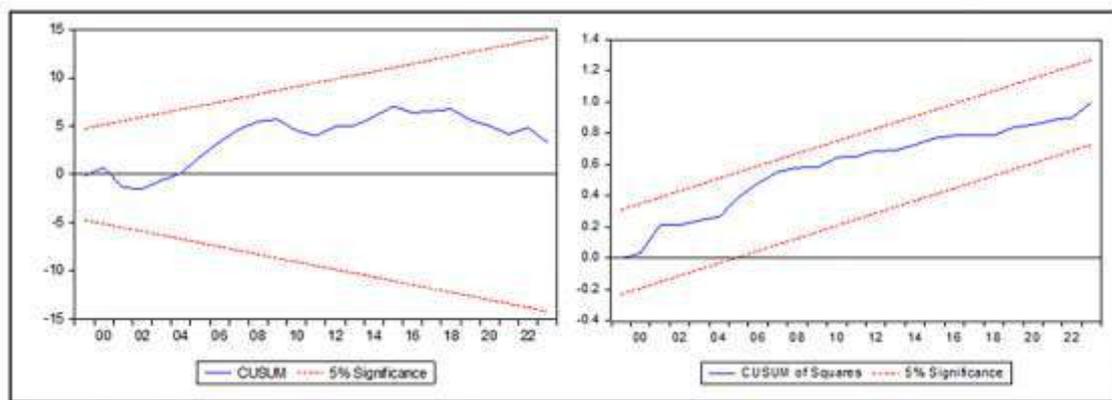
4.3.2 Findings from the diagnostic test

The findings represented in the lower part of Table 6 relating to the serial correlation test confirmed that the model's residuals are not serially correlated. Additionally, it observed that the analysis is free from heteroscedasticity issues and the model is correctly specified as per the satisfactory results of the Ramsey RESET test. Similarly,

the Jarque-Bera test results indicate normality of the models' residuals. The result of CUSUM and CUSUMQ of recursive residuals, as grounded by Brown et al. (1975), presented in Figure 1, suggests that the model remains stable throughout the study period at the 5% significance level. Therefore, this section of the research ensures the validity of the models and the robustness of the outcomes.

4.3.3 Findings from the pairwise Granger causality test

The Granger causality test result presented in Table 7 indicates that there is bi-directional causality between infrastructure and financial development, exports and FDI, as well as between exchange rate and military expenditure, which means these variables causally affect each other, respectively. However, exchange rate, urbanisation, and carbon emissions affect FDI unidirectionally, while FDI leads to causal effects on financial development (Hanif & Shariff, 2016) and military spending. Moreover, military spending is causally affected by infrastructure, exports, urbanisation, and carbon emissions, while exchange rates, exports, and urbanisation are unidirectionally linked with infrastructure.



Source: Computation by the authors

Figure 1. Plot of the cumulative sum of recursive residuals for the model

Table 7. Results of the Granger causality test

Sl. No.	Null Hypothesis Rejected	F-Statistic	Prob.	Causality
1.	lnNFRA does not Granger-cause lnFD	3.1382	0.0551	Bi-directional
	lnFD does not Granger-cause lnNFRA	4.33577	0.0203	
2.	lnXPRT does not Granger-cause lnFDI	4.75427	0.0145	Bi-directional
	lnFDI does not Granger-cause lnXPRT	4.02621	0.0262	
3.	lnMLX does not Granger-cause lnXCR	4.5763	0.0168	Bi-directional
	lnXCR does not Granger-cause lnMLX	6.85233	0.0029	

Sl. No.	Null Hypothesis Rejected	F-Statistic	Prob.	Causality
4.	lnFDI does not Granger-cause lnFD	2.53004	0.0934	Unidirectional
5.	lnXPRT does not Granger-cause lnFD	2.54488	0.0921	Unidirectional
6.	lnXCR does not Granger-cause lnFD	2.96196	0.0641	Unidirectional
7.	lnFD does not Granger-cause lnCO2Epc	4.14191	0.0238	Unidirectional
8.	lnXCR does not Granger-cause lnFDI	6.61856	0.0035	Unidirectional
9.	lnUNZ does not Granger-cause lnFDI	4.45428	0.0185	Unidirectional
10.	lnFDI does not Granger-cause lnMLX	3.2975	0.0481	Unidirectional
11.	lnCO2Epc does not Granger-cause lnFDI	4.57959	0.0167	Unidirectional
12.	lnXCR does not Granger-cause lnXPRT	4.53939	0.0173	Unidirectional
13.	lnXPRT does not Granger-cause lnNFRA	3.2461	0.0502	Unidirectional
14.	lnXPRT does not Granger-cause lnMLX	3.49175	0.0408	Unidirectional
15.	lnXPRT does not Granger-cause lnCO2Epc	2.5185	0.0900	Unidirectional
16.	lnUNZ does not Granger-cause lnXCR	2.46643	0.0987	Unidirectional
17.	lnXCR does not Granger-cause lnNFRA	2.53783	0.0927	Unidirectional
18.	lnUNZ does not Granger-cause lnNFRA	2.75732	0.0765	Unidirectional
19.	lnUNZ does not Granger-cause lnMLX	3.55504	0.0387	Unidirectional
20.	lnNFRA does not Granger-cause lnMLX	3.00625	0.0617	Unidirectional
21.	lnCO2Epc does not Granger-cause lnMLX	3.44747	0.0424	Unidirectional

Source: Computation by the authors

## 5. Conclusion

This study provides valuable insights into the long-term dynamics between FDI, urbanisation, infrastructure, carbon emissions, military spending, and financial development in India from 1980 to 2023. By incorporating additional variables like exports and exchange rates, and using advanced models like FMOLS, DOLS, and CCR, the study examines both long- and short-term effects of these factors on financial development. Key findings reveal that urbanisation, infrastructure, exports, and military spending significantly drive financial development in the long run, while FDI, exchange rates, and carbon emissions show a negative impact. In the short term, infrastructure, FDI, military spending, and exports have positive effects, while carbon emissions and urbanisation unexpectedly influence financial growth. The correction in the error term (Coint Eq(-1)) reveals that the system adjusts to the overlong equilibrium at 83% annually. The Granger causality test

showed bi-directional causality between financial development, infrastructure, exports, FDI, and military spending, while exchange rates, urbanisation, and carbon emissions had unidirectional impacts on FDI.

## 6. Theoretical and Practical Implication

The findings offer significant theoretical and practical insights for sustainable financial development. A. Prioritising low-carbon infrastructure development via foreign direct investment can align financial growth with environmental sustainability. B. Investment in green technologies, including solar and wind power, is crucial for diminishing reliance on carbon-intensive industries. C. Eliminating barriers to foreign direct investment, especially in the defence sector, may enhance exports and support exchange rate stability. D. Promoting the export of carbon-neutral defence technologies through targeted foreign direct investment incentives can significantly contribute to financial growth. Ultimately, prioritising long-term export

strategies will stabilise the local currency and strengthen low-carbon infrastructure, thereby promoting sustainable development within the financial sector.

In conclusion, these policy recommendations can help enhance India's financial resilience, promote sustainable urban and infrastructure development, and mitigate environmental impact, leading to a prosperous, environmentally friendly future. Future research may explore qualitative methods or focus on regional financial development in developing countries.

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- <https://data.worldbank.org/indicator/PA.NUS.FCRF?locations=IN>
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- [https://www.globalfirepower.com/country-military-strength-detail.php?country\\_id=india](https://www.globalfirepower.com/country-military-strength-detail.php?country_id=india)
- <https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS?locations=IN>
- <https://www.iea.org/countries/india/emissions>
- <https://lpi.worldbank.org/international/global>

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# Market Structure and Industrial Loan Portfolio Diversification: Differential Effects on Performance and Stability in Indian Banking

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## A b s t r a c t

This study examines how industrial loan portfolio diversification affects bank outcomes across different market structures in India. We analyse 26 Indian banks across 19 industrial sectors from 2011 to 2023 using system GMM estimation. Banking stability is assessed through a comprehensive six-dimensional index incorporating soundness, asset quality, earnings, liquidity, efficiency, and market risk dimensions. Our analysis reveals that banks in concentrated deposit markets control most lending across all industrial sectors. Results show that portfolio concentration significantly reduces bank performance in competitive markets (coefficient: -0.0803,  $p < 0.01$ ), while showing no significant effect in concentrated markets (coefficient: -0.0361). For stability, diversification benefits both market structures, with concentrated markets showing twice the economic magnitude (coefficient: -0.218 vs -0.107). Performance persistence is stronger in concentrated markets, while stability drivers differ systematically, with competitive markets relying on asset quality and operational efficiency compared to concentrated markets' dependence on capital adequacy and liquidity buffers. These findings reveal that banking consolidation has concentrated industrial financing, with varying diversification effects requiring differentiated regulatory approaches.

**Keywords:** *Industrial loan portfolio diversification, Market structure, Market concentration, Banking stability, System GMM, Emerging markets.*

## 1. Introduction

The 1997 Asian financial crisis revealed early warning signs when institutions with concentrated exposure to the property and manufacturing sectors faced severe distress (Corsetti et al., 1999). This pattern intensified during the 2008 global financial crisis, which revealed how banks with heavy real estate exposure experienced losses that contributed to systemic banking failures and \$2.8 trillion in global financial sector write-downs (Acharya et al., 2009; IMF, 2009). More recently, the COVID-19 pandemic highlighted sectoral concentration risks in European banks. Banks with heavy exposure to vulnerable sectors like food and accommodation, aviation, commercial real estate, and retail trade had faced material financial risks that required enhanced credit risk assessment and provisioning adjustments (ECB Banking Supervision, 2021).

These crisis episodes illustrate precisely why diversifying loan portfolios has emerged as a fundamental principle of prudent banking. The relationship between loan portfolio diversification (LPD) and bank performance has been a cornerstone of banking research since Markowitz's (1952) modern portfolio theory was first applied to financial institutions. Traditional banking theory suggests that spreading lending across sectors reduces risk through exposure to imperfectly correlated sectors or products, thereby enhancing both bank stability and performance.

However, economic theory and empirical evidence don't have a consensus on this relationship, with conflicting findings emerging across diverse economies. Studies supporting diversification benefits span developed markets such as Austria (Rossi et al., 2009) and emerging economies, including Argentina (Bebczuk & Galindo, 2008), as well as 55 developing countries (Amidu & Wolfe, 2013). Similarly, evidence favouring concentration strategies appears across developed markets such as Italy (Acharya et al., 2006), Germany (Jahn et al., 2013), and Japan (Wu, 2024), as well as emerging economies, including Brazil (Tabak et al., 2011). The fact that both patterns exist across different development contexts indicates that diversification effectiveness likely depends on common structural characteristics that transcend economic development levels. Market structure emerges as one such potential explanation, as it fundamentally changes the incentives and constraints governing bank credit allocation. While Shim (2019) provides pioneering evidence that diversification benefits vary between concentrated and competitive banking markets, this line of

research remains nascent and limited in scope. Huynh (2024) finds that competitive banks diversify asset portfolios while maintaining concentrated loan portfolios, though using aggregate sectoral measures. Similarly, Gkoumas et al. (2024) examine portfolio concentration effects under market competition but focus on stock crash risk rather than fundamental bank performance and stability outcomes. These studies, while employing aggregate sectoral measures, provide limited insight into crucial heterogeneity in diversification effects. Banks actually manage credit portfolios across diverse industrial categories ranging from mining and textiles to infrastructure and chemicals, and risk-return dynamics may differ substantially from those captured by three or five-sector classifications. This methodological limitation creates an important research gap. Additionally, traditional banking stability measures focus on single dimensions, typically Z-scores measuring insolvency risk, while ignoring other critical aspects of financial stability such as liquidity risk, operational efficiency, and market risk sensitivity (Lepetit & Strobel, 2013; Čihák & Schaeck, 2010). This narrow approach creates problems for understanding the dynamics of stability in emerging economies, where banks face multiple risk exposures simultaneously. Third, despite its policy importance, this relationship remains underexplored in emerging economies with limited empirical studies.

These limitations are not merely academic concerns but have direct implications for financial stability and economic development policy. In emerging economies where banking consolidation and industrial development occur simultaneously, this understanding of how diversification strategies perform across competitive environments becomes crucial for both regulatory oversight and strategic bank management. When a few large banks control the majority of sectoral lending, their portfolio decisions can simultaneously affect entire industries, creating systemic risks that extend beyond individual bank failures. These dynamics transform industrial development policy into banking policy by proxy, where sectoral credit allocation depends upon dominant banks' portfolio choices rather than market-based allocation mechanisms.

The Indian banking sector provides an ideal natural setting for examining these relationships, driven by several compelling factors. First, India's unique market structure dynamics offer within-country variation essential for robust analysis. The sector underwent significant consolidation through government-led mergers over the past decade, with

the five largest banks now controlling approximately 55% of total deposits (RBI, 2023), while our study period (2011-2023) covers important regulatory changes including asset quality recognition requirements (2013-2015), stricter provisioning norms (2015-2017), and revised debt restructuring mechanisms (2017-2023). This combination enables analysis of market structure effects without cross-country institutional confounds while providing natural experiments in how diversification strategies perform under different regulatory regimes. Additionally, Basel III disclosure requirements mandate Indian banks to report lending across 19 distinct industrial sectors in their annual reports, providing the most granular industrial classification among major emerging economies and enabling precise diversification measurement unavailable elsewhere.

Second, the strategic importance of industrial financing for India's economic transformation makes understanding banks' sectoral credit allocation patterns crucial for policy and financial stability. India's ongoing industrial development initiatives, including "Make in India" and "Atmanirbhar Bharat," semiconductor manufacturing (₹76,000 crore Semicon India Programme), and defence production (₹1.27 lakh crore in FY 2023-24), all depend critically on banking sector financing (Economic Survey 2024-25). In India's bank-dominated financial system, where corporate bonds constitute only 18% of GDP, compared to 80% in South Korea and 36% in China, and 97% of issuances are concentrated in top-rated categories (Economic Survey 2024-25), banks remain the primary financing mechanism for industrial development.

Third, empirical evidence suggests the presence of potential financing constraints in India's industrial transformation. Despite the National Manufacturing Policy 2011's ambitious target of raising manufacturing's contribution to 25% of GDP by 2022 (Department for Promotion of Industry and Internal Trade, 2011), the sector achieved only 12.93% by 2023 (World Bank, 2024). This significant shortfall raises questions about whether banking sector credit allocation patterns may be constraining industrial development, making an understanding of diversification strategies crucial for realising India's industrial transformation objectives.

Finally, the existing Indian banking literature has shown inconsistent diversification effects: Ahamed (2017) found benefits, Sahoo and Mishra (2012) reported volatility increases, and Chandramohan et al. (2022) reported mixed stability effects, suggesting that market structure may be the

missing factor explaining these contradictory results. To bridge these research gaps, this study addresses two research questions on how market structure influences industrial LPD effects on banking performance and stability in India. Specifically, we investigate whether diversification effects on bank outcomes vary systematically across concentrated and competitive banking environments. We use a comprehensive dataset comprising 26 Indian banks, representing approximately 85% of the scheduled commercial banking sector's total assets, and spanning 338 bank-year observations from 2011 to 2023. Our methodological approach incorporates three key innovations. First, we develop a comprehensive six-dimensional Banking Stability Index that incorporates soundness, asset quality, earnings, liquidity, efficiency, and market risk dimensions, following the approaches used by the Reserve Bank of India. Second, we measure industrial LPD using the Herfindahl-Hirschman Index applied to credit allocation across 19 distinct industrial sectors as disclosed under Basel III regulatory requirements in banks' annual reports. Third, we employ system GMM estimation to address endogeneity concerns between diversification choices and bank outcomes while accounting for performance and stability persistence over time.

Our empirical findings reveal that diversification benefits vary systematically across competitive environments. Industrial LPD most strongly enhances bank performance in competitive markets, whereas it shows weaker effects in concentrated environments. For banking stability, diversification benefits emerge in both market structures, though with a larger economic magnitude in concentrated markets despite lower statistical precision. Additionally, we document that banks in concentrated markets control 80-90% of lending across all 19 industrial sectors, transforming sectoral development from market-based allocation to institutional portfolio choices. These results suggest that optimal diversification strategies must be calibrated to specific competitive environments rather than uniformly implemented across banking systems.

This study makes three main contributions to fill a gap in the banking literature. First, we demonstrate that granular industrial diversification measurement reveals market structure effects that broad sectoral categories miss entirely. As Aggarwal and Vadgama (2024) highlight, academic research on sector-specific portfolio analysis remains scarce in emerging markets, particularly for industrial portfolios, despite their critical role in economic

development. Second, our comprehensive multidimensional stability index captures dynamics beyond traditional measures, providing a more complete assessment of banking stability. Third, our findings reveal that market structure creates differential effects on diversification strategies, with concentrated markets showing weaker performance responsiveness to diversification while maintaining larger stability benefits. This suggests that banking consolidation, while potentially strengthening individual institutions, may alter the risk-return dynamics of portfolio allocation decisions, requiring differentiated regulatory approaches across competitive environments.

## 2. Literature Review

### 2.1 Theoretical Background

LPD in banking builds on Markowitz's (1952) modern portfolio theory, which predicts that spreading investments across imperfectly correlated assets reduces overall portfolio risk while maintaining expected returns. Banking theorists extended this logic to suggest that diversifying credit across sectors, industries, and geographical regions can enhance bank risk-adjusted returns by reducing exposure to sector-specific economic shocks (Winton, 1999; Boyd & Prescott, 1986). Empirical studies support this theoretical foundation across diverse banking contexts, documenting enhanced performance and stability for diversified institutions in Turkey (Ozdincer & Ozyildirim, 2008), the United States (Meslier et al., 2016; Shim, 2019; Tran et al., 2025), and Malaysia (Šeho et al., 2024). However, the Corporate finance theory challenges this perspective, contending that diversification may deteriorate bank performance by reducing monitoring efficiency and increasing operational complexity when institutions enter unfamiliar sectors (Diamond, 1984; Acharya et al., 2006). Banks develop specialised knowledge and relationship-specific advantages within particular industries, which can be diluted through excessive diversification. Evidence from multiple markets demonstrates superior outcomes for banks with concentrated portfolios in Brazil (Tabak et al., 2011), Ghana (Kusi et al., 2020), international samples (Beck et al., 2022), and Japan (Wu, 2024). The persistence of these contradictory findings across diverse economic contexts suggests that neither theoretical framework is universally applicable, pointing to the need to understand the conditions under which each approach proves optimal.

While these theories provide the base for loan diversification, banking literature has evolved to recognise that financial institutions operate under constraints and

incentives that modify basic portfolio optimisation principles. Growing recognition that diversification effects are contingent on context has led newer studies to explore competitive market structure as a critical moderating factor. Three complementary theoretical frameworks explain why market structure should fundamentally alter diversification effectiveness. Agency theory suggests that market structure systematically affects managerial incentives for diversification (Jensen & Meckling, 1976; Demsetz & Lehn, 1985). Competitive markets discipline managers through performance pressure, forcing efficient portfolio allocation and making diversification benefits more apparent in bank outcomes. On the other hand, in concentrated markets, bank managers face reduced pressure to optimise portfolio allocation, as pricing advantages derived from structural market position can compensate for suboptimal diversification strategies.

While agency theory explains managerial motivations, the actual implementation of diversification strategies depends on operational considerations. The Transaction cost theory focuses on monitoring and coordination economics (Williamson, 1985; Cuyppers et al., 2021). Market structure fundamentally alters these cost calculations because competitive intensity determines available resources and monitoring requirements. In competitive markets, banks face resource constraints and performance pressure that increase the transaction costs of monitoring diverse portfolios, making specialisation more cost-effective. Whereas, in concentrated markets, banks possess greater resources and face less immediate performance pressure, enabling them to bear the higher transaction costs associated with effective diversification monitoring across multiple sectors (Williamson, 1985; Ketokivi & Mahoney, 2020).

These operational cost considerations operate within broader competitive environments that shape strategic decision-making. Industrial organisation theory shows that market structure affects firm behaviour through competitive discipline (Berger et al., 2004; Miller, 2024). When banks compete intensely, inefficient diversification quickly hurts market share and profits, creating immediate feedback that forces portfolio optimisation. When markets are concentrated, banks can afford inefficient diversification because they earn profits from market power regardless of how well they manage their portfolios.

Despite these theoretical predictions, empirical evidence on how market structure influences diversification effectiveness remains limited. Studies examining

competitive markets find that diversification serves different strategic purposes depending on the institutional context. Studies from Europe (Căpraru et al., 2020; Ferreira, 2023) show that banks in competitive environments diversify revenue sources to maintain a competitive edge, while Turk-Ariss (2010) demonstrates that competition drives beneficial diversification across 55 developing countries. In contrast, evidence from concentrated markets suggests different diversification dynamics, with Shim (2019) finding that diversifying banks perform better in concentrated U.S. markets than in competitive ones. Asian market studies reveal additional complexity, with Nguyen et al. (2012a, 2012b) finding non-linear relationships between market power and diversification across ASEAN and South Asian banks, while recent evidence from Huynh (2024) and Wu (2024) suggests that diversification effects vary by bank type and diversification category in Vietnam and Japan, respectively. These contradictory findings point to the need for a more systematic analysis of how market structure moderates diversification effectiveness, particularly using granular measures that can capture the complexity of bank portfolio allocation decisions across different competitive environments.

## 2.2 Banking Stability Measurement and Research Gaps

A critical limitation in existing research is the reliance on single-dimensional stability measures that fail to capture the multifaceted nature of banking stability. Traditional banking stability research has predominantly employed Z-scores as the primary indicator, which measures only insolvency risk while ignoring other crucial dimensions, including liquidity risk, operational efficiency, and market risk sensitivity. The limitations of traditional measures have become increasingly apparent as researchers have discovered that Z-scores are backwards-looking and cannot capture banks' future risk profiles, while aggregate prudential ratios have limited reliability in distinguishing strong from weak banking systems (Lepetit & Strobel, 2013; Čihák & Schaeck, 2010). This narrow approach creates particular problems for understanding stability dynamics in emerging economies where banks face multiple simultaneous risk exposures, with scholars arguing that single measures fail to provide timely early warning signals for emerging instabilities (Hafeez et al., 2022; Gulati, 2023). Recognising these limitations, regulators have begun adopting more comprehensive approaches, with the Reserve Bank of India employing multiple indicators across various risk dimensions in its

Financial Stability Reports to assess banking sector health more accurately.

The application of these improved methodological approaches to emerging markets, particularly India, reveals additional research gaps. Previous research on Indian banking has mainly focused on broad diversification patterns without investigating sector-specific concentration effects. Ahamed (2017) examines income diversification's impact on profitability, focusing on non-interest revenue streams and their interaction with asset quality. Extending this income diversification research, Pennathur et al. (2012) investigate how ownership structures influence diversification strategies, analysing fee-based revenue patterns across public, private, and foreign banks. Taking a different approach, Sahoo and Mishra (2012) analyse operational diversification effects and reveal that extensive diversification can increase performance volatility rather than reducing it. Building on these insights, Reddy's (2021) geographic diversification study constructs environmental portfolios across seven economic activities but employs aggregate sectoral measures rather than granular classification. More recently, Chandramohan et al. (2022) adopted a broader framework examining functional, geographic, and LPD comprehensively. However, their stability assessment relies on traditional Z-score variants, capturing only unidimensional risk measures.

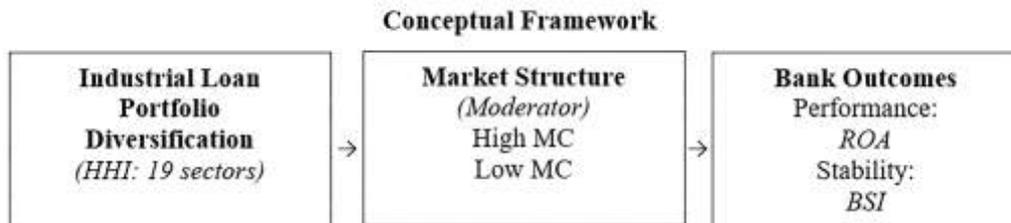
These limitations reveal three critical research gaps that this study addresses. First, existing studies employ broad sectoral categories that fail to capture the granular sectoral diversification decisions banks actually make. Second, reliance on single-dimensional stability measures ignores the multifaceted nature of banking stability, especially in emerging market contexts. Third, no systematic examination exists of how market structure moderates the relationship between industrial LPD and bank outcomes in India, despite theoretical predictions that competitive dynamics should fundamentally alter diversification effectiveness.

## 2.3 Hypothesis Development

Considering the theoretical perspectives and empirical studies examined above, we establish the following hypotheses:

**H1:** Industrial LPD positively affects bank outcomes (performance and stability).

**H2:** The diversification effects on bank outcomes vary across market structures.



*Note: MC = Market Concentration. High MC and Low MC represent concentrated and competitive banking markets, respectively. HHI: 19 sectors measure industrial loan portfolio diversification. Control Variables: SIZE, CAR, NPAR, LIQR, OE, PR, GDPG | Method: Two-step System GMM. See Section 3 for measurement details.*

*Source: Author's own Computation*

**Figure 1. Conceptual Framework: Market Structure Moderation of Industrial Loan Portfolio Diversification Effects**

**H3:** Performance and stability persistence patterns differ between concentrated and competitive markets.

These hypotheses collectively examine whether diversification benefits are conditional in different market structures. We expect market structure to fundamentally alter both the magnitude and persistence of diversification effects.

Figure 1 illustrates how market structure moderates the relationship between industrial loan portfolio diversification and bank outcomes, with differential effects on performance versus stability across concentrated and competitive markets.

### 3. Data and Methodology

#### 3.1 Sample and Data Sources

The study analyses 26 Indian banks chosen based on three criteria, which are: continuous listing on the National Stock Exchange of India for at least 10 years during 2011-2023 to ensure consistent disclosure practices; have complete industry-wise credit deployment data across all 19 industrial sectors disclosed under Basel III requirements; and no major structural changes outside the documented merger activity. This sample represents approximately 85% of the scheduled commercial banking sector's total assets, ensuring representativeness while maintaining data quality.

We reconstruct pre-merger data, treating merged entities as single banks throughout the sample period to address survivorship bias from merger activity. This approach maintains panel balance while reflecting the reality of banking consolidation.

#### 3.2 Variable Construction

##### 3.2.1 Banking Stability Index (BSI)

Following approaches similar to those used by the RBI methodology, we construct a composite BSI incorporating 15 financial ratios across six dimensions: soundness (CRAR, Tier 1 to Capital), asset quality (NPAs to Advances, Provisioning Coverage, Sub-Standard Advances), earnings (ROA, NIM, Interest Margin), liquidity (Liquidity Assets, Cash-Deposit Ratio), efficiency (Cost to Income, Staff Expenses), and market risk sensitivity (RWA to Capital, Trading Income). Each ratio is normalised and averaged by dimension. The BSI is calculated as the average of these six indices and lies between zero and one.

This multidimensional approach provides a more comprehensive assessment of banking stability, with higher values meaning more stable environments.

##### 3.2.2 Industrial LPD

The primary independent variable is Industrial LPD, which captures the degree of diversification across 19 industries in the industrial loan portfolio. We use the Herfindahl-Hirschman Index (HHI) to measure portfolio concentration, where lower HHI values indicate greater diversification.

$$HHI = \sum(s_j)^2$$

Where  $s_j$  represents the share of loans to industry  $j$  as a proportion of the bank's total industrial loan portfolio, the HHI ranges from  $1/19$  (approximately 0.053) for a perfectly diversified portfolio to 1 for a completely concentrated

portfolio (where all loans are to a single industry). In our analysis, lower HHI values indicate greater diversification across industrial sectors, while higher values represent more concentrated portfolios. The 19 industrial sectors are detailed in Table 1.

### 3.2.3 Market Structure

We calculate the Herfindahl-Hirschman Index (HHI) of total deposits across all banks per period to assess the competitive structure of the Indian banking market. We refer to this measure as Market Concentration (MC) throughout our analysis. Higher MC values indicate markets where deposits are concentrated among fewer banks (less competitive), while lower values represent markets where deposits are more evenly distributed (more competitive). We employ time-varying median splits to capture the dynamic nature of India's banking sector during significant consolidation through government-led mergers. This approach allows banks to transition between competitive regimes over time, reflecting realistic market dynamics rather than static classifications, while maintaining balanced subsamples for robust estimation following Drechsler et al. (2017).

### 3.2.4 Control Variables

Our models include finance literature established control variables affecting bank stability and performance. NPAR measures asset quality through the ratio of non-performing assets to total assets (Naili & Lahrichi, 2022). CAR represents regulatory capital adequacy under Indian banking regulations (El-Ansary et al., 2019). SIZE, calculated as the natural logarithm of total assets, controls for potential scale effects (Mwangi, 2018). OE captures operational efficiency through the ratio of operating expenses to total income (Kosmidou et al., 2007). GDPg accounts for macroeconomic conditions (Ullah et al., 2022). We include policy rate (PR) to control monetary policy effects (English et al., 2015).

### 3.3 Empirical Strategy

We employ System GMM estimation (Arellano & Bover, 1995; Blundell & Bond, 1998) to address the well-documented endogeneity in bank diversification-performance relationships. System GMM is specifically designed to handle three endogeneity sources inherent in our setting. The first is reverse causality, arising as portfolio decisions and bank outcomes are simultaneously determined. Poorly performing banks may diversify to

reduce risk, while successful banks concentrate on profitable sectors. The System GMM breaks this feedback loop by using lagged values (t-2 and earlier) as instruments, which correlate with current diversification but not current shocks. Second, unobserved heterogeneity from time-invariant characteristics (managerial quality, risk culture, client relationships) affects both diversification and outcomes. The System GMM eliminates these fixed effects through first-differencing while maintaining efficiency via level equations, thus improving upon difference GMM. Third, dynamic persistence in banking outcomes creates Nickell bias in fixed effects models with lagged dependent variables. Both performance and stability exhibit significant autocorrelation (lagged ROA: 0.311,  $p < 0.01$ ; lagged BSI: 0.123,  $p < 0.05$ ), necessitating dynamic panel estimation. System GMM explicitly models these dynamics without bias, an important consideration for our panel structure ( $T=13$ ,  $N=26$ ). These methodological choices ensure our estimates are free from endogeneity bias.

#### Performance Models

$$ROA_{it} = \alpha + \beta_1 ROA_{it-1} + \beta_2 HHI_{it} + \beta_3 \text{Control Variables}_{it} + \eta_i + \varepsilon_{it}$$

#### Stability Models

$$BSI_{it} = \alpha + \beta_1 BSI_{it-1} + \beta_2 HHI_{it} + \beta_3 \text{Control Variables}_{it} + \eta_i + \varepsilon_{it}$$

We treat lagged dependent variables and HHI as endogenous, instrumenting with their second and third lags. Bank-specific controls (CAR, NPAR, LIQR, OE) are predetermined, instrumented with first lags. Macroeconomic variables (GDPg, PR) are treated as exogenous. We use two-step estimation with Windmeijer correction and limit instruments to avoid proliferation bias (Roodman, 2009).

Diagnostic tests validate our approach: Hansen tests confirm instrument exogeneity (p-values: 0.135-0.516), indicating instruments are uncorrelated with errors. Arellano-Bond AR(2) tests show no second-order autocorrelation ( $p > 0.10$ ), validating our lag structure. These results confirm that System GMM effectively controls endogeneity, providing unbiased estimates of diversification effects across market structures.

System GMM is superior to its alternatives: OLS ignores endogeneity entirely; fixed effects suffers from Nickell bias with lagged dependent variables; random effects incorrectly assumes bank effects are uncorrelated with regressors; standard IV is inefficient under heteroskedasticity;

difference GMM has weak instrument problems with persistent variables. Our approach provides consistent, efficient estimates while properly accounting for the complex endogeneity inherent in banking relationships.

#### 4. Empirical Results

##### 4.1 Industrial Loan Portfolio Patterns in Indian Banking (2011-2023)

Table 1 reveals a systematic pattern where banks in High

MC markets dominate industrial lending, providing 80-90% of loans across most sectors, while Low MC banks contribute only 10-20%. This pattern is strongest in capital-intensive sectors (Petroleum & Nuclear Fuels: 92.9% vs. 7.1%; Mining: 91.4% vs. 8.6%; Engineering: 90.8% vs. 9.2%). Even in sectors with more balanced distribution, concentrated market banks still provide over three-quarters of financing. This indicates structural market concentration rather than sector-specific financing needs.

**Table 1. Distribution of Industrial Loans between Banks in High vs. Low Market Concentration Areas**

Sector	Loans in High MC Markets (%)	Loans in Low MC Markets (%)	Loan Amount in High MC Markets (₹ Crore [\$ Million])	Loan Amount in Low MC Markets (₹ Crore [\$ Million])
ALL ENGINEERING	90.8	9.2	4400675 (676176)	453705 (68344)
BASIC METAL AND METAL PRODUCTS	90.4	9.6	5866433 (913976)	630707 (97465)
BEVERAGE AND TOBACCO	78.6	21.4	98594 (15578)	28034 (19831)
CEMENT AND CEMENT PRODUCTS	90.0	10.0	811927 (126775)	90475 (140815)
CHEMICAL AND CHEMICAL PRODUCTS	90.9	9.1	3700770 (559125)	369333 (615071)
CONSTRUCTION	83.3	16.7	2474958 (370465)	495273 (444808)
FOOD PROCESSING	88.2	11.8	2641892 (401462)	352376 (455238)
GEMS AND JEWELLERY	83.0	17.0	959374 (151027)	209136 (181950)
GLASS AND GLASSWARE	82.8	17.2	46590 (7034)	9959 (1461)
INFRASTRUCTURE	88.5	11.5	14204942 (2146399)	1811703 (279380)

Sector	Loans in High MC Markets (%)	Loans in Low MC Markets (%)	Loan Amount in High MC Markets (₹ Crore [\$ Million])	Loan Amount in Low MC Markets (₹ Crore [\$ Million])
LEATHER AND LEATHER PRODUCTS	89.3	10.7	110928 (17242)	13486 (2072)
MINING AND QUARRYING (INCLUDING COAL)	91.4	8.6	976294 (147432)	88861 (13869)
OTHER INDUSTRIES	78.4	21.6	8754131 (1328612)	2450730 (366221)
PAPER AND PAPER PRODUCTS	82.3	17.7	364996 (55684)	78620 (11988)
PETROLEUM, COAL PRODUCTS AND NUCLEAR FUELS	92.9	7.1	3080360 (468458)	237458 (35727)
RUBBER, PLASTIC AND THEIR PRODUCTS	87.1	12.9	528379 (79067)	79349 (11729)
TEXTILES	87.1	12.9	2436875 (378472)	367524 (56068)
VEHICLE, VEHICLE PARTS AND TRANSPORT EQUIPMENT	84.7	15.3	1273690 (192257)	230342 (34744)
WOOD AND WOOD PRODUCT	77.9	22.1	85945 (12889)	24796 (3664)

Notes: Table 1 shows sectoral loan distribution for banks in High vs. Low MC environments (2011-2023). Values in ₹ Crore with US\$ million in parentheses. Due to rupee depreciation (₹45.56-80.36/\$), dollar comparisons across years should be interpreted cautiously.  
Source: Compiled from Annual Report of Banks

The absolute financing gaps highlight systematic constraints across key sectors. Infrastructure shows a ₹12,393 crore difference, chemicals ₹3,331 crore, and petroleum ₹2,843 crore, demonstrating that competitive banks cannot substitute for dominant bank decisions. When a few institutions control the majority of sectoral financing, it fundamentally influences banks' financing capacity, risk appetite, and sectoral lending strategies. This pattern transforms industrial policy into banking policy by proxy, where sectoral development depends on a few institutions' strategic preferences rather than market-based allocation.

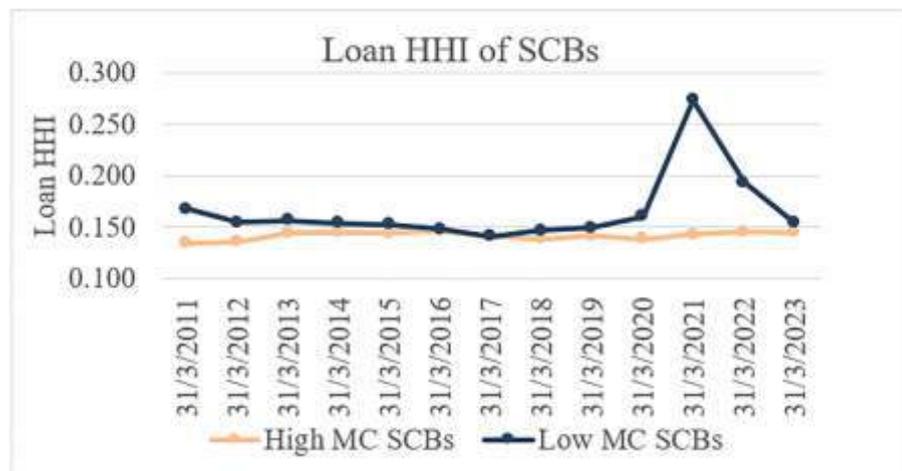
Figure 2 reveals distinct industrial loan concentration patterns between banks in different competitive environments over 2011-2023. Banks in concentrated deposit markets maintained steady diversification strategies ( $HHI \approx 0.14$ ) regardless of economic conditions, while competitive banks showed strategic flexibility, concentrating portfolios during economic uncertainty (COVID-19 peak at 0.27). This pattern indicates that dominant banks diversify through market power while competitive banks must adapt strategies to economic cycles.

Figure 3 illustrates the substantial disparity in deposit size between banks operating in concentrated versus competitive environments throughout 2011-2023. Banks in concentrated markets consistently maintain significantly larger deposit bases, with even the median bank in this group holding deposits several times larger than those in competitive markets. This gap widens after 2017, highlighting structural differences in resource access that are likely to influence lending strategies and portfolio

decisions across different market structures.

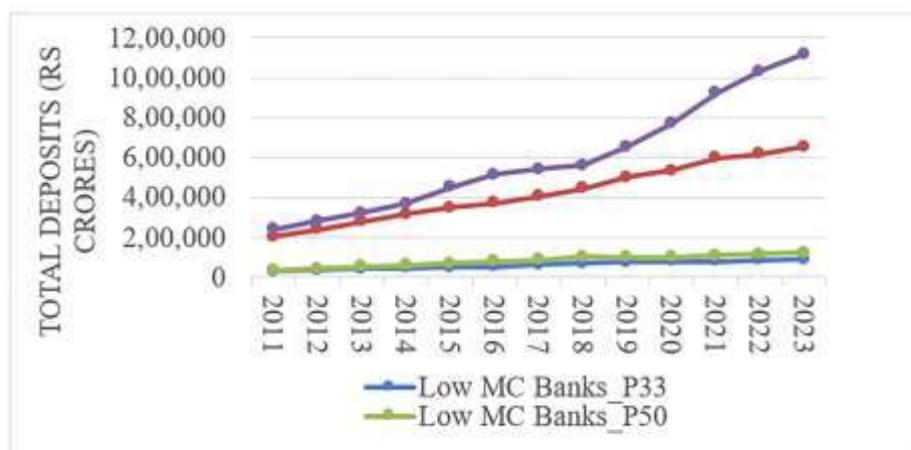
#### 4.2 Descriptive Statistics

Table 2 presents summary statistics for all variables employed in our study. ROA shows the highest Coefficient of variation (CV=214%), with substantial performance differences across banks ranging from a negative minimum (-0.051), indicating some significant losses during the period, to strong returns (0.024).



Source: Author's Computation

**Figure 2. Trend of Industrial Loan Portfolio Concentration (HHI) by Market Structure Type (2011-2023)**



Source: Author's Computation

**Figure 3. Total Deposits by Market Concentration Categories (2011-2023)**

**Table 2. Descriptive Statistics of Key Variables, 2011-2023**

Variable	Mean	SD	Min	Max
ROA	0.0050	0.0108	-0.0514	0.0238
BSI	0.5925	0.0574	0.3871	0.7305
HHI	0.1920	0.0728	0.0960	0.5361
GDPG	0.0579	0.0361	-0.0583	0.0905
SIZE	5.3895	0.5629	4.0718	6.7417
MC	0.0039	0.0113	0.0000	0.0658
CAR	0.1415	0.0276	0.0751	0.2368
NPAR	0.0290	0.0284	0.0001	0.1669
LIQR	0.0667	0.0217	0.0308	0.2362
PR	0.0634	0.0140	0.0400	0.0850
OE	0.2170	0.0583	0.0892	0.4514

*Notes: This table reports descriptive statistics for 338 observations. All financial ratios are expressed as decimals rather than percentages, with means and standard deviations calculated over the full sample period. Variables include return on assets (ROA) as a performance measure, Herfindahl-Hirschman Index (HHI) for LPD, Composite Banking Stability Index (BSI) for bank stability, Deposit HHI for market concentration, liquidity ratio (LIQR), non-performing assets ratio (NPAR), capital adequacy ratio (CAR), operating efficiency (OE), bank size (SIZE), GDP growth (GDPG), and Policy Rate (PR).*

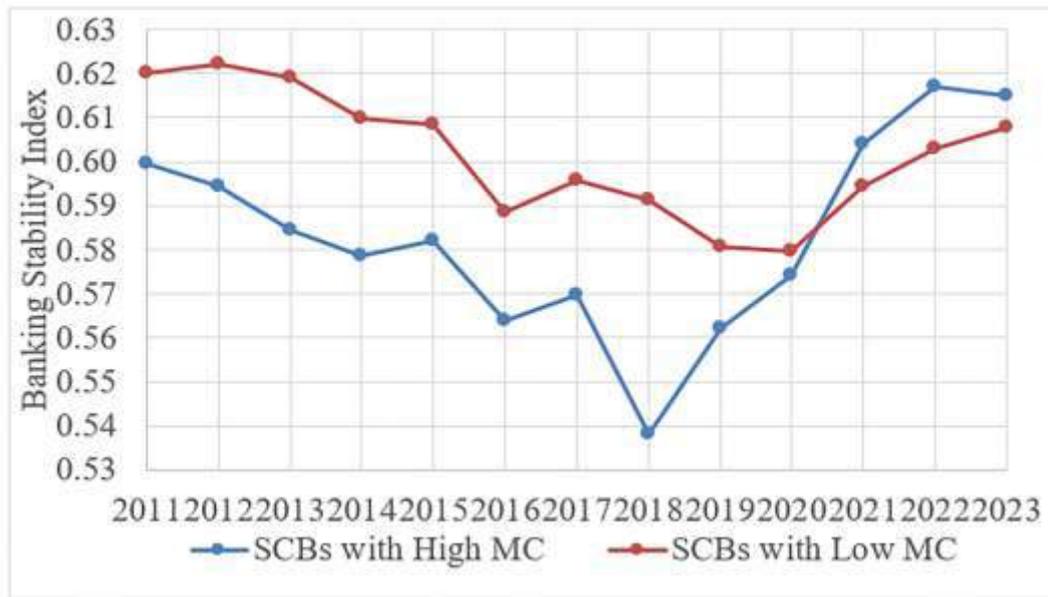
*Source: Compiled from Annual Report of Banks*

Industrial concentration averages 0.192 with moderate variation (CV=38%), reflecting portfolios between the theoretical extremes of perfect diversification and complete concentration. MC exhibits extreme variability (CV=287%) with a low mean (0.004), confirming heterogeneous competitive environments in which Indian banks operate. Asset Quality varies significantly across banks (CV=98%), suggesting some institutions maintain minimal bad loans (0.0001), while others face substantial challenges (up to 0.167). Capital adequacy, liquidity, and operational efficiency display moderate variation (CV=19.5%, 32.5%, and 26.9%, respectively), indicating manageable but meaningful differences in bank fundamentals. GDPg during the period averages 0.058 with moderate variability (CV=62%), reflecting the macroeconomic conditions affecting bank performance. The negative minimum corresponds to economic contractions during Covid-19. These statistics confirm substantial heterogeneity across multiple dimensions, which our analysis will see in subsequent sections.

Figure 4 shows divergent stability trends between market types. Concentrated market banks initially maintained higher stability (0.62) through 2015 before gradually declining to 0.58 by 2019. Conversely, competitive market banks experienced steeper stability declines until 2018 (reaching 0.54) before sharply improving post-2019 and eventually surpassing concentrated market banks by 2021, coinciding with their increased industrial loan concentration as seen in Figure 2. This crossover coincides with competitive banks' increased portfolio concentration during the COVID period, suggesting different optimal strategies for different market positions.

#### **4.3 Baseline Results: Effects of Industrial LPD on Performance**

Table 3 presents the System GMM estimation results examining the relationship between industrial LPD and bank performance (ROA). The full sample results reveal that industrial loan portfolio concentration (HHI) has a significant negative effect on bank performance.



Source: Author's Computation

Figure 4. Banking Stability Trends by Deposit Market Structure (2011-2023)

Table 3. System GMM Estimation Results for Bank Performance (ROA) Models

	Full Sample	Low MC	High MC
L.ROA	0.311*** (4.18)	0.618** (2.34)	0.442*** (4.31)
HHI	-0.0299** (-2.30)	-0.0803*** (-2.66)	-0.0361 (-1.44)
CAR	0.102*** (3.11)	0.101* (1.87)	0.0372** (2.05)
NPAR	-0.175*** (-6.03)	-0.0877** (-1.64)	-0.158*** (-5.23)
LIQR	0.160 (1.49)	0.0123 (0.19)	0.0138* (1.83)
OE	-0.0143* (-1.79)	-0.00415 (-0.21)	-0.00183 (-0.24)
SIZE	-0.000844 (-0.59)	0.00189 (0.94)	-0.00259 (-1.55)
PR	0.0671 (1.13)	-0.0165 (-0.24)	-0.0383 (-1.54)
GDPG	0.0269 (1.17)	0.0247 (1.23)	0.0154 (1.29)
_cons	-0.00898 (-0.78)	-0.00466 (-0.45)	0.0247 (1.56)
N	312	164	148
ar1p	0.00243	0.0966	0.0478
ar2p	0.574	0.943	0.926
hansenp	0.135	0.302	0.516

MC = Market Concentration. HHI = LPD.

Notes: *t*-statistics appear in parentheses. AR (1) and AR (2) denote Arellano-Bond statistics for first-order and second-order serial correlation in differenced residuals. Hansen test statistics evaluate instrument validity under over-identification constraints, where H0: instruments are exogenous. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Source: Authors' Computation

The analysis reveals a pattern consistent with our initial hypothesis. In Low MC markets, diversification shows a stronger and highly significant effect (coefficient: -0.0803) with high statistical precision, reflecting consistent effects when banks face similar competitive pressures and must optimise portfolio allocation for profitability, consistent with Shim (2019). Conversely, in High MC markets, the diversification effect becomes statistically insignificant (coefficient: -0.0361), reflecting heterogeneous profit strategies among fewer dominant banks. This suggests that market power can substitute for diversification in generating profits, as banks in concentrated markets can rely on pricing power rather than portfolio optimisation (Berger et al., 2009).

Control variables demonstrate expected patterns. Performance persistence is strong across all specifications,

consistent with established evidence of profit persistence in banking (Goddard et al., 2004). Capital adequacy shows positive effects on performance, while asset quality demonstrates the expected negative relationship with profitability (Louzis et al., 2012). Hansen test statistics confirm instrument validity, while AR(1) and AR(2) tests show appropriate autocorrelation patterns consistent with well-specified dynamic models.

#### 4.4 Industrial LPD and Banking Stability: Evidence across Market Structures

Table 4 presents stability analysis using our comprehensive BSI. The full sample analysis shows that industrial loan concentration (HHI) has a significant negative association with stability.

**Table 4. System GMM Stability Models**

	Full Sample	Low MC	High MC
L.BSI	0.123** (2.20)	0.264*** (2.98)	0.251** (2.10)
HHI	-0.0653** (-1.97)	-0.107*** (-3.77)	-0.218** (-2.06)
CAR	0.672*** (4.12)	0.245 (1.23)	0.999*** (5.60)
NPAR	-0.656*** (-5.56)	-0.892*** (-4.97)	-0.652*** (-5.30)
OE	-0.236*** (-6.25)	-0.224*** (-4.05)	-0.216*** (-6.97)
LIQR	0.825*** (4.19)	0.487*** (4.24)	0.481 (0.80)
SIZE	-0.00478 (-0.57)	0.00585 (0.37)	0.00288 (0.33)
GDPG	0.0374 (1.11)	0.157** (2.15)	0.0390 (1.12)
PR	0.168 (0.95)	-0.115 (-1.00)	-0.0771 (-0.20)
_cons	0.464*** (11.89)	0.438*** (8.48)	0.360*** (3.30)
<i>N</i>	312	164	148
ar1p	0.00590	0.00169	0.0800
ar2p	0.376	0.910	0.482
hansenp	0.501	0.437	0.466

MC = Market Concentration. HHI = LPD.

Notes: *t*-statistics appear in parentheses. AR (1) and AR (2) denote Arellano-Bond statistics for first-order and second-order serial correlation in differenced residuals. Hansen test statistic evaluates instrument validity under over-identification constraints, where  $H_0$ : instruments are exogenous. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$

Source: Authors' Computation

Across market structures, both environments show significant diversification benefits, but with important differences in magnitude and statistical precision. In High MC markets, diversification demonstrates a larger economic effect (coefficient: -0.218), reflecting the greater systemic importance of individual banks in these markets. When a few large banks dominate, their portfolio concentration risks can have amplified consequences for overall financial stability. However, the lower statistical precision may reflect the heterogeneous risk profiles and fewer observations in concentrated market segments. In Low MC markets, diversification shows a smaller but highly significant effect (coefficient: -0.107), indicating more consistent stability benefits across many similar banks competing in these environments. The high statistical precision reflects the uniform nature of diversification effects when many banks with similar risk profiles operate under competitive pressure. Unlike the performance results, stability benefits from diversification persist across both market structures, reflecting fundamental risk-reduction properties that operate regardless of competitive dynamics. This suggests that while market power can substitute for diversification in generating profits, it cannot replace diversification's role in financial stability, as risk management remains critical regardless of market position. Control variables show consistent patterns, with capital adequacy and liquidity positively associated with stability, while asset quality problems and operational inefficiency reduce stability across both market structures.

## 5. Discussion

Our empirical findings provide strong support for all three hypotheses, revealing the conditional nature of diversification benefits in emerging banking markets. Industrial LPD significantly enhances bank performance and stability (H1), confirming portfolio theory's risk-reduction properties across India's 19 distinct industrial sectors. Diversification effects vary markedly across market structures (H2): competitive markets show both performance and stability benefits, while concentrated markets show only stability effects with larger magnitudes. Performance and stability persistence patterns differ between market structures (H3), with concentrated markets exhibiting stronger temporal dynamics but lower statistical consistency for both outcomes. These results collectively demonstrate that market structure fundamentally alters diversification mechanisms rather than merely scaling their effects, challenging assumptions of universal diversification benefits in banking literature.

The differential market responses we document have direct consequences for India's industrial development. As established in our sectoral analysis, banks in concentrated markets dominate lending across all major industries, yet these same institutions demonstrate no performance sensitivity to diversification (coefficient: -0.0361, insignificant). This means that sectoral credit allocation for India's capital-intensive industries, like infrastructure or strategic energy sectors like petroleum and nuclear sectors, depends on dominant banks' portfolio choices rather than economic fundamentals, as such national development projects and energy transition financing remain vulnerable to such decisions. This pattern even extends to employment-critical categories like textiles and food processing, where rural development and India's export competitiveness face similar constraints. When dominant banks like the State Bank of India or the HDFC Bank decide to concentrate lending in specific industries while reducing exposure to others, competitive banks cannot compensate due to their limited market share. The stability amplification we observe (coefficient: -0.218 versus -0.107) indicates that concentrated portfolio decisions by dominant banks create systemic risks that extend beyond individual institutions to affect entire industrial sectors.

Our findings directly contradict Huynh's (2024) Vietnamese evidence, which shows competitive banks reduce sectoral loan diversification while diversifying income sources. In contrast, we find that competitive Indian banks achieve stronger performance and stability benefits through greater industrial LPD. Šeho et al. (2024) support our argument that market structure enhances conventional bank stability only in less concentrated Malaysian markets, with no effect under concentration. On the contrary, Islamic banks show no diversification effectiveness but benefit from market concentration. Khan's (2023) BRIC evidence reinforces that competitive markets enable better risk management, showing reduced corporate risk-taking through improved financing access. These studies collectively suggest that optimal diversification responses to competition depend on specific market structure characteristics rather than following universal patterns across emerging economies.

## 6. Conclusion

This study demonstrates that portfolio diversification effectiveness in banking is contingent on market structure, extending portfolio theory beyond its traditional focus on statistical risk reduction. The contradictory findings in existing literature can be reconciled by recognising that competitive dynamics determine whether diversification

translates into performance gains or remains confined to stability benefits. However, for regulators, this exposes a previously unrecognised policy constraint in emerging market financial regulation that banking stability, industrial development efficiency, and regulatory uniformity cannot be simultaneously optimised when market structure creates divergent incentives for portfolio optimisation.

Industrial loan concentration varies substantially across banks (from highly diversified to highly concentrated portfolios), suggesting considerable strategic flexibility within current regulation. The absence of performance benefits from diversification for concentrated market banks indicates their concentrated portfolios reflect strategic positioning rather than regulatory failures requiring correction.

Imposing uniform diversification requirements would disrupt India's banking system through multiple channels. The concentration of infrastructure and manufacturing lending among dominant banks has developed over decades, reflecting accumulated sector-specific expertise and established relationships with borrowers. Forcing these banks to diversify would undermine these informational advantages as they enter unfamiliar sectors, increasing screening and monitoring difficulties. Moreover, if all major banks simultaneously restructure their portfolios, withdrawal from currently concentrated sectors could create credit shortages in infrastructure and manufacturing, while a sudden influx of lending into smaller sectors could fuel excessive credit growth in areas unable to productively absorb such capital.

Regulatory policy should therefore differentiate between banks based on their market positions. Capital requirements could be adjusted based on portfolio concentration levels and sectoral market dominance, with highly concentrated banks required to hold additional capital buffers against potential losses. Quarterly disclosure of sectoral concentration levels and market shares would allow investors and market participants to evaluate risks independently, creating market discipline without regulators dictating specific portfolio allocations. The Reserve Bank of India's sectoral exposure guidelines receive empirical validation from our analysis, suggesting that context-specific application based on market structure would enhance their effectiveness.

For countries considering banking consolidation to enhance financial stability, these findings reveal important trade-offs. While mergers strengthen individual bank balance

sheets and create institutions capable of financing large-scale projects, they concentrate sectoral credit decisions among fewer banks. When dominant banks show no performance sensitivity to diversification choices, sectoral credit allocation depends on institutional preferences rather than economic fundamentals, potentially distorting credit flows away from productive sectors. Policymakers must weigh consolidation's stability benefits against these risks to efficient credit allocation.

Despite these contributions, limitations exist regarding our sample size and timeframe. Our sample, comprising 26 banks representing 85% of the banking sector's total assets, may limit generalizability to smaller banking systems. The binary classification of market structure potentially oversimplifies competitive dynamics and their interaction with diversification strategies. Future work should examine other lending segments that contribute to banks' overall risk profiles and employ alternative methodological approaches to strengthen these findings. As India's banking sector continues to evolve, tailored diversification strategies that consider market conditions offer banks a practical way to balance stability with growth.

#### Declarations

All authors declare that they have no conflicts of interest.

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