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Digital Transformation and its Effect on the Retail and Manufacturing Industries in Tamil Nadu

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Abstract

The study examines digital transformation's effects on Tamil Nadu's retail and manufacturing sectors by incorporating digital technologies into operations. It compares traditional methods with digital approaches to assess impacts on profitability, customer retention, and efficiency. Data was collected from three retail and two manufacturing firms using a structured questionnaire with 50 respondents. Both quantitative and qualitative analyses were conducted to assess changes in sales, inventory, and customer interaction. Traditional retailers saw a 20.8% drop in growth and profitability due to online shopping, which changed customer behavior and reduced store visits. Customer retention rates fell from 85% to 70%, highlighting the need for improved engagement strategies. Manufacturing firms gained from digital transformation through enhanced efficiency and supply chain management, though they faced challenges such as resistance to change. The findings indicate that traditional retailers must adopt digital marketing, hybrid models, and training to address resistance and skill shortages. Manufacturing companies should continue improving digital capabilities to enhance production and stay competitive in a changing market. The study concludes that while digital transformation poses challenges like reduced retail profitability, it also provides opportunities for efficiency and market growth in both sectors. These insights guide companies and policymakers toward a strategic approach to digitalization for sustainable growth and competitive advantage.

Keywords: Consumer Behaviour, Digital Transformation, Manufacturing Firms, Online Shopping, Retail Industry.

Introduction

Digital transformation is a sweeping force reshaping global business landscapes, with Tamil Nadu being no exception. The integration of digital technologies has fundamentally altered how businesses operate and interact with customers. In Tamil Nadu, sectors such as retail and manufacturing particularly are impacted, prompting enterprises to adopt innovative approaches to remain competitive. Digital shopping has disrupted the traditional retail industry in Tamil Nadu, significantly affecting growth and profitability. Traditional retailers face challenges from online shopping platforms, which have altered consumer purchasing behaviour and expectations. To remain competitive, traditional retailers are encouraged to enhance their strategies, such as adopting digital marketing techniques and improving customer engagement through online platforms. Digital shopping has led to a decline in foot traffic and sales for traditional retailers, affecting their growth and profitability platforms provide (1). E-commerce cost advantages, such as reduced overheads, which traditional retailers struggle to match (2). The convenience and accessibility of online shopping have altered consumer preferences, leading to a decrease in visits to brick-and-mortar stores. Consumers in Tamil Nadu are increasingly influenced by socio-economic and psychological factors, prompting a shift towards online shopping. Traditional retailers are encouraged to adopt omnichannel strategies, integrating online and offline experiences to enhance customer engagement. Embracing technology, such as artificial intelligence and augmented reality, can help traditional retailers improve their in-store experience and supply chain management (3). While e-commerce presents challenges, it also offers opportunities for traditional retailers to expand their market reach and streamline operations. The government and traditional businesses need to collaborate on regulatory frameworks to ensure a balanced retail ecosystem (4).

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Digital transformation enhances the competitiveness of manufacturing companies by increasing total factor productivity, research and development intensity, and human capital. A 1% increase in digital transformation can lead to a 0.015% enhancement in company competitiveness (5). The integration of digital technologies such as big data, 5G, and AI into manufacturing processes improves production performance and operational (6). This study explores the nature and extent of digital transformation in these industries, focusing on how online shopping has reshaped traditional retail and the operational dynamics of manufacturing firms. The primary aim of the research is to identify and investigate the digital changes that have occurred over the years in the retail and manufacturing industry. The objectives are focused to develop a questionnaire and identify the specific parameters and to evaluate the metrics with reference to digital Transformation, to assess changes in revenue post-digital transformation and to evaluate customer loyalty improvements due to digital strategies, to track changes in marketing investment post-digital transformation and to assess inventory management efficiency after adopting digital tools.

Methodology

The primary method used in this paper is to collect data through a structured questionnaires designed to collect data on various aspects of digital transformation distributed to key stakeholders, including business owners, managers, and operational staff. This includes general company information, sales revenue, operational efficiency, engagement, customer and more. The questionnaire is tailored to capture both quantitative and qualitative data, providing a comprehensive view of the impact of digital tools on business metrics. The questionnaire is distributed to a sample of 3 retail and 2 manufacturing companies within the retail and manufacturing sectors. The data collection process involves reaching out to these companies and encouraging them to provide detailed responses about their digital transformation experiences. The paper uses comparative analysis to evaluate changes in key business metrics before and after the adoption of digital tools. This involves comparing data such as sales revenue, inventory turnover, and customer retention rates to assess the effectiveness of digital strategies. The questionnaire was designed to capture the following dimensions:

- Perceptions of digital transformation.
- Impact of digital technologies on operational efficiency.
- Influence of online shopping on traditional retail.
- Strategies employed by firms to adapt to digital disruptions.
- Operational and financial impacts.
- Challenges faced in adapting to digital technologies.
- Strategies employed to mitigate challenges and leverage opportunities.

General Information and Sales Revenue

The research initiative systematically gathers fundamental company information, which encompasses variables such as the type of industry in which the company operates, the total number of years the company has been in business, and the size of the workforce as indicated by the number of Furthermore, it analyses employees. the fluctuations in average monthly sales revenue that transpired before and after the adoption of digital tools, with the ultimate goal of deepening our understanding of how digital transformation enhances sales growth.

Operational Efficiency

The structured questionnaire is designed to assess the degree to which digital tools are effectively utilized for the purposes of monitoring inventory levels and managing operational processes. It also thoughtfully explores how operational bottlenecks have been alleviated, while considering the overall impact of these changes on productivity levels within the organizations.

Customer Engagement

This particular segment of the study is dedicated to exploring the utilization of digital platforms as a means for enhancing customer engagement, personalizing customer experiences, and developing the capability to accumulate and respond to customer feedback in a timely manner. This section aims to thoughtfully examine how effective various digital strategies are in enhancing customer interaction and satisfaction.

Revenue Growth

This research thoughtfully explores the significant role that embracing digital technologies can have in fostering revenue growth, carefully considering the implications for market expansion and the impact that online sales channels may have on the traditional revenue streams that many companies depend on.

Marketing Spend

This aspect of the study strives to carefully track variations in marketing expenditures that occur subsequent to the digital transformation process, drawing comparisons between monthly marketing investments made before and after the implementation of digital platforms. Additionally, it scrutinizes the evolution of marketing strategies, including an increase in online advertising initiatives and the adoption of data-driven marketing campaigns.

Inventory Turnover Ratio

The research decisively highlights the evaluation of inventory management efficiency by comparing the inventory turnover ratio recorded before and after the implementation of digital tools, with the aim of identifying significant improvements achieved in inventory management processes.

Customer Retention Rate

This research intends to explore how the implementation of digital strategies, including tailored marketing campaigns and better customer support services, can positively impact customer loyalty. The overall effectiveness of these strategies in driving higher customer retention rates is thoroughly evaluated.

Adoption of Digital Tools and Workforce Adaptation

This segment of the study compassionately explores the effectiveness of employee training programs concerning the new digital tools, taking into account the smoothness of their integration into the daily operations of the companies and the overall comfort level experienced by the workforce during adoption. Moreover, it evaluates the degree to which employees have adapted to digital workflows and their preparedness for future advancements in digital technology.

Quantitative Metrics

Specific quantitative metrics are used to measure the impact of digital transformation. These include average monthly sales revenue, inventory turnover ratio, and customer retention rate. By focusing on these metrics, the paper aims to provide a clear picture of the tangible benefits of digital adoption.

Qualitative Insights

In addition to quantitative data, the paper also gathers qualitative insights from respondents. This includes feedback on the challenges faced during digital transformation, the effectiveness of employee training, and the overall satisfaction with digital tools.

Overall, the research offers a comprehensive and in-depth analysis of the ways in which digital transformation influences key business metrics, thereby providing valuable insights into critical areas such as operational efficiency, customer engagement, revenue growth, and additional pertinent factors. These methods collectively provide a robust framework for understanding the impact of digital transformation on business operations and outcomes. The structured approach ensures that the data collected is both comprehensive and relevant to the research objectives.

Scoring Mechanism

The paper employs a structured approach to score calculation and evaluation, focusing on operational efficiency and other parameters. Here are the methods used, as derived from the provided contexts:

Questionnaire Distribution: The paper involves distributing a questionnaire to respondents, with an example scenario involving 10 respondents in each sector.

Scoring Mechanism: Respondents rate each question on a scale from 1 to 10, where 1 indicates "Strongly Disagree" and 10 indicates "Strongly Agree".

Parameter Score Calculation: The scores for each parameter are aggregated by summing the responses to all questions under that parameter. The total score for a parameter is then divided by the number of respondents to calculate the average score for that parameter.

Example Calculation: For instance, if the total score for operational efficiency from 10 respondents is 84, the average score is calculated as 8.4 by dividing 84 by 10.

These methods provide a systematic way to evaluate and interpret the data collected through the questionnaire, ensuring that the results are both reliable and easy to understand. The use of a consistent scoring mechanism allows for clear comparisons across different parameters and sectors.

Results and Discussion

The Table 1 delineates the comparative digital adoption levels within the retail and manufacturing sectors, taking into account the size of the companies and their operational duration. In the retail sector, Saravana Stores [30 employees, 10 years] displays a significantly elevated level of digital adoption, in contrast to Benzz Pharma [50 employees, 5 years] and Rathna Agencies [75

Table 1:	Profile	of Sample	Companies
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employees, 35 years], which exhibit moderate levels of adoption. In the manufacturing domain, Sakthi Laser Ltd [150 employees, 25 years] showcases a high degree of digital adoption, while Amco [200 employees, 30 years] sustains a moderate level of adoption, notwithstanding its greater size and extended operational history. The data suggests a diverse approach to digital transformation across sectors, influenced by company size, age, and strategic focus.

Industry Sector	Company	Size	Years	In	Digital	Adoption
	(Employees)		Operation		Level	
Retail (Benzz Pharma - Branch)	50		5		Moderate	
Retail (Saravana Stores - Branch)	30		10		High	
Retail (Rathna agencies - Branch)	75		35		Moderate	
Manufacturing (Sakthi laser Ltd)	150		25		High	
Manufacturing (Amco)	200		30		Moderate	

Impact of Digital Transformation on Business Operations

From the results of Table 2 operational efficiency metrics indicate strong digital adoption across both manufacturing [8.4] and retail [8.7] sectors, with manufacturing showing a slight edge in supply chain efficiency due to strategic digital integration. Conversely, retail excels in customer engagement, scoring [9.1] compared to manufacturing's [8.2], attributed to its direct-toconsumer approach and proactive digital strategies, despite facing challenges from declining offline sales. Furthermore, while retail leads in digital adoption metrics [9.2 vs. 8.9], it grapples with training deficits, whereas manufacturing benefits from workforce preparedness and a focus on automation, reflecting distinct maturity levels and adaptation strategies in their digital transformation journeys.

Table 2: Impact of Digital Transformation on Business Operations

Dimension	Retail Sector	Retail	Manufacturing Sector	Manufacturing
		(Average		(Average Score)
		Score)		
Operational	Improved inventory	8.4	Enhanced supply chain	8.7
Efficiency	and sales tracking		management	
Customer	Increased online	9.1	Limited direct consumer	8.2
Engagement	engagement		interactions	
Revenue	Decline in offline	7.8	Marginal growth due to	8.0
Growth	sales		digital tools	
Adoption of	Training and skill	8.9	Resistance to technological	9.2
Digital Tools	gaps		adoption	
Workforce	Integration of e-	7.6	Automation and digital	7.9
Adaptation	commerce		workflow systems	
	platforms			

Technology Adoption

The rapid growth of digital technologies is transforming retail and manufacturing in Tamil Nadu. Commercial entities are adopting ecommerce, data analytics, and customer relationship management systems to improve efficiency and enhance customer engagement. The study reveals that these technologies have redefined strategies and value propositions, assisting companies in more effectively meeting market requirements. The 20.8 percent decrease in growth for traditional retailers illustrates the pressing need to integrate innovative technologies in order to keep pace with the evolving landscape of digital shopping (7).

Organizational Readiness

Organizational readiness is essential for the effective execution of digital transformation projects. The study shows that traditional retailers are struggling to keep pace with the changing digital landscape (8), as evidenced by the decline in customer retention rates from 85 to 70 percent. This suggests a deficiency in revising strategies and operational methods to align with the evolving consumer behaviours and preferences. Organizations ought to review their internal assets, like employee expertise, leadership resolve, resource management, to effectively and implement digital technologies and nurture a culture of innovation.

Environmental Factors

The external environment greatly affects organizations' digital transformation. Market competition, consumer expectations, and regulations impact retail and manufacturing operations. Online marketing changes consumer behavior, requiring traditional retailers to adjust strategies. Organizations must address environmental challenges and seize digital opportunities, like personalized services and engagement, community to improve competitiveness.

Regional Digital Literacy Programs and Labour upskilling

Upskilling Initiatives: Labour upskilling is a significant concern, with both sectors facing substantial training and skill gaps, reflected in an average score of [8.9]. With training and skill gaps in the adoption of digital tools, localized digital literacy programs can play a pivotal role in equipping the workforce with necessary skills. This is essential for overcoming resistance to technological adoption [9.2] and ensuring successful integration of automation and digital workflows [7.9]. This highlights the urgent need for targeted training programs to equip the workforce with the necessary skills to navigate the digital landscape effectively. Research indicates that continuous learning and development are essential for organizations to remain competitive in an ever-evolving market (9).

Community Engagement: Programs aimed at increasing digital literacy can also enhance

customer engagement by fostering a more digitally savvy consumer base, thus improving the limited direct consumer interactions [8.2] observed in the retail sector.

Influence of State Policies

Support for Digital Transformation: Tamil Nadu's government has been proactive in promoting digital initiatives, which aligns with the high average scores in customer engagement [9.1 for retail] and the adoption of digital tools [8.9 for retail]. State policies that encourage e-commerce and digital literacy can further enhance these scores.

Incentives for Manufacturing: Policies aimed at boosting manufacturing, such as subsidies for technology adoption and support for small and medium enterprises (SMEs), can help address the marginal growth in revenue [8.0] and improve operational efficiency [8.7].

Infrastructure Availability: Robust Digital Infrastructure: Tamil Nadu has a relatively strong digital infrastructure, which facilitates improved inventory and sales tracking [8.4 for retail] and enhances supply chain management [8.7 for manufacturing]. This infrastructure supports the integration of e-commerce platforms, which scored lower at [7.6], indicating room for growth.

Logistics and Connectivity: The state's welldeveloped logistics and transport infrastructure can help mitigate the decline in offline sales [7.8] by improving the overall consumer experience and boosting online engagement.

Financial Limitations

Financial limitations also pose challenges, particularly for the retail sector, which scored [7.8] due to a decline in offline sales. Conversely, the manufacturing sector reported a score of [8.0], indicating marginal growth attributed to digital tools. Financial constraints can hinder the ability to invest in new technologies thereby underscoring the necessity for enterprises to judiciously allocate resources to guarantee sustainable development (10).

Data Security

Data security is another critical issue, with both sectors scoring [8.7] for enhanced supply chain management. The importance of safeguarding sensitive information cannot be overstated, as data breaches can lead to significant financial losses and damage to reputation (11). Organizations must prioritize robust cybersecurity measures to protect their assets and maintain consumer trust.

Resistance to Change

Resistance to change is the most pressing issue identified, with an average score difference of 0.3 across both sectors. This reluctance towards technological adoption can impede progress and innovation. Fostering a culture that embraces change is vital for organizations aiming to thrive in a digital era. Employee buy-in and leadership support are crucial in overcoming this barrier.

In summary, addressing these issues—labour upskilling, financial limitations, data security, and resistance to change—is essential for both the retail and manufacturing sectors to successfully navigate the challenges posed by digital transformation.

Table 3: Impact of Online Shopping on Traditional Retail

Metric	Before Online Shopping	After Online Shopping		
Average Monthly Sales (₹)	12,00,000	9,50,000		
Customer Retention Rate (%)	85	70		
Marketing Spend (₹)	1,00,000	1,50,000		
Inventory Turnover Ratio	4.5	3.8		

Table 3 highlights the impact of online shopping on key business metrics. The average monthly revenue experienced a reduction from ₹12,00,000 to ₹9,50,000, indicating a decrease in income following the transition to online shopping. Client retention ratios have dropped from 85% to 70%, indicating a vital moment to strengthen connections with loval customers in the digital marketplace. Despite the decline in sales and retention, promotional expenditure increased from ₹1,00,000 to ₹1,50,000, decisively targeting online consumers. In addition, the inventory turnover ratio has notably declined from [4.5 to 3.8], showcasing a slower inventory movement and the imperative to refine our transition to the digital model.

Retail Sector Insights

The rise of online shopping platforms has led to a noticeable decline in sales for traditional retail outlets (12). Customers increasingly prefer the convenience, variety, and competitive pricing offered by e-commerce platforms. This has forced retailers to reevaluate their business strategies, invest in digital marketing, and enhance their online presence. However, traditional retailers still hold an advantage in providing personalized services and fostering local community connections (13).

Retail businesses face the dual challenge of declining foot traffic and the rise of online competitors. Among surveyed retailers, 80% reported a noticeable decline in in-store sales since adopting online platforms. Conversely, those integrating e-commerce channels noted revenue growth of up to 30% within two years (14). This

underscores the critical need for hybrid business models that blend physical and digital presence.

Consumer behaviour has shifted dramatically, with preferences leaning towards convenience, personalized recommendations, and competitive pricing offered by online platforms (15). Traditional retailers, however, retain an edge in providing personalized customer service, a factor highlighted by 60% of respondents as crucial to customer retention (16).

Manufacturing Sector Insights

Manufacturers in Tamil Nadu have embraced digital tools to streamline operations, enhance supply chain management, and improve production efficiency. Technologies such as cloud computing, Internet of Things (IoT), and automation have enabled firms to respond quickly to market demands. Despite these advancements, challenges such as workforce adaptation and high initial investment costs persist.

Automation, IoT technologies, and advanced analytics have enabled manufacturers to optimize workflows and enhance supply chain visibility (16). Digital transformation in manufacturing has primarily focused on improving operational efficiency and reducing production costs (17). However, adoption is not without challenges. For instance, 40% of surveyed manufacturers cited resistance from employees as a barrier to implementing digital technologies.

Moreover, the transition has created a need for reskilling and upskilling the workforce (18). Companies investing in employee training programs reported smoother transitions and better return on investment ROI from digital initiatives.

Shifts in Consumer Behaviour

Consumer preferences have shifted significantly in the digital age, driven by the convenience of online platforms and greater access to product information (19). This evolution demands that traditional businesses adapt by incorporating omnichannel strategies that blend online and offline customer experiences.

Limitations and Recommendation for Wider Applicability

The emphasis on Tamil Nadu in digital transformation research may restrict the generalizability of results due to the state's distinct socio-economic and cultural traits. Additionally, data inconsistencies regarding digital initiatives in retail and manufacturing could compromise the validity of conclusions. The swift evolution of technology presents challenges, as findings may quickly become obsolete, highlighting the need for continuous research. Moreover, the varied nature of companies in these sectors suggests differing experiences with digital transformation that may not be adequately captured in broad studies.

Retail Sector: Traditional retailers should leverage their unique strengths by offering personalized services, emphasizing local expertise, and creating loyalty programs. Collaborating with online platforms to create hybrid models can also enhance their market reach.

Manufacturing Sector: Manufacturers should continue to invest in digital tools and employee training programs to ensure smooth adaptation. Collaboration with technology providers can help overcome cost barriers and accelerate digital integration.

Policy Implications: Government initiatives should focus on providing financial incentives and training programs to support small and mediumsized enterprises (SMEs) in their digital transformation journeys.

To improve the applicability of future research, it is advisable to broaden the geographic focus beyond Tamil Nadu to encompass other regions in India and global contexts. Longitudinal studies would yield insights into the enduring impacts of digital transformation, while including diverse stakeholders like employees, customers, and suppliers would enhance comprehension of its effects. Partnering with policymakers to establish guidelines and frameworks could further facilitate successful digital transformation efforts, equipping businesses with essential tools for the changing digital environment. Addressing these limitations and applying these suggestions would greatly enhance the findings concerning digital transformation in the retail and manufacturing sectors.

Conclusion

Digital transformation is reshaping the business landscape in Tamil Nadu, offering both challenges and opportunities for the retail and manufacturing sectors. While the transition poses difficulties in terms of cost, workforce adaptation, and competition, it also provides pathways to enhanced efficiency, broader market access, and consumer engagement. Digital adoption has significantly enhanced operational efficiency in both retail [8.4] and manufacturing [8.7] sectors, suggesting that similar benefits can be achieved across various Indian states, particularly where traditional systems prevail. Tailored customer engagement strategies are essential, with retail benefiting from strong online engagement [9.1] while manufacturing [8.2] requires improved direct-to-consumer interfaces. States with robust consumer markets, such as Maharashtra and Gujarat, should develop sector-specific digital outreach programs, while promoting hybrid retail strategies to balance offline and online integration. Despite high adoption scores in both sectors [Retail: 8.9, Manufacturing: 9.2], challenges like skill gaps and resistance to change remain prevalent, necessitating ongoing skilling initiatives and state-sponsored digital literacy campaigns. Workforce adaptation is crucial, with moderate scores [Retail: 7.6, Manufacturing: 7.9] indicating a need for targeted development in e-commerce and automation. Additionally, the drop in customer retention and increased marketing costs posttransition highlight the necessity for innovative engagement strategies and budget allocation to ensure successful digital transformation across Indian states.

This study underscores the need for a strategic approach to digitalization, where businesses leverage their unique strengths while adapting to evolving consumer expectations. In conclusion, the TOE framework shows how technology adoption, readiness, and environment interact in Tamil Nadu's retail and manufacturing. This understanding helps organizations create strategies to thrive in the digital marketplace. Future research should focus on long-term outcomes of digital adoption and its socioeconomic implications for Tamil Nadu's industrial landscape.

Abbreviations

IoT: Internet of Things, ROI: Return On Investment, SMEs: Small and Medium-Sized Enterprises, TOE: Technology Adoption.

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Author Contributions

AR Vijayalakshmi: Conceptualization,

Methodology, Original draft preparation, Data collection, Data processing, Writing, Statistical analysis, A Morarji: Data curation, Data analysis, Methodology, Review, Editing, Overall Supervision.

Conflict of Interest

All the authors declare that there is no conflict of interest. The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethics Approval

Not Applicable.

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