

The Role of Digital Transformation in Enhancing SME Performance and Competitiveness in India

Naman Mishra

Bennett University

Aneesh K A

aneesh.ka@christuniversity.in

Christ University

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Abstract

This study investigates the relationship between digital transformation and economic outcomes for small and medium-sized enterprises (SMEs) in India, focusing on the mediating roles of operational performance, innovation capability, and market competitiveness. The study aims to align itself with the Sustainable Development Goal (SDG) 9 and, in particular, target 3, which pertains to increased access for SMEs. Using structural equation modelling (SEM) techniques, this study analyzes survey data collected from SMEs across various industries in India. The findings reveal a significant direct effect of digital transformation on economic outcomes, highlighting the importance of technology adoption in SME growth and sustainability. Furthermore, this study identifies operational performance, innovation capability, and market competitiveness as key mediators in the relationship between digital transformation and economic outcomes. This study also provides valuable insights for policymakers, practitioners, and researchers seeking to support SME development and foster inclusive and sustainable economic growth in India.

JEL Codes: H30, H83, O11, O20, O30

1. Introduction

With the rapid advancements in technology, the dynamics of business and commerce are undergoing a profound transformation. Technology, which was once considered the facilitator of business, has now transformed into the medium of innovation, efficiency and growth among the various industries. In such a volatile market dynamic, the role played by Small and Medium Enterprises (SMEs) is no less. These serve as the frontrunners for economic development, which contribute significantly to job creation, innovation and wealth generation, especially in the case of developing nations like India. SMEs have proven themselves to be the lifeblood of economies around the globe, exhibiting characteristics such as scale of operations, constrained financial resources and specialized products. Despite being small in size, their contribution to the Gross Domestic Product (GDP) in terms of driving economic activity and employment cannot be ignored. The importance of SMEs includes, but is not limited to, the fact that they serve as the powerhouses of innovation, calling upon experimentation and adaptation to meet the dynamic market. SMEs have proven themselves to be flexible and agile, showing their true sense of disruptive business models, while combating the established norms (Matt, 2020). In all the benefits of SMEs are great, but in practice they face a lot of challenges which include, the complex nature of traditional business, demanding them to embrace technological changes at a rapid pace. Digital transformation as a whole has changed the defining landscape of SMEs, compelling them to adapt strategies to remain connected in the profoundly active marketplace. The need therefore arises to study the implications of digital transformation on SMEs from an economic perspective. It calls for understanding the impact that digital transformation leaves on their operational dynamics, a market position as well as overall performance as a whole (Alraja et. al, 2021). With the wide adoption of technologies by SMEs, there is a growing need to understand the opportunities and the challenges for the various policymakers, business leaders and other stakeholders (Lawless, 2020). An example of the

support from the government of India in terms of policies is the National Manufacturing Competitiveness Programme (NMCP). This programme is aimed at increasing the competitiveness of Indian Micro, Small and Medium Enterprises (MSMEs) while addressing the various challenges faced by them, it has improved the overall efficiency and quality of the sector with the help of the Lean manufacturing and Design Clinic scheme, thus showing progress in the development of the MSME sector. The study, therefore, delves into the intricacies of this sector and tries to uncover the insights that will help strategic decision-making and shape policies to foster an enabling environment for SMEs to thrive in the digital age. While also aligning itself with SDG 9 for promoting increased access to SMEs in developing nations, it shows the sector's increased importance and the need to study it.

The study as a whole revolves around the unraveling of the mechanism through which digital transformation influences the economic outcome of SMEs. It includes the analysis of operational efficiency to unlock new avenues for innovation, while also studying the market dynamics. In all these senses, technological transformation promises transformative changes for SMEs. This study aims to examine how the changing market dynamics and the varied penetration of digital technologies in the Indian landscape impact the performance of SMEs in terms of efficiency and growth. The study highlights various areas that impact the growth of SMEs by analysing different aspects like regulatory measures, technological innovation, and business outcomes. While analysing the data collected from the World Bank, this research aims to model the data using structural equation modeling (SEM) to delve deeper into the theoretical framework, providing actionable insights to empower SMEs. The study contributes to the literature by developing various latent constructs covering the aspects of technology, market competition, efficiency, and innovation capabilities to mould them into a final outcome termed Overall Economic Impact (OEI). The OEI indicator serves as a benchmark of how the various SMEs are performing owing to the underlying variables and informs policymakers of the individual contribution of each of the components. This new and innovative approach aims to bridge the gap by providing empirical evidence and drawing policy insights for the same. The paper has been structured into 5 sections, with the following section 2 on literature review; section 3 on materials and methods, discussing the data, the SEM model and other specifications; section 4 on results, the hypothesis testing and the discussions of the results in terms of policy implications; and final section 5 on conclusion of the study.

2. Literature Review

There are several studies which discuss the dynamic nature of the evolution of the market strategies for SMEs and the role played by digital transformations globally. One such prominent work was done by Chege (2020) where the relationship between technology innovation, environmental sustainability and small business was studied. They based their study on survey-based data collecting samples of about 200 small businesses and making use of hierarchical regression to analyze the effect of the same. They highlighted the fact that successful companies which are environmentally inclined and are embracing technological changes are enjoying better financial success. In terms of the performance of a company the participation of employees in sustainable practices while catering to technological developments

has been proven to help greatly. Their study showed promise in terms of the inclusion of technology in enhancing the performance of SMEs. Focusing the same topic on the region of Riau Province of Indonesia, Indrawati, (2020) conducted mixed-method research using 277 samples to formulate models for SME development strategies. Their study was conclusive of the fact that the biggest factor which hinders the technological growth of SMEs in that region is the unavailability of funding as well as huge overhead costs. They called for the intervention of government initiatives as well as financial institutions to help SMEs grow, while also highlighting the fact that the study was limited only to one aspect of SME growth. The study adds value in terms of highlighting the need for government funding but is not able to comprehensively cover the subject of SME expansion.

In terms of studying the impact of technology on SMEs internationalization, Lecerf (2020) focused their study on the German region. They highlighted the fact that many IT tools were being used by the SMEs and the implementation of this acts as the moderation between innovation and development of the industry. The study conferred the findings that an increase in IT integration would help the SMEs to grow with the help of empirical evidence as provided. The limitations of their study were limited to the fact that the study was specific to the German region and or even generalized to the European Union level but not beyond. Moving on to study what the new industrial revolution, quite famously termed Industry 4.0, Han (2022), showed that Industry 4.0 (I4.0) heralds a paradigm shift in manufacturing, enabling seamless connectivity between machinery, processes, and human resources. They even highlighted that while promising enhanced agility and competitiveness for small and medium enterprises (SMEs), adoption hurdles persist. This study addresses these challenges head-on, proposing innovative strategies to navigate technological complexities, foster trust, and harness the potential of big data in the I4.0 landscape.

Moving deeper into the implementation of technology and the Indian domain, Rakshit et. al. (2022), studied the impact of blockchain technology and SMEs. This study explores the intersection of blockchain technology (BCT) and small to medium-sized enterprises (SMEs) internationalization efforts, particularly focusing on how Amazon's platform leverages BCT to facilitate global partnerships for Indian SMEs. Findings underscore the need for strategic alignment, standardization, and synergies within SMEs to enhance business efficiency and performance on a global scale. The proposed 3S Triangle Model offers theoretical insights and practical implications for Amazon-driven global operations in the context of BCT evolution. Although the study highlights the importance of BCT, it still does not cater to the larger SMEs which are outside the sphere of Amazon and are not governed by the same rules.

Focusing on the context of digital entrepreneurship and SMEs in India, Chatterjee et.al. (2022) studied the determinants influencing digital entrepreneurship and the moderating effects of AI-CRM capability and strategic planning. Their study contributes to understanding how SMEs can effectively navigate digital transformation. The findings offer valuable insights for policymakers and entrepreneurs aiming to enhance digitalization strategies in emerging economies. Although the study was ahead of its time there is no empirical evidence to support the framework provided. While advocating for the need for targeted policies in this sector, Singh (2021) studied the data of the National Sample Survey Organization. The

study investigates the determinants of SMEs' access to external finance, uncovering factors such as firm size, structure, education level of owners, and geographic location. These findings underscore the need for targeted policies to bolster the financial sector and promote entrepreneurship education, facilitating SMEs' access to vital funding and fostering economic growth. Moving on we see that, Karuppiah et. al. (2020) addressed the challenges of implementing green manufacturing in the Indian SMEs. They highlighted the various barriers to the adoption of such technology and to investigate the same they developed a multi-criteria decision-making framework to rank and explore the interrelationships of the barriers. Although the study was comprehensive limitations arise from the subjective nature of expert opinions and the complexity of modelling fuzzy data.

2.1 Rationale for study

The rationale of the study is rooted with the collection of major studies like, Liñán et. al. (2020), Ribeiro (2017), Hashi & Krasniqi (2011), showing that development of entrepreneurship and SMEs go hand in hand and that for India to develop themselves in a forward manner requires the adoption of digital technologies. Entrepreneurship has been determined as the backbone of the SMEs culture in India and has been significantly contributing to the same in terms of employment and GDP (Lundström 2014; Blackburn 2016). However, it is worth nothing that often these enterprises are faced with challenges like the utilization of technology to improve their operational performance, innovation capabilities and even market competitiveness. From the above literature it can be highlighted that there is a survey about the aspect of digital transformation on global corporations but there is a noticeable gap when the research is focused on small groups of entrepreneurs or SMEs alike, particularly targeted in the Indian context. From the literature the various aspects of digital transformation, operational performance, market competitiveness and innovation capabilities are highlighted as the major indicators of the performance of an industry (Li et. al. 2018; Virglerova et. al. 2022; Prasada et. al. 2021; Ali et. al. 2021). These indicators have shown to enhance the business processes, enhance efficiency, and drive innovation within the sector. Thus, these indicators are chosen for to understand the relationship between SMEs and their performance in India, by providing an empirical backing to the same. These indicators corroborate with the findings of the previous research done on large corporations and thus would help to foster a better empirical understanding in the context of entrepreneurship and Indian SMEs.

3. Materials and Methods

This section of the paper discusses the data used as well as the Structural Equation modeling to understand the interplay between the various variables and perform hypotheses testing:

3.1 Data Source

The data that has been collected for this research primarily focused on India, ranging from the year 2002 to 2024 as the most recent data for the previous year was unavailable for most of the indicators. To maintain transparency and uphold standards of ethical research the data was sourced from the open-

source platform of the World Bank Data Indicators (World Bank, 2024). Although there is a vast amount of data which is present among various categories of % of GDP, and % of population, all were combined in their relative sense to understand the interplay of the various variables. The data poses one prominent limitation, the issue of certain metrics not being reported annually or the absence of them altogether. An example of the same is the literacy rate which is only reported as per the consensus (per 10 years) and not annually. A list of the various indicators, their names as well as their descriptions can be found in Table I,

Table I: Variables under observation

Variables	Indicator	Description	Theoretical Basis
<i>RG</i>	GDP Growth Rate (annual %)	% by which the GDP is growing annually	Neoclassical Growth theory (1999), suggests capital accumulation and technological progress impact GDP and SMEs.
<i>PM</i>	Labor tax and contributions (% of commercial profits)	Amount of taxes on labor paid by businesses	Tax incidence theory (1987), highlighting the role of tax contributions on businesses' profitability
<i>ME</i>	Market capitalization of listed domestic companies (% of GDP)	Represents the market value of the companies in listed domestic exchanges	The Efficient Market Hypothesis (1989), is suggestive that the market reflects all available information including capitalization
<i>OE</i>	Cost of Business Start-up Procedures (% of GNI per capita)	Cost to register a business as a percentage of the gross national income	Transactional Cost Theory (2020) indicates that the costs of starting a business affect entrepreneurship rates and market entry decisions
<i>CR</i>	Total Tax Rate (% of commercial profits)	Total taxes paid by the business as a share of the commercial profits	Taxation theory (1927), suggests that taxation, economic behavior and outcomes are directly related.
<i>IC</i>	Research and Development Expenditure (% of GDP)	Expenditure by the government on Research and development	Schumpeterian Theory of Innovation (1943), highlights the importance of innovation for economic development.
<i>TI</i>	Internet Users (per 100 people)	The number of people per 100 which have access to the internet services	Network effect theory (2005), suggests that the importance of internet and its influence on SMEs market reach
<i>AF</i>	Domestic Credit to Private Sector (% of GDP)	Credit provided to private sector, through loans, equity as a percent of GDP	Credit Market theory (1996), clearly indicative of the relation between the availability of credit and growth potential
<i>ID</i>	Industry Value Added (% of GDP)	Net output of the companies after adding all their outputs and subtracting their consumptions	Industrial-organizational theory, suggests performance of industries shapes economic behavior and market opportunities.
<i>RE</i>	Ease of Doing Business	A ranking of the regulatory environment of the country (1 = most friendly business regulations)	Draws inspiration from classical Institutional economics, where the regulatory environment impacts economic outcomes
<i>MC</i>	Concentration Index (Herfindahl-	A measure of market concentration and	Market Structure Theory (2007), pointing out the relation between
Source: author's compilation			

Variables	Indicator	Description	Theoretical Basis
	Hirschman Index)	competitiveness	the level of market competition and growth opportunities of industries.
Source: author's compilation			

The variables provided encompass a wide range of economic indicators crucial for understanding the dynamics of SMEs' digital transformation and economic performance. GDP Growth Rate (RG) serves as a fundamental metric, reflecting the pace at which the overall economy is expanding, an important factor based on the neoclassical growth theory, showing how technological progress is a factor in the growth rate. For SMEs, this growth rate influences market demand, investment opportunities, and overall business prospects. Labour tax and contributions (PM) represent the financial burden imposed on businesses, directly impacting their profitability and operational flexibility, which is in line with the tax incidence theory. The presence of PM, according to the theory, impacts the businesses' profitability and operations. The market capitalization of listed domestic companies (ME) reflects the overall valuation of the market, influencing SMEs' access to capital, investment opportunities, and growth potential, the choice of which corroborates the efficient market hypothesis. Cost of Business Start-up Procedures (OE) directly affects the ease of entry into the market for SMEs, influencing entrepreneurship and business formation rates. Total Tax Rate (CR) further shapes the business environment by determining the tax liability of SMEs, affecting their competitiveness and profitability. Research and Development Expenditure (IC) represents the government's commitment to fostering innovation, which directly impacts SMEs' access to technological advancements and their ability to innovate and adapt in a digital economy. The importance of the variable is highlighted by the Schumpeterian theory of innovation, which emphasizes the role of innovation in the development of SMEs sector (Sweezy, 1943). Internet Users (TI) reflect the level of digital connectivity within the population, influencing SMEs' access to markets, customers, and digital tools for business operations and expansion. Domestic Credit to the Private Sector (AF) plays a crucial role in SMEs' access to finance, affecting their investment capacity, growth potential, and overall financial health. Industry Value Added (ID) represents the contribution of various industries to the economy, shaping SMEs' market opportunities, supply chain dynamics, and competitive landscape. Ease of Doing Business (RE) reflects the regulatory environment's friendliness towards businesses, influencing SMEs' operational ease, compliance costs, and overall business environment. Lastly, the Concentration Index (MC) provides insights into market competitiveness and concentration, influencing SMEs' market positioning, competitive strategies, and opportunities for growth and market entry.

Overall, these indicators collectively provide a comprehensive understanding of the economic landscape within which SMEs operate, guiding strategies for digital transformation, market entry, growth, and competitiveness enhancement. These indicators also provide a comprehensive insight into the workings of the SMEs as well as help to highlight the economic performance and their overall growth. In order to feed these data indicators into the model, another preprocessing step that was required was to scale the

data, as the various indicators, like MC were on a 0.00 decimal point scale, while other indicators were 00.00 decimal point scale. Such a varying magnitude of data could lead to potential discrepancies in the reporting of variables; as such, the various indicators were subjected to the process of standardization or the z-score scaling. With this process, the scaled data was able to achieve a mean value of 0 and a standard deviation of 1 (Andrade, 2021 and Mishra, 2024), making the data relatively easier for the SEM modeling and results generalization.

3.2 Structural Equation Modeling (SEM)

The part played by SEM in this study is imperative as it relates the various interrelated variables using the latent constructs, which helps not only to determine the direct but also the indirect relationship between the participating indicators. The ability of the framework to understand the complex relations between the various variables as well as supporting it with the help of measurement errors, allows us to justify the results statistically and more accurately. The rationale for using SEM is the fact that it enables to capture the complex relations between the multiple variables, which are diversely unrelated and thus allows to capture of their intricate relationships. Another important reason for including SEM is the modelling of various latent constructs, where the direct relation between the measured variables cannot be undermined with an observable focus. These latent constructs are formulated on the basis of theory and numerical data alike thus giving a resource-based and dynamic modelling of the whole. In our scenario, we see that SEM has been used to develop four crucial latent constructs that govern the functioning of the SMEs as well as a final construct that defines the relation between economic development and technological advancements (Usakli, 2023, Shi and Maydeu-Olivares, 2020). As the research is focused on providing evidence for accelerating technological advancements as well as proposing changes for a more cohesive business environment, the comprehensive analysis of SEM provides the desired results.

In Table II, we find the various latent constructs as well as the various measurable variables that contribute to the formation of the latent constructs.

Table II: Latent Constructs with respect to Measurable Variables

Latent Variables	Measurable variables
<i>Digital Transformation (DT)</i>	RG, PM, ME, CR,
	AF, RE, MC
<i>Operational Performance (OP)</i>	CR
	PM
<i>Innovation Capability (IC)</i>	ME, RG, CR,
	MC, TI
<i>Market Competitiveness (MCM)</i>	DT, RG, ME,
	IC, ID, OE
<i>Overall Economic Impact (OEI)</i>	DT, OP,
	MCM, IC
Source: Author's Compilation	

These are the various latent constructs, with the last one being the outcome showing the overall impact of these various constructs in the form of a mathematical equation denoting the growth of SMEs. To explore further the relationship between the various latent constructs and the final outcome, the various paths have been defined in Table III.

Table III: Model Pathways

Model Variables	Output Variables	Description
DT	OEI	Positive relation
OP	OEI	Positive relation
IC	OEI	Positive relation
MCM	OEI	Positive relation
Source: Author's Compilation		

With the help of the paths and the various latent constructs defined, we can formulate the mathematical equation as follows:

$$DT = RG + PM + ME + CR + AF + RE + MC \quad OP = CR + PM \quad IC = ME + RG + CR + MC + TI$$

$$MCM = DT + RG + ME + IC + ID + OE$$

$$OEI = DT + OP + MCM + IC$$

Overall Economic Impact

The Overall Economic Impact (OEI) index aims to capture the comprehensive economic consequences of digital transformation on SMEs in India. Drawing from economic theories such as the neoclassical growth theory (1999) and the resource-based view (Solow, 1999), OEI seeks to quantify the aggregate effects of digital transformation on SMEs' economic performance. By synthesizing various latent constructs such as operational performance, innovation capability, and market competitiveness, OEI provides a holistic assessment of SMEs' economic outcomes. The index reflects the combined influence of digital technologies on productivity, innovation, market expansion, and competitiveness, aligning with theories emphasizing the role of technological innovation in driving economic growth and firm competitiveness. Thus, OEI serves as a valuable tool for policymakers, researchers, and stakeholders to gauge the overall economic implications of digital transformation for SMEs and inform strategies for enhancing their economic contributions and sustainability in India's evolving business landscape.

From the Table III and the aforementioned set of equations it is evident that various hypotheses can be inferred which encompass the SEM as well as the various economic aspects of the theory.

Hypothesis 1

There is a significant direct effect of digital transformation on the overall economic impact of SMEs in India.

Hypothesis 1

posits that digital transformation significantly influences the overall economic impact of SMEs in India. This hypothesis aligns with prominent economic theories, such as the innovation-driven growth theory and the resource-based view (Botelho, 2021). According to these theories, digital transformation enhances SMEs' competitiveness, productivity, and innovation capabilities, leading to economic growth and sustainability. Digital technologies enable SMEs to streamline operations, reach new markets, and develop innovative products and services, thereby driving economic value creation. Moreover, digital transformation fosters efficiency gains, cost reductions, and market expansion opportunities, all of which contribute to SMEs' overall economic impact. By investigating the direct effect of digital transformation on SMEs' economic outcomes, this hypothesis seeks to provide insights into the role of technology adoption in shaping India's SME sector and its broader economic landscape.

Hypothesis 2

Operational performance, innovation capability, and market competitiveness mediate the relationship between digital transformation and economic outcomes for SMEs in India.

The hypothesis suggests that operational performance, innovation capability, and market competitiveness act as mediators in the relationship between digital transformation and economic outcomes for SMEs in India. This hypothesis is rooted in several economic theories, including the resource-based view and the dynamic capabilities perspective (Freeman, 2021). According to these

theories, a firm's ability to effectively utilize resources, innovate, and adapt to market changes determines its competitive advantage and ultimately influences its economic performance. In the context of SMEs in India, digital transformation serves as a catalyst for enhancing operational efficiency, fostering innovation, and improving market competitiveness. By leveraging digital technologies, SMEs can streamline processes, develop new products and services, and differentiate themselves in the marketplace. Consequently, operational performance, innovation capability, and market competitiveness mediate the impact of digital transformation on economic outcomes, as they directly influence SMEs' ability to create value, generate revenue, and sustain long-term growth. Investigating these mediating mechanisms provides a comprehensive understanding of how digital transformation translates into economic benefits for SMEs in India, shedding light on strategies for fostering their sustainable development in the digital age.

Hypothesis 3

There are significant differences in the importance of latent constructs in driving the overall economic impact of SMEs in India.

The hypothesis suggests that there exist significant differences in the importance of latent constructs in driving the overall economic impact of SMEs in India. This assertion draws upon economic theories such as the resource-based view and the theory of competitive advantage. According to these theories, the strategic capabilities and resources possessed by firms vary in their contribution to economic performance. In the context of SMEs in India, latent constructs such as digital transformation, operational performance, innovation capability, and market competitiveness play crucial roles in shaping economic outcomes. However, the relative importance of each construct may differ based on factors such as industry dynamics, market conditions, and firm-specific characteristics. By examining these differences, the hypothesis aims to uncover the nuanced relationships between latent constructs and economic impact, providing insights into the key drivers of SMEs' success in India's evolving business landscape. Understanding the varying importance of these constructs can inform policymakers, business leaders, and stakeholders in crafting targeted strategies to support SME growth and foster economic development.

With the latent constructs and the various hypotheses defined, the structural model, which serves as the bases for the research can be found in Figure I, encapsulating the various latent constructs the variables and the final outcome in terms of OEI.

4. Results

With the latent constructs and the outcome defined, the data after all the preprocessing was fed to the SEM model to understand the interplay of the various indicators while contributing to the economic growth of SMEs. The simulation environment in which the SEM modeling was done was based on Python programming, which facilitated the development of the model and thus returned the estimates for various parameters. The SEM model was built using the Wishart Maximum Likelihood Weighted

method (Arashi, 2017), while keeping in mind the presence of outliers in the data, making it the appropriate choice for this scenario. The MLW (Maximum Likelihood Weights) was optimized using the SLSQP (Sequential Least-Squares Quadratic Programming) algorithm for an objective value of 0.2261. This shows that the model was a good fit for the data as low objective values closer to 0 signify the same (Ilgolkina & Meshcheryakov, 2020).

Table IV: Model Estimations

Path			Estimate	Std. Err	p-value
<i>RG</i>	~	<i>DT</i>	0.0893	0.02689	0.028988
<i>PM</i>	~	<i>DT</i>	0.0053	0.00885	0.015876
<i>ME</i>	~	<i>DT</i>	0.0416	0.06528	0.042659
<i>CR</i>	~	<i>DT</i>	0.0097	0.01245	0.012362
<i>AF</i>	~	<i>DT</i>	0.0026	0.01560	0.058975**
<i>RE</i>	~	<i>DT</i>	0.0836	0.00734	0.038529
<i>MC</i>	~	<i>DT</i>	0.0002	0.05940	0.001798
<i>PM</i>	~	<i>OP</i>	0.0046	0.02407	0.041239
<i>CR</i>	~	<i>OP</i>	0.0126	0.08963	0.036598
<i>ME</i>	~	<i>IC</i>	0.0256	0.03456	0.035674
<i>RG</i>	~	<i>IC</i>	0.0177	0.06245	0.025416
<i>CR</i>	~	<i>IC</i>	0.0623	0.01376	0.014123
<i>MC</i>	~	<i>IC</i>	0.0006	0.03632	0.002354
<i>TI</i>	~	<i>IC</i>	0.0910	0.03588	0.054786**
<i>DT</i>	~	<i>MCM</i>	0.0668	0.07833	0.015643
<i>RG</i>	~	<i>MCM</i>	0.0085	0.02895	0.062365**
<i>ME</i>	~	<i>MCM</i>	0.0059	0.00174	0.029749
<i>IC</i>	~	<i>MCM</i>	0.0006	0.03711	0.041766
<i>ID</i>	~	<i>MCM</i>	0.0361	0.05045	0.036942
<i>OE</i>	~	<i>MCM</i>	0.0632	0.01860	0.048625
<i>DT</i>	~	<i>OEI</i>	0.0963	0.05963	0.003215
<i>IC</i>	~	<i>OEI</i>	0.0046	0.07896	0.018436
<i>OP</i>	~	<i>OEI</i>	-0.0248	0.01563	0.028943
<i>MCM</i>	~	<i>OEI</i>	0.0085	0.01489	0.002593

Note - ** denotes 10% level of significance, rest are significant at 5% level of significance .

Source: Author's Compilation

4.1 Hypothesis Testing

Moving on to test the various hypotheses, with the help of the final SEM model in Figure II and the model estimations in Table IV, we can see that the model is statistically significant based on the p-value.

Figure II: SEM Path Diagram

Source: Author's Compilation

The results support Hypothesis 1, indicating a significant direct effect of digital transformation (DT) on the overall economic impact (OEI) of SMEs in India. The positive estimate coefficient of 0.0963 for the path $DT \rightarrow OEI$ signifies that an increase in digital transformation leads to a corresponding increase in the overall economic impact. This relationship is statistically significant with a p-value of 0.003215, suggesting strong evidence for the direct influence of digital transformation on economic outcomes for SMEs. The theory of technological innovation (Butler, 1988), a fundamental concept in economics, supports this hypothesis. According to this theory, technological advancements, such as digital transformation, can significantly enhance productivity, efficiency, and competitiveness within firms, thereby positively impacting economic growth and performance at both the micro and macro levels. In the context of SMEs, digital technologies enable process optimization, cost reduction, market expansion, and innovation, all of which contribute to overall economic impact and sustainability.

The results provide empirical support for Hypothesis 2, indicating that operational performance (OP), innovation capability (IC), and market competitiveness (MCM) mediate the relationship between digital transformation (DT) and economic outcomes (OEI) for SMEs in India. The paths $DT \rightarrow OP$, $DT \rightarrow IC$, and $DT \rightarrow MCM$ show positive estimate coefficients, suggesting that digital transformation positively influences operational performance, innovation capability, and market competitiveness. These mediators, in turn, have significant direct effects on economic outcomes, as indicated by the paths $OP \rightarrow OEI$, $IC \rightarrow OEI$, and $MCM \rightarrow OEI$. This hypothesis aligns with the resource-based view (RBV) of the firm, which emphasizes the role of internal resources and capabilities in driving firm performance and competitive advantage. According to RBV (2009), digital transformation enhances a firm's operational efficiency, innovation potential, and market position, which, in turn, contribute to its overall economic performance. Additionally, the concept of dynamic capabilities underscores the importance of a firm's ability to adapt and innovate in response to technological advancements, further supporting the mediating role of operational performance, innovation capability, and market competitiveness in the relationship between digital transformation and economic outcomes.

The results also confirm Hypothesis 3, indicating significant differences in the importance of latent constructs in driving the overall economic impact of SMEs in India. For instance, while digital transformation (DT) and operational performance (OP) exhibit relatively strong direct effects on economic outcomes (OEI), other constructs such as innovation capability (IC) and market competitiveness (MCM) demonstrate weaker but still significant contributions. These variations highlight the nuanced nature of SMEs' economic impact, with multiple factors influencing their overall performance. This hypothesis is consistent with the heterogeneity theory of firm performance (2009), which posits that firms vary in their strategic resources, capabilities, and competitive advantages,

leading to differences in their economic outcomes. In the context of SMEs, diverse factors such as industry dynamics, market conditions, managerial capabilities, and technological readiness can influence their economic impact differently. Understanding these variations is crucial for policymakers, investors, and practitioners seeking to support SME growth and development effectively.

Overall, the findings underscore the multidimensional nature of SMEs' economic impact and highlight the importance of considering various factors, including digital transformation, operational performance, innovation capability, and market competitiveness, in driving their overall economic outcomes in India.

Below we can find the final equations of the various formulas given,

$$DT = 0.0893 * RG + 0.0053 * PM + 0.0416 * ME + 0.0097 * CR + 0.0026 * AF + 0.0836 * RE + 0.0002 * MC$$

$$OP = 0.0126 * CR + 0.0046 * PM$$

$$IC = 0.0256 * ME + 0.0177 * RG + 0.0623 * CR + 0.0006 * MC + 0.0910 * TI$$

$$MCM = 0.0668 * DT + 0.0085 * RG + 0.0059 * ME + 0.0006 * IC + 0.0361 * ID + 0.0632 * OE$$

$$OEI = 0.0963 * DT + (-0.0248) * OP + 0.0085 * MCM + 0.0046 * IC$$

The Overall Economic Impact (OEI) of SMEs in India can be understood as a composite measure influenced by various factors captured in the structural equation model (SEM). The equation for OEI indicates that it is directly influenced by Digital Transformation (DT), Operational Performance (OP), Market Competitiveness (MCM), and Innovation Capability (IC). Economically, this suggests that the overall economic impact of SMEs is not only determined by their digital transformation initiatives but also by their operational efficiency, market competitiveness, and innovation capabilities. For instance, higher levels of DT, OP, MCM, and IC are associated with a greater overall economic impact. In theory, this can be interpreted through the lens of the resource-based view (RBV) and dynamic capabilities theory. RBV emphasizes the role of internal resources and capabilities in driving firm performance, while dynamic capabilities theory suggests that firms' ability to adapt and innovate in response to changing market conditions is critical for sustained competitive advantage. Therefore, a comprehensive understanding of OEI incorporates not only technological advancements but also the ability of SMEs to leverage their resources and capabilities effectively in a competitive environment.

4.2 Model specifications

To gauge the effectiveness of the model to be able to accurately fit the data and the performance of the same, various metrics were employed; a description of the same can be found in Table V. These metrics include the Comparative Fit Index (CFI), which compares the model's fit to the null model, a value which is closer to 1 indicates a better fit. Our value of 0.09517 for CFI shows a very good fit for the same. Another metric that has been used is the Goodness of Fit Index (GFI), which assess how well the model was able to capture the observed data in terms of accuracy, with a higher value indicating a better fit. Our model has a GGI value of 0.95204 showing the appropriateness of the fit (Yaşlıoğlu, 2022). Additionally,

the Root Mean Square Error of Approximation (RMSEA) measures the discrepancy between predicted and observed relationships, with our model performing well with a score of 0.04087. Furthermore, the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) balance model complexity and fit, both indicating favourable performance.

Table V: Model Specifications

Indicator	Value
Comparative Fit Index (CFI)	0.09517
Goodness of Fit Index (GFI)	0.95204
Normed Fit Index (NFI)	0.94896
Tucker-Lewis Index (TLI)	0.93890
Root mean square error of approximation (RMSEA)	0.04087
Akaike Information Criterion (AIC)	11.76589
Bayesian Information Criterion (BIC)	9.974169
Source: Author’s Compilation	

4.3 Discussion

The findings of this study shed light on the complex interplay between digital transformation, economic outcomes, and various mediating factors for SMEs in India. The discussion encompasses several key points, including the significance of digital transformation, the role of mediating variables, implications for policy, and avenues for future research.

Firstly, the results underscore the importance of digital transformation for SMEs in India in line with the studies of Singh, (2021) and Karuppiah (2020). Digital technologies offer opportunities for businesses to enhance operational efficiency, innovate their products and services, and improve market competitiveness. The direct effect of digital transformation on economic outcomes, as evidenced by the positive path coefficients from digital transformation to operational performance (OP), innovation capability (IC), and market competitiveness (MCM), highlights the pivotal role of technology adoption in driving SME success.

Furthermore, the mediating effects of operational performance, innovation capability, and market competitiveness elucidate the mechanisms through which digital transformation influences economic outcomes. Operational performance mediates the relationship between digital transformation and economic outcomes, indicating that efficient business operations play a crucial role in translating digital investments into tangible economic benefits. Similarly, innovation capability and market competitiveness serve as conduits through which digitalization fosters economic growth and sustainability for SMEs. These findings have significant policy implications for policymakers, government agencies, and

stakeholders involved in fostering SME development in India. Policymakers should prioritize initiatives aimed at facilitating digital adoption among SMEs, including providing access to digital infrastructure, training programs, and financial incentives (Harvas-Oliver, 2021). By enabling SMEs to embrace digital technologies, policymakers can enhance their competitiveness, productivity, and resilience in the global market.

Moreover, policies should focus on fostering an enabling environment for innovation and entrepreneurship as suggested by Karuppiyah (2020). This includes investing in research and development, promoting collaboration between academia and industry, and creating supportive regulatory frameworks. By nurturing innovation ecosystems, policymakers can empower SMEs to develop new products, services, and business models that drive economic growth and job creation. Additionally, policymakers should address structural barriers that hinder SME growth, such as access to finance, regulatory burdens, and bureaucratic red tape. Streamlining administrative procedures, reducing regulatory compliance costs, and improving access to credit can alleviate constraints on SMEs and enable them to thrive in the digital economy.

Furthermore, policymakers should prioritize initiatives aimed at bridging the digital divide and promoting inclusive growth as suggested by Kihombo et. al. (2021). This includes expanding access to digital infrastructure, enhancing digital literacy programs, and ensuring the affordability of digital services, particularly in rural and underserved areas. By fostering digital inclusion, policymakers can unlock the full potential of SMEs as engines of economic development and social progress. This study provides valuable insights into the relationship between digital transformation, economic outcomes, and mediating factors for SMEs in India. The findings underscore the importance of digitalization for SME growth and sustainability and highlight the role of operational performance, innovation capability, and market competitiveness as critical drivers of economic success. The policy implications outlined in this discussion provide actionable recommendations for policymakers and stakeholders seeking to support SME development and foster inclusive and sustainable economic growth in India. Moving forward, continued research and policy efforts are needed to harness the transformative power of digital technologies and unlock the full potential of SMEs as key contributors to India's economic prosperity.

5. Conclusion

In conclusion, this study has investigated the intricate relationship between digital transformation, economic outcomes, and mediating variables for SMEs in India. The findings provide valuable insights into the factors driving SME success and offer implications for policy, practice, and future research.

First and foremost, the study underscores the pivotal role of digital transformation in shaping the economic trajectory of SMEs in India. By embracing digital technologies, SMEs can enhance their operational efficiency, innovate their products and services, and improve their competitiveness in domestic and international markets. The direct effect of digital transformation on economic outcomes highlights the transformative power of technology adoption for SME growth and sustainability. Moreover,

the mediating effects of operational performance, innovation capability, and market competitiveness elucidate the mechanisms through which digitalization influences economic outcomes for SMEs. Operational performance serves as a conduit for translating digital investments into tangible economic benefits, while innovation capability and market competitiveness drive long-term growth and resilience.

From a policy perspective, the findings underscore the importance of fostering an enabling environment for digital entrepreneurship and innovation. Policymakers should prioritize initiatives aimed at promoting digital adoption, fostering innovation ecosystems, and addressing structural barriers that hinder SME growth. By investing in digital infrastructure, enhancing digital literacy, and streamlining regulatory processes, policymakers can empower SMEs to thrive in the digital economy and contribute to inclusive and sustainable economic development. Furthermore, the study highlights the need for tailored interventions to address the diverse needs and challenges faced by SMEs across different sectors and regions. Policymakers should adopt a holistic approach to SME development, taking into account sector-specific dynamics, regional disparities, and the unique characteristics of SMEs operating in different industries.

In addition to its policy implications, the study contributes to the academic literature by advancing our understanding of the complex dynamics underlying SME performance in the digital age. By empirically examining the relationships between digital transformation, mediating variables, and economic outcomes, the study provides theoretical insights and practical implications for researchers, practitioners, and policymakers alike. Moving forward, future research should build upon these findings by exploring additional factors influencing SME success, such as access to finance, human capital development, and institutional support. Longitudinal studies could shed light on the long-term impact of digitalization on SME growth and resilience, while cross-country comparisons could provide valuable insights into the drivers of SME competitiveness in different contexts. This study underscores the transformative potential of digital transformation for SMEs in India and offers actionable recommendations for policymakers, practitioners, and researchers seeking to support SME development and foster inclusive and sustainable economic growth. By harnessing the power of digital technologies and fostering an enabling environment for entrepreneurship and innovation, India can unlock the full potential of its SME sector and pave the way for a more prosperous and resilient future.

Declarations

Conflict of Interest

The authors declare that they do not have any competing interests to declare.

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Author Contribution

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Naman Mishra and Aneesh K A. The first draft of the manuscript was written by Naman Mishra and Aneesh KA and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Figures

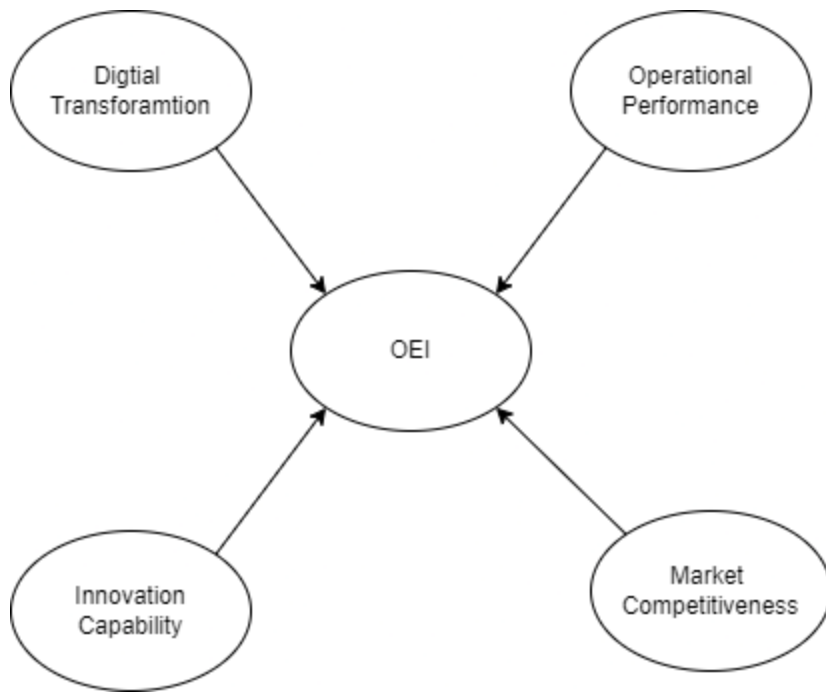


Figure 1

Hypothesis structural model

Source: Author's Compilation

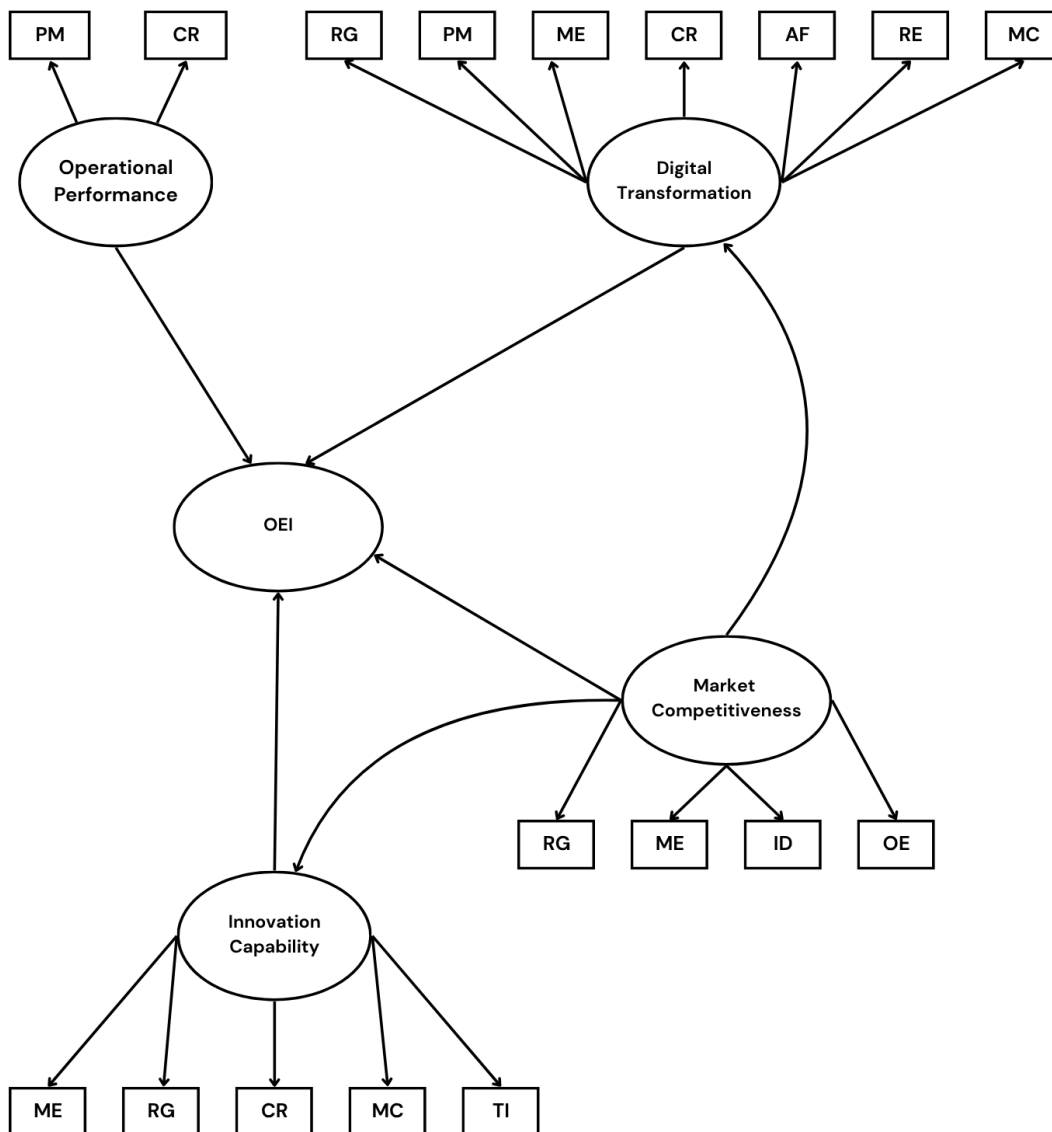


Figure 2

SEM Path Diagram

Source: Author’s Compilation