

Digital Transformation and E-Commerce Adoption Among SMEs in Coimbatore District

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ABSTRACT

Digital transformation has fundamentally reshaped business models, market structures, and value creation processes across global economies. In India, the rapid expansion of digital infrastructure, increasing internet penetration, and the growth of e-commerce platforms have created new opportunities for small and medium enterprises (SMEs), particularly in tier-II industrial cities. Coimbatore, a major industrial and commercial hub of Tamil Nadu, has witnessed a significant shift toward digital commerce among local enterprises. This study examines the extent of digital transformation in e-commerce adoption and its impact on business performance, market reach, and sustainable livelihood outcomes among SMEs and retailers operating in Coimbatore district. A mixed-method research design was employed to address the study objectives. Quantitative data were collected through a structured survey administered to 120 SME owners and retailers across key sectors such as textiles, engineering, manufacturing, and services. Qualitative insights were obtained through in-depth interviews with 15 entrepreneurs actively engaged in e-commerce activities. The findings indicate that digital transformation has a significant positive influence on revenue growth, operational efficiency, customer engagement, and income stability. E-commerce adoption enabled enterprises to expand beyond local markets, enhance business resilience, and generate employment opportunities. However, the study also identifies critical challenges, including digital skill gaps, infrastructure constraints, cybersecurity concerns, and increasing dependence on digital platforms, which hinder the full realization of digital benefits. The study contributes sector-specific empirical evidence from textile SMEs in Coimbatore district and extends the literature on digital transformation, e-commerce adoption, and sustainable business growth in tier-II industrial regions.

Keywords: Digital transformation; E-commerce adoption; Small and medium enterprises; Sustainable livelihood; Coimbatore district

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1. Introduction

Digital transformation has emerged as a central driver of structural change in contemporary economies, reshaping how organizations create value, interact with customers, and compete in increasingly digitized markets. It involves the strategic integration of digital technologies such as cloud computing, data analytics, artificial intelligence, and digital platforms into business processes and organizational models, resulting in fundamental changes in operational efficiency, market engagement, and innovation capability. Among the various dimensions of digital transformation, e-commerce represents one of the most influential developments, enabling firms to overcome geographical constraints and participate more effectively in digital markets.

By 2025, India's digital economy has reached a critical phase of maturity, supported by widespread internet penetration, near-universal smartphone usage, expansion of digital payment systems, and sustained policy initiatives such as Digital India, Startup India, and ONDC. These developments have significantly accelerated e-commerce adoption across sectors, particularly among small and medium enterprises (SMEs), which constitute the backbone of India's industrial and employment ecosystem. The post-pandemic business environment has further reinforced the strategic importance of digital channels, as enterprises increasingly rely on e-commerce for business continuity, resilience, and growth. Recent developments in India's digital commerce ecosystem have further accelerated the adoption of e-commerce among businesses of all sizes. The rapid growth of digital payment platforms, increasing consumer preference for online purchasing, expansion of logistics networks, and the introduction of the Open Network for Digital Commerce (ONDC) have created new opportunities for SMEs to participate in digital markets. The integration of artificial intelligence, data analytics, and customer relationship management tools has enabled businesses to enhance customer engagement, personalize services, and improve operational efficiency. These developments have transformed e-commerce from a supplementary sales channel into a strategic component of business growth and competitiveness.

While existing studies on digital transformation and e-commerce adoption have largely focused on metropolitan regions and large enterprises, empirical evidence from tier-II industrial cities remains limited, particularly in the recent post-pandemic and post-digital-infrastructure-expansion phase. In 2025, tier-II cities play an increasingly important role in India's digital growth trajectory, as SMEs in these regions adopt digital platforms to enhance competitiveness and access wider markets. Coimbatore, a major industrial and commercial hub of Tamil Nadu, with strong clusters in textiles, engineering, manufacturing, and services, represents a relevant and timely context for examining these transformations. Coimbatore occupies a distinctive position in Tamil Nadu's industrial landscape due to its strong concentration of textile manufacturing, engineering industries, and emerging entrepreneurial ventures. In recent years, enterprises in the district have increasingly adopted digital platforms to reach customers beyond traditional local markets and strengthen their competitive position in national and global value chains. Despite this growing digital engagement, empirical evidence on the extent to which digital transformation contributes to business performance and sustainable economic outcomes in Coimbatore remains limited. This gap highlights the need for focused regional studies that examine the practical implications of digital transformation within the context of tier-II industrial economies.

Although the study examines SMEs and retailers across multiple sectors, the textile sector constitutes the largest proportion of respondents in the sample. As one of the most significant industries in Coimbatore district, textile enterprises provide valuable insights into the digital transformation process and the adoption of e-commerce practices among SMEs. Consequently, the findings of the study offer important implications for understanding how traditional industrial sectors are adapting to the evolving digital economy. Beyond firm-level performance, digital transformation through e-commerce has broader socio-economic implications, especially in terms of sustainable livelihood outcomes. For SME owners, retailers, and micro-entrepreneurs, sustainable livelihood in 2025 encompasses income stability, employment generation, financial inclusion, and resilience to market volatility. Understanding the extent to which digital transformation contributes to these outcomes is essential for designing inclusive digital policies and region-specific development strategies. Against this backdrop, the present study examines the extent of digital transformation and e-commerce adoption among SMEs and retailers in Coimbatore district and analyses their influence on business performance, market expansion, and sustainable livelihood outcomes.

Unlike many previous studies that primarily focus on metropolitan regions or large enterprises, this research provides region-specific evidence from a major tier-II industrial district and contributes to a deeper understanding of digital transformation in emerging regional economies.

2. Review of Literature

The growing body of literature on digital transformation emphasizes its role in reshaping organizational processes, business models, and competitive dynamics across industries. Digital transformation is not merely the adoption of digital tools but a strategic shift that integrates digital technologies into core business functions, enabling firms to create and capture value in new ways (Bharadwaj et al., 2013; Vial, 2019). Small and medium enterprises (SMEs) increasingly view digital transformation as a critical driver of competitiveness and long-term survival. Studies indicate that digital technologies enhance operational efficiency, innovation capability, and customer responsiveness among SMEs (Verhoef et al., 2021). However, SMEs often face constraints such as limited financial resources, inadequate digital skills, and resistance to organizational change, which slow the pace of digital transformation (Kraus et al., 2019). Research also highlights that SMEs in emerging economies experience uneven digital maturity due to infrastructural disparities and institutional limitations (Nambisan et al., 2019). In tier-II industrial cities, digital transformation remains largely incremental rather than strategic, suggesting the need for region-specific empirical analysis. E-commerce represents a key outcome of digital transformation, allowing firms to expand market reach, reduce transaction costs, and improve customer engagement. Empirical studies confirm a positive relationship between e-commerce adoption and business performance indicators such as revenue growth, sales volume, and operational flexibility (Verhoef et al., 2021). Digital marketplaces and platform-based selling models further enable SMEs to overcome geographical constraints and scale their operations efficiently. However, dependency on third-party platforms, logistics challenges, and cybersecurity concerns remain significant barriers to sustained e-commerce success, particularly for smaller firms operating in non-metropolitan regions.

The concept of sustainable livelihood extends beyond income generation to include economic stability, reduced vulnerability, and enhanced well-being. Digital platforms contribute to sustainable livelihoods by enabling diversified income sources, flexible work arrangements, and improved market access (OECD, 2021). Studies suggest that e-commerce adoption supports employment generation and financial inclusion, especially for micro-entrepreneurs and women-owned businesses. Despite these benefits, scholars caution that unequal access to digital infrastructure and skills may exacerbate existing economic inequalities, highlighting the need for inclusive digital policies (UNDP, 2021). Recent literature has highlighted the increasing role of advanced digital technologies in transforming business operations and enhancing organizational competitiveness. The integration of artificial intelligence, big data analytics, cloud computing, and digital platforms has enabled firms to improve decision-making processes, customer engagement, and operational efficiency. Researchers have emphasized that digital transformation has evolved beyond technology adoption and is now regarded as a strategic imperative for business sustainability and long-term growth. In particular, SMEs are increasingly leveraging digital technologies to strengthen their market position and respond effectively to changing consumer expectations in highly competitive business environments (Dwivedi et al., 2023; Verhoef et al., 2021; OECD, 2024). The rapid expansion of e-commerce ecosystems has further accelerated digital transformation among SMEs across emerging economies. Recent studies indicate that online marketplaces, social commerce platforms, mobile applications, and integrated digital payment systems have significantly improved market accessibility for small businesses.

E-commerce adoption enables enterprises to reach geographically dispersed customers, reduce transaction costs, improve supply chain coordination, and enhance overall business performance. Furthermore, the emergence of digital platforms and omnichannel retailing strategies has created new opportunities for SMEs to expand their customer base and improve revenue generation (UNCTAD, 2024; World Bank, 2024; OECD, 2024). Contemporary research also suggests that digital transformation contributes not only to business growth but also to broader socio-economic development outcomes. The adoption of digital technologies has been associated with employment creation, financial inclusion, entrepreneurial development, and income diversification. Digital platforms provide opportunities for micro-enterprises and local businesses to participate in wider markets, thereby improving livelihood security and economic resilience. Nevertheless, challenges relating to digital literacy, cybersecurity threats, technological infrastructure, and platform dependency continue to limit the full realization of digital benefits among SMEs, particularly in developing and regional economies. These findings highlight the importance of region-specific investigations into the relationship between digital transformation, e-commerce adoption, business performance, and sustainable livelihood outcomes (World Economic Forum, 2024; UNDP, 2024; OECD, 2024).

3. Research Gap

While existing literature consistently demonstrates the positive influence of digital transformation and e-commerce adoption on organizational performance, several important gaps remain. First, a substantial proportion of empirical studies have been conducted in developed economies, metropolitan regions, or large business organizations, limiting the applicability of their findings to SMEs operating in tier-II industrial districts. Consequently, the digital transformation experiences of SMEs in regional economic clusters remain insufficiently explored. Second, previous research has predominantly focused on firm-level outcomes such as profitability, operational efficiency, market expansion, and customer satisfaction. Comparatively limited attention has been given to the broader socio-economic consequences of digital transformation, particularly its contribution to sustainable livelihood outcomes such as income stability, employment generation, financial inclusion, and economic resilience. As a result, the livelihood implications of digital transformation remain inadequately understood. Third, empirical evidence from industrial districts such as Coimbatore is relatively scarce despite the district's significant contribution to manufacturing, textiles, engineering, retail, and entrepreneurial activities. The growing adoption of digital technologies and e-commerce platforms among SMEs in Coimbatore necessitates region-specific investigations that can provide contextual insights into the opportunities and challenges associated with digital transformation. Therefore, the present study seeks to address these gaps by examining the interrelationships among digital transformation, e-commerce adoption, business performance, and sustainable livelihood outcomes among SMEs and retailers in Coimbatore district. By providing updated empirical evidence from a major tier-II industrial economy, the study contributes to the growing body of knowledge on digital transformation and inclusive economic development.

4. Theoretical Foundation

The present study is grounded in the Technology–Organization–Environment (TOE) Framework, which provides a comprehensive perspective for understanding technology adoption within organizations. Developed by Tornatzky and Fleischer, the TOE framework proposes that the adoption and utilization of technological innovations are influenced by three interrelated contexts: technological, organizational, and environmental factors.

The technological context refers to the availability, accessibility, and perceived benefits of digital technologies such as e-commerce platforms, digital payment systems, cloud-based applications, and data

analytics tools. The organizational context includes factors such as managerial support, resource availability, firm size, employee competencies, and digital literacy that influence the organization's readiness to adopt digital technologies. The environmental context encompasses external factors including market competition, customer expectations, government policies, digital infrastructure, and industry dynamics. The TOE framework is particularly relevant for examining digital transformation among SMEs because it captures both internal and external factors affecting technology adoption. In the context of the present study, digital transformation represents the technological enabler, e-commerce adoption reflects organizational implementation, and business performance and sustainable livelihood outcomes represent the resulting organizational and socio-economic impacts. Accordingly, the framework provides an appropriate theoretical basis for analysing the influence of digital transformation on e-commerce adoption, business performance, and sustainable livelihood outcomes among SMEs and retailers in Coimbatore district.

4.1 Statement of the Problem

Digital transformation and the growth of e-commerce platforms have created significant opportunities for small and medium enterprises (SMEs) to enhance business performance and income generation. In India, increased digital infrastructure and policy initiatives have accelerated this transition; however, the benefits of digital adoption are uneven across regions. In tier-II industrial districts such as Coimbatore, many SMEs and local retailers continue to face challenges related to limited digital skills, infrastructural constraints, platform dependency costs, and cybersecurity concerns. Although e-commerce adoption has the potential to improve market access and income stability, there is limited empirical evidence on whether digital transformation translates into sustainable livelihood outcomes for SMEs in regional industrial clusters. Existing studies predominantly focus on metropolitan areas and firm-level performance, with inadequate attention to livelihood sustainability indicators such as income stability and employment generation. Consequently, there is a lack of region-specific understanding of how digital transformation in e-commerce influences business performance and sustainable livelihood among SMEs in Coimbatore district. This study seeks to address this research gap.

4.2 Objectives of the study

- To examine the extent of digital transformation and e-commerce adoption among SMEs and retailers in Coimbatore district.
- To analyze the impact of e-commerce adoption on business performance indicators such as revenue growth, market reach, and operational efficiency.
- To assess the influence of digital transformation on sustainable livelihood outcomes, including income stability and employment generation.
- To identify the key challenges and constraints faced by SMEs in adopting and utilizing e-commerce platforms effectively.

4.3 Hypotheses

- H1: Digital transformation has a significant positive impact on the adoption of e-commerce platforms among SMEs and retailers in Coimbatore district.
- H2: E-commerce adoption has a significant positive effect on business performance, measured in terms of revenue growth, market expansion, and operational efficiency.

- H3: Improved business performance resulting from e-commerce adoption has a significant positive influence on sustainable livelihood outcomes, including income stability and employment generation.
- H4: Digital literacy significantly moderates the relationship between e-commerce adoption and business performance.

4.4 Conceptual Framework

The conceptual framework of this study is developed to examine the relationship between digital transformation, e-commerce adoption, business performance, and sustainable livelihood outcomes among SMEs and retailers in Coimbatore district. Digital transformation is conceptualized as the strategic integration of digital technologies into business processes, including online platforms, digital payments, and data-driven operations. It serves as the primary enabling factor for e-commerce adoption. E-commerce adoption represents the extent to which enterprises utilize online marketplaces, websites, and digital platforms for sales and customer engagement. Enhanced adoption of e-commerce is expected to improve business performance by expanding market reach, increasing sales revenue, improving operational efficiency, and strengthening customer relationships. Business performance acts as a mediating variable linking e-commerce adoption and sustainable livelihood outcomes. Improved business performance contributes to income stability, employment generation, and economic resilience, which collectively represent sustainable livelihood. These outcomes reflect not only firm-level success but also broader socio-economic benefits for business owners and workers. Digital literacy is incorporated as a moderating variable in the framework, influencing the strength of the relationship between e-commerce adoption and business performance. Higher levels of digital literacy enable SMEs to effectively utilize digital tools, optimize platform usage, and mitigate risks associated with digital operations.

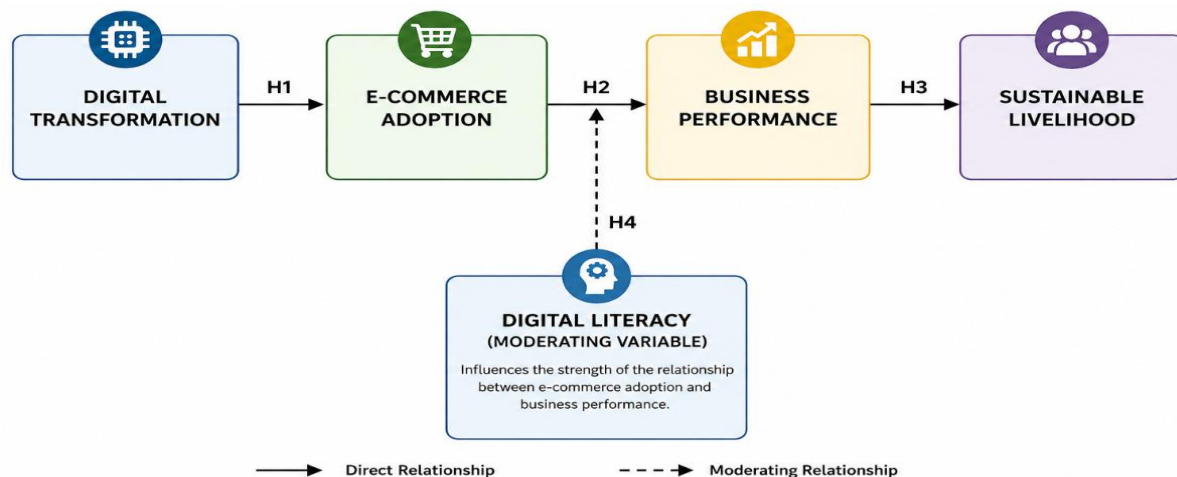


Fig. 1. Conceptual Framework Illustrating the Relationships among Digital Transformation, E-Commerce Adoption, Business Performance, Sustainable Livelihood, and the Moderating Role of Digital Literacy

5. Research Methodology

The study adopts a descriptive and explanatory research design to examine the impact of digital transformation on e-commerce adoption, business performance, and sustainable livelihood outcomes among SMEs and retailers in Coimbatore district. A mixed-method approach was employed to obtain both quantitative and qualitative insights, strong presence of textile, engineering, manufacturing, and service-based SMEs. Data collection was carried out during 2025. The quantitative component of the study consists of 120 SME owners and retail entrepreneurs operating in Coimbatore district. Stratified random sampling was used to ensure representation across major sectors such as textiles, engineering, manufacturing, and services. For the qualitative component, 15 entrepreneurs actively engaged in e-commerce were selected using purposive sampling to gain in-depth insights into digital adoption experiences. The sample size of 120 respondents was considered adequate for the objectives of the study and the statistical techniques employed. According to methodological guidelines for social science research, a sample exceeding 100 respondents is generally sufficient for conducting correlation and multiple regression analyses with acceptable statistical power. Furthermore, the sample size exceeds the minimum requirement for regression-based studies involving multiple independent variables and provides reliable estimates for hypothesis testing. The inclusion of respondents from different sectors, including textiles, engineering, manufacturing, and services, further enhances the representativeness of the sample and improves the generalizability of the findings within the context of SMEs and retailers in Coimbatore district. Primary data were collected using a structured questionnaire administered to SME owners and retailers. The questionnaire was designed using a five-point Likert scale, measuring variables related to digital transformation, e-commerce adoption, business performance, digital literacy, and sustainable livelihood outcomes. In addition, semi-structured interviews were conducted with selected entrepreneurs to capture contextual factors, challenges, and perceived benefits of digital transformation. Participation in the study was voluntary, and respondents were assured of confidentiality and anonymity. Data were used solely for academic research purposes.

5.1 Tools and Techniques of Analysis

The collected data were analysed using:

- Descriptive statistics to summarize respondent characteristics and adoption levels
- Reliability analysis using Cronbach's alpha ($\alpha > 0.70$)
- Correlation analysis to examine relationships among variables
- Multiple regression analysis to test hypotheses
- Moderation analysis to assess the role of digital literacy
- Qualitative thematic analysis for interview data

6. Data Analysis and Results

6.1 Profile of the Respondents

The demographic and business profile of the respondents provides context for understanding digital transformation and e-commerce adoption among SMEs in Coimbatore district.

Table 1: Profile of the Respondents

	Category	Frequency	Percentage (%)
Gender	Male	78	65.0
	Female	42	35.0
Age	Below 30 years	24	20.0
	31–40 years	46	38.3
	41–50 years	34	28.3
	Above 50 years	16	13.4
Business Sector	Textile	36	30.0
	Engineering/Manufacturing	32	26.7
	Services	28	23.3
	Retail/Trading	24	20.0
Years of Operation	Less than 5 years	29	24.2
	5–10 years	51	42.5
	Above 10 years	40	33.3

Source: Primary data

6.2 Level of Digital Transformation and E-Commerce Adoption

The extent of digital adoption among SMEs was assessed through indicators such as online presence, platform usage, and digital payment systems.

Table 2: Digital Transformation and E-Commerce Adoption

Indicator	Yes (%)	No (%)
Business has website / online store	70.0	30.0
Selling through e-commerce platforms	55.0	45.0
Use of digital payment systems	82.5	17.5
Use of digital marketing tools	61.7	38.3

Source: Computed from Primary Data

The results indicate a moderate level of digital maturity, with widespread adoption of digital payments and increasing engagement with online marketplaces.

6.3 Reliability Analysis

The internal consistency of the measurement scales was tested using Cronbach's alpha.

Table 3: Reliability Statistics

Construct	Number of Items	Cronbach's Alpha
Digital Transformation	6	0.84
E-Commerce Adoption	5	0.81
Business Performance	6	0.86
Digital Literacy	4	0.79
Sustainable Livelihood	5	0.83

Source: Computed from Primary Data

All constructs exhibit acceptable reliability ($\alpha > 0.70$), confirming the suitability of the scales for further analysis.

6.4 Descriptive Statistics

Table 4: Descriptive Statistics of Study Variables

Variable	Mean	Standard Deviation
Digital Transformation	3.87	0.68
E-Commerce Adoption	3.74	0.72
Business Performance	3.91	0.65
Digital Literacy	3.79	0.70
Sustainable Livelihood	3.85	0.67

Source: Computed from Primary Data

The descriptive statistics indicate moderate to high levels of digital transformation, e-commerce adoption, business performance, digital literacy, and sustainable livelihood among the surveyed SMEs. The relatively low standard deviation values suggest consistency in respondent perceptions across the study variables.

6.5 Relationship between E-Commerce Adoption and Business Performance

Correlation analysis was conducted to examine associations among the key variables.

Table 5: Correlation Matrix

Variable	1	2	3	4
Digital Transformation	1			

E-Commerce Adoption	0.62**	1		
Business Performance	0.58**	0.65**	1	
Sustainable Livelihood	0.46**	0.53**	0.68**	1

Note: $p < 0.01$

The results show strong and positive correlations, particularly between e-commerce adoption and business performance.

6.6 Regression Analysis

Multiple regression analysis was performed to test the study hypotheses.

Table 6: Regression Results: Impact of E-Commerce Adoption on Business Performance

Predictor	β	t-value	Sig.
Digital Transformation	0.31	4.12	0.000
E-Commerce Adoption	0.44	5.87	0.000
R^2	0.52		
F-value	63.21		0.000

Source: Computed from Primary Data

The model explains 52% of the variance in business performance, indicating a strong explanatory power. E-commerce adoption has a significant positive effect, supporting H2.

6.7 Impact of Business Performance on Sustainable Livelihood

Table 7: Regression Results: Business Performance and Sustainable Livelihood

Predictor	β	t-value	Sig.
Business Performance	0.68	9.14	0.000
R^2	0.46		
F-value	83.54		0.000

Source: Computed from Primary Data

Business performance significantly influences sustainable livelihood outcomes, thereby supporting H3.

6.8 Moderating Effect of Digital Literacy

To examine whether digital literacy moderates the relationship between e-commerce adoption and business performance, an interaction term between e-commerce adoption and digital literacy was included in the regression model.

Table 8: Moderating Effect of Digital Literacy on the Relationship between E-Commerce Adoption and Business Performance

Variable	β	t-value	Sig.
E-Commerce Adoption	0.39	4.98	0.000
Digital Literacy	0.27	3.54	0.001
E-Commerce Adoption $\times$ Digital Literacy	0.18	2.67	0.009

Source: Computed from Primary Data

The interaction effect between e-commerce adoption and digital literacy is positive and statistically significant ($\beta = 0.18$, $p < 0.01$), indicating that higher levels of digital literacy strengthen the positive influence of e-commerce adoption on business performance. Therefore, H4 is supported.

6.9 Result of Hypotheses Testing

Table 8: Summary of Hypotheses Results

Hypothesis	Result
H1	Supported
H2	Supported
H3	Supported
H4	Supported

Source: Computed from Primary Data

► Table captions go ABOVE the table; figure captions go BELOW the figure. Number each series continuously in the order of first mention — Table 1, Table 2... and Fig. 1, Fig. 2... — and never re-use a number. Build tables as real Word tables; tables pasted as images or Excel objects cannot be typeset and will be returned. Every table and figure carries a source note.

7. Discussion

The findings of the present study reinforce the growing recognition of digital transformation as a strategic necessity for SMEs operating in increasingly competitive and technology-driven business environments. The significant relationship between digital transformation and e-commerce adoption suggests that SMEs are no longer treating digital technologies as supplementary business tools but are integrating them into their core operational and marketing activities. This finding supports the theoretical perspectives of Bharadwaj et al. (2013) and Vial (2019), who argue that digital transformation fundamentally alters organizational processes and value creation mechanisms. The positive influence of e-commerce adoption on business performance demonstrates that digital channels have become important instruments for enhancing organizational competitiveness. In the context of Coimbatore district, SMEs that adopted online marketplaces, digital payment systems, and digital marketing tools were able to overcome geographical limitations and access broader customer segments.

This observation is consistent with the findings of Verhoef et al. (2021) and Santos-Jaén et al. (2023), who reported that e-commerce adoption contributes to improved operational efficiency, customer engagement, and revenue generation. The results indicate that digital transformation is particularly valuable for SMEs in tier-II industrial regions, where traditional market boundaries may otherwise restrict business expansion. A notable contribution of the study lies in establishing the connection between business performance and sustainable livelihood outcomes. While previous research has predominantly focused on financial and operational benefits of digital transformation, the present study demonstrates that improved business performance can generate wider socio-economic benefits, including income stability, employment opportunities, and economic resilience. This finding suggests that digital transformation should be viewed not only as a business strategy but also as a mechanism that supports inclusive local economic development. In industrial districts such as Coimbatore, where SMEs contribute substantially to employment and regional growth, the socio-economic implications of digital transformation are particularly significant. The moderating effect of digital literacy highlights the critical role of human capabilities in the successful utilization of digital technologies. The findings indicate that technological investments alone may not guarantee improved performance unless business owners and employees possess the skills necessary to effectively utilize digital tools and platforms.

This observation supports recent studies emphasizing that digital competence is a key determinant of successful digital transformation among SMEs. Higher levels of digital literacy enable enterprises to optimize platform usage, improve decision-making, and respond more effectively to technological challenges and market changes. Overall, the study contributes to the emerging literature by providing empirical evidence from a tier-II industrial district in India, an area that has received comparatively limited scholarly attention. The findings demonstrate that digital transformation, e-commerce adoption, business performance, and sustainable livelihood outcomes are closely interconnected. Consequently, policy initiatives aimed at strengthening SME competitiveness should focus not only on expanding digital infrastructure but also on enhancing digital literacy, promoting technology adoption, and creating supportive institutional ecosystems that facilitate inclusive digital growth.

8. Conclusion

This study examined the impact of digital transformation on e-commerce adoption, business performance, and sustainable livelihood outcomes among SMEs and retailers in Coimbatore district, with particular emphasis on textile enterprises, which constituted the largest sector represented in the study. The results indicate that SMEs engaging in e-commerce platforms experience improved revenue growth, expanded market reach, and greater operational efficiency. These performance gains translate into enhanced income stability and employment generation, underscoring the role of digital transformation as a driver of sustainable livelihoods in tier-II industrial districts. The moderating effect of digital literacy further highlights the importance of human capital in maximizing the benefits of digital technologies. Despite these positive outcomes, challenges related to digital skill gaps, infrastructural limitations, and platform dependency costs continue to constrain full-scale adoption among SMEs. Addressing these challenges is essential to ensure that digital transformation leads to inclusive and equitable economic development. Overall, the study contributes region-specific empirical evidence to the digital transformation and e-commerce literature and emphasizes the need for targeted policy interventions and capacity-building initiatives. By strengthening digital capabilities, digital literacy, and technological infrastructure, Coimbatore's SMEs—particularly those operating in the textile sector can further leverage e-commerce as a catalyst for business growth, competitiveness, and sustainable livelihood development.

9. Contribution of the study

This study contributes to the growing body of knowledge on digital transformation and e-commerce adoption by examining their influence on business performance and sustainable livelihood outcomes among SMEs and retailers in Coimbatore district. The study makes significant theoretical, empirical, and policy contributions to the existing literature and provides valuable insights into the digitalization experiences of enterprises operating in a tier-II industrial region. From a theoretical perspective, the study extends the existing literature on digital transformation by integrating digital transformation, e-commerce adoption, business performance, sustainable livelihood, and digital literacy within a unified conceptual framework. While previous studies have predominantly focused on the relationship between digital transformation and organizational performance, the present study broadens the scope by examining how improvements in business performance contribute to sustainable livelihood outcomes. Furthermore, the inclusion of digital literacy as a moderating variable enhances the understanding of the conditions under which digital transformation generates positive organizational and socio-economic outcomes.

From an empirical perspective, the study provides contemporary evidence from Coimbatore district, a major tier-II industrial hub in India that has received relatively limited attention in digital transformation research. Unlike many existing studies that focus on large organizations or metropolitan regions, this research concentrates on SMEs and retailers operating in a regional industrial ecosystem. The findings demonstrate that digital transformation significantly promotes e-commerce adoption, enhances business performance, and contributes to sustainable livelihood outcomes. Consequently, the study offers region-specific insights into the opportunities and challenges associated with SME digitalization and enriches the empirical literature on digital transformation in emerging economies. From a policy perspective, the study highlights the importance of strengthening digital literacy, digital infrastructure, and institutional support mechanisms to maximize the benefits of digital transformation among SMEs. The findings provide evidence-based guidance for policymakers, industry associations, and development agencies seeking to promote inclusive digital growth and enhance the competitiveness of small businesses. By identifying the factors that facilitate successful e-commerce adoption and livelihood enhancement, the study contributes to the formulation of targeted policies and strategic interventions aimed at fostering sustainable economic development in regional economies.

The policy recommendations presented below are derived from the empirical findings of the study and are intended to support the digital transformation of SMEs in tier-II industrial regions. The findings of this study highlight the need for targeted and region-specific policy interventions to enhance the effectiveness of digital transformation and e-commerce adoption among SMEs in tier-II industrial districts such as Coimbatore. Policymakers should prioritize the development of comprehensive digital literacy and skill-building programs tailored to SME owners and employees. Such initiatives would enable enterprises to effectively utilize e-commerce platforms, digital marketing tools, and data-driven decision-making systems. Improving digital infrastructure remains a critical policy priority. Investments in reliable internet connectivity, digital payment security, and logistics infrastructure can significantly reduce operational constraints faced by SMEs and enhance their ability to compete in online markets. Strengthening last-mile delivery systems and integrating regional logistics hubs would further support e-commerce growth. Financial support mechanisms are also essential to encourage digital adoption. Subsidized loans, tax incentives, and grants for adopting digital technologies can reduce entry barriers for smaller enterprises. Policymakers may also consider regulating platform governance to address issues related to high commission fees, platform dependency, and data transparency, thereby ensuring a fair and competitive digital marketplace.

Finally, fostering public–private partnerships involving government agencies, industry associations, and technology providers can accelerate the development of a supportive digital ecosystem. Such collaborative efforts can promote inclusive digital growth, enhance SME resilience, and contribute to sustainable livelihood development in regional economies.

The results of this study offer several practical insights for SME owners, managers, and entrepreneurs seeking to leverage digital transformation through e-commerce platforms. Managers should view digital transformation as a strategic initiative rather than a short-term operational tool. Developing a clear digital strategy that aligns e-commerce adoption with business goals can enhance market reach, customer engagement, and long-term competitiveness. Investment in digital skills and continuous learning is essential. SME managers should prioritize training programs for themselves and their employees to improve digital literacy, platform management, and data-driven decision-making capabilities. Enhanced digital competence enables businesses to optimize platform usage, manage online customer relationships effectively, and reduce risks associated with cybersecurity and platform dependency. Managers should also focus on diversifying digital channels instead of relying on a single e-commerce platform. Combining marketplace participation with own-brand websites and social commerce can reduce dependency risks and improve bargaining power. Additionally, leveraging digital analytics tools for demand forecasting, inventory management, and customer insights can improve operational efficiency and profitability. Finally, collaboration with technology service providers, logistics partners, and digital marketing agencies can help SMEs overcome resource constraints. Strategic partnerships enable enterprises to access specialized expertise, improve service quality, and strengthen resilience in an increasingly competitive digital marketplace.

10. Limitations and Future Research Directions

Despite its contributions, this study has certain limitations that should be acknowledged. First, the research is confined to SMEs and retailers in Coimbatore district, which may limit the generalizability of the findings to other regions or metropolitan contexts. Second, the study relies primarily on self-reported data, which may be subject to response bias and perceptual inaccuracies. Third, the cross-sectional research design captures digital transformation outcomes at a single point in time and does not account for dynamic changes in digital adoption and performance over time. Future research can address these limitations by adopting longitudinal study designs to examine the long-term impact of digital transformation on business performance and sustainable livelihood outcomes. Comparative studies across multiple districts or states would provide deeper insights into regional variations in digital adoption. Further research may also explore sector-specific digital transformation patterns, the role of emerging technologies such as artificial intelligence and data analytics, and the influence of institutional and policy environments on SME digitalization. Incorporating objective performance indicators and mixed stakeholder perspectives would further strengthen empirical understanding in this domain.

Declarations

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Conflict of interest. There is no conflict of interest that the authors declare.

Ethics approval and consent. Ethical approval was not necessary for this study as it does not engage with human data, human subjects, or doctor research interventions.

Data availability. The data of this study are available from the corresponding author after a reasonable request within ethical and privacy constraints.

Use of generative AI. No generative AI tools were used to prepare, analyze, write, or edit this paper.

Author contributions. P.Prema: conceptualisation, analysis, original draft; T. Ramya.:data curation, review and editing.

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References

- Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital business strategy: Toward a next generation of insights. *MIS Quarterly*, 37(2), 471–482. <https://doi.org/10.25300/MISQ/2013/37.2.03>
- Costa, P., & Rodrigues, H. (2024). The ever-changing business of e-commerce: Net benefits while designing a new platform for small companies. *Review of Managerial Science*, 18, 2507–2545. <https://doi.org/10.1007/s11846-023-00681-6>
- Dwivedi, Y. K., Hughes, L., Baabdullah, A. M., Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, M. M., Dennehy, D., Metri, B., Buhalis, D., Cheung, C. M. K., Conboy, K., Doyle, R., Dubey, R., Dutot, V., Felix, R., Goyal, D. P., Gustafsson, A., Hinsch, C., Jebabli, I., Janssen, M., & Wamba, S. F. (2023). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 71, 102642. <https://doi.org/10.1016/j.ijinfomgt.2023.102642>
- Kraus, S., Palmer, C., Kailer, N., Kallinger, F. L., & Spitzer, J. (2019). Digital entrepreneurship: A research agenda on new business models for the digital age. *Technological Forecasting and Social Change*, 146, 353–364. <https://doi.org/10.1016/j.techfore.2019.06.002>
- Mattos, C. S., Pellegrini, G., Hagelaar, G., & Dolfsma, W. (2024). Systematic literature review on technological transformation in SMEs: A transformation encompassing technology assimilation and business model innovation. *Management Review Quarterly*, 74(2), 1057–1095. <https://doi.org/10.1007/s11301-023-00327-7>
- Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. *Research Policy*, 48(8), 103773. <https://doi.org/10.1016/j.respol.2019.03.018>
- Organisation for Economic Co-operation and Development. (2021). *The digital transformation of SMEs*. OECD Publishing. <https://doi.org/10.1787/bdb9256a-en>
- Organisation for Economic Co-operation and Development. (2024). *SME digitalisation to build back better*. OECD Publishing.
- Sagala, G. H., & Öri, D. (2024). Toward SMEs digital transformation success: A systematic literature review. *Information Systems and e-Business Management*, 22(4), 667–719. <https://doi.org/10.1007/s10257-024-00682-2>
- Santos-Jaén, J. M., Gimeno-Arias, F., León-Gómez, A., & Palacios-Manzano, M. (2023). The business digitalization process in SMEs from the implementation of e-commerce: An empirical analysis. *Journal of Theoretical and Applied Electronic Commerce Research*, 18(4), 1700–1720. <https://doi.org/10.3390/jtaer18040086>
- Schmidt, R., Drews, P., & Schirmer, I. (2024). Digital transformation in SMEs: A taxonomy of externally supported digital innovation projects. *International Journal of Information Management*, 74, 102713. <https://doi.org/10.1016/j.ijinfomgt.2023.102713>
- United Nations Conference on Trade and Development. (2024). *Digital economy report 2024*.

United Nations Development Programme. (2021). *Digital transformation for sustainable development*. <https://www.undp.org/publications/digital-transformation-sustainable-development>

United Nations Development Programme. (2024). *Human development report: Digital transformation and inclusive development*.

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889–901. <https://doi.org/10.1016/j.jbusres.2019.09.022>

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, 28(2), 118–144. <https://doi.org/10.1016/j.jsis.2019.01.003>

World Bank. (2022). *Digital economy for inclusive growth*. World Bank. <https://www.worldbank.org/en/topic/digitaldevelopment>

World Bank. (2024). *Digital development overview*. World Bank.

World Economic Forum. (2024). *Future of digital economy and society report*. World Economic Forum.

Zucchella, A., & Previtali, P. (2024). Navigating through the digital swamp: Assessing SME propensity for online marketplaces. *Review of Managerial Science*, 18, 2583–2612. <https://doi.org/10.1007/s11846-023-00704-2>