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MDIM Journal of Management Review and Practice is published by Management Development Institute Murshidabad. The journal started publishing in 2023 in English Language. The journal aims to create and advance knowledge in the field of management sciences and its allied disciplines. High quality research papers, case studies, opinion pieces and book reviews are published in *MDIM Journal of Management Review and Practice*.

Through thought leadership, the journal fosters a knowledge ecosystem that enriches the existing body of knowledge.

MDIM Journal of Management Review and Practice is published twice a year, in March and September. The journal publishes research works that are thought provoking. The most recent developments in the following fields have been covered in recent years. Thought leaders, researchers, academicians as well as corporate professionals publish their scholarly work through this outlet.

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- Organization Behaviour
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The main features (paper types) of the journal are as follows:

- Applied and Normative Research
- Review Articles
- Case Studies
- Book Reviews

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MDIM Journal of Management Review and Practice, a humble initiative of Management Development Institute Murshidabad, strives and fosters to propel research in the arena of business and management sciences by providing evidence-based research papers of highest quality for academicians, researchers, managers and policy makers. The journal endeavors to create influence on corporate and academia think tanks. It aspires to provide a platform for discussions and cross-pollinations of ideas across wide spectrum of scholarly perspectives to garner theoretical, empirical and comparative research on ongoing and probable problems in the business world.

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Weaving Futures: Enhancing Learning and Innovation Capabilities of Rural Women in the MSME Textile Sector

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Oly Mishra¹ 

Abstract

Purpose: Industrialization has led to centralized development, urbanization, migration and concentration of people in selected areas, that is, cities. The current model of development is not a sustainable one. While progress has been made through this model, it has also increased social inequalities, damaged health and caused irreversible depletion of the natural environment. The need of the hour is to create a new model of development to achieve sustainable development across rural and semi-urban regions.

Objective: The objective of the new development model is to find out the relation between learning and innovation capability on the customer-based performance of a textile-based micro, small and medium enterprise (MSME). The research questions that will be answered are how rural women working in textile MSMEs can improve their learning and innovation capabilities? What is the impact of learning and innovation capabilities on the customer-based performance of the MSMEs?

Methodology: The research method used for this study was based on primary data collected from the stakeholders of rural textile-based MSMEs and secondary data.

Findings and Suggestions: The paper suggests that localized micro-factories enable people to stay close to their roots. The need of the hour is to train people with the required skill sets. The learning and innovation capability of the MSMEs reflects on their customer-based performance. The implementation of advanced technology will make localized micro-factories profitable. These technologies will provide services to citizens efficiently and equitably. The proposed smart

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cities will have to create more equitable and symbiotic relationships with the surrounding semi-urban and rural areas. The emphasis should be on learning new techniques of production using locally available resources. Once the new techniques have been learned, the company should be able to implement them innovatively to improve its customer experience.

Keywords

Sustainable development, localized micro-factories, learning capability, innovation capability, customer-based performance

Introduction

Societies have distinctive cultures. The culture of a society should be self-sustaining and self-healing. Our society has undergone drastic changes as the environment around us is very dynamic. In other words, the Volatile, Uncertain, Complex and Ambiguous (VUCA) environment has affected our society's culture as well. Individuals are striving for a better quality of life in the framework of industrial development with the help of technology. In the cut-throat competition of today's world, there is a lack of strong community associations. People are unable to maintain balance in society as well as ecology. Even though now there are means to do things quickly and efficiently, people are unable to lead a balanced and simple life. Some of the major concerns of human society now are emotional imbalance, lack of happiness, mistrust and lack of care and compassion among fellow human beings. The main reason for this is the skewed development pattern, which is mainly focused on a few areas like the metro cities. There is a strong need for a sensible approach to ensure the well-being of all people in society and balanced economic development. The aim is to provide a model that leads to increased participation and contribution of the rural population within their area of expertise. The education system should also focus on human values and should be able to prepare students with skills such that they can choose a profession or vocation for themselves accordingly.

Organizations try to not only survive but also prosper in the face of ongoing changes and uncertainties in today's dynamic and constantly changing business landscape. The capacity for innovation and learning has come to be recognized in this endeavour as essential to long-term success. Considering the significance of these talents, this study attempts to explore the complex interactions that occur between learning capacity, innovation capability and customer-based performance inside an organization.

The ability of an organization to gather, process and use knowledge to adjust to its surroundings is referred to as learning capability. Conversely, innovation capability denotes the ability of the organization to produce new concepts, goods or procedures that promote expansion and competitiveness (Oyeniyi, 2011).

In the current customer-centric era, a company's customer-based performance is a crucial indicator that indicates how well it offers to meet or surpass consumer

expectations, resulting in increased customer satisfaction and loyalty. The purpose of this study is to clarify if the learning, innovation and customer-based performance of an organization are significantly correlated or not. For businesses looking to maximize their investments, plans and operational procedures to attain sustainable growth and a competitive advantage in the market, they must comprehend this relationship.

The textile industry has undergone a tremendous transformation over the last few years. This transformation now requires the correct direction so that it is beneficial to society at large. The current industry is strongly influenced by globalization. The manufacturing centres have been shifted to some specific locations only. According to the Reserve Bank of India (2019), there has been a stagnant contribution of 30% by the micro, small and medium enterprises (MSMEs) to the GDP of the country. This implies that the MSMEs are not able to largely grow. This might be because the current model of doing business is not efficient enough. People have been forced to move out of their native places and shift to places where the companies have set up manufacturing centres. This has led to the creation of centralized manufacturing hubs. The phenomena of migration and urbanization have occurred due to the centralization of manufacturing centres in some specific locations. The effect of that is the inequality in development. Some places, that is, the cities developed more rapidly than the rural areas. Such an imbalance in development has social consequences. The current situation is such that almost all the resources that are required for the manufacturing sector are becoming scarce and there is an urgent need for change in the business model as it is not sustainable for the future. The sustainability of the business model is when one can meet the needs of the present generation without compromising the ability to meet future generations' needs. Building huge infrastructures and a humongous amount of consumable goods on the cost of balance of nature and exploiting natural resources has resulted in massive problems like global warming and a threat to human existence.

Since 2016, the start-up initiative has increased the number of people who have started their businesses. Most of these businesses are in the MSME sector only. It has also created several direct and indirect jobs (Chakraborty, 2019). The lifecycle of start-ups in comparison to traditional businesses has reduced drastically. Usually, companies start innovation when they reach a later stage in the product life cycle (PLC) curve. But, now the need for learning and innovation capability has changed. The new organizations are built on the dual aspect of invention as well as commercialization in a sustainable manner.

Building learning and innovation capability is quite a big challenge for organizations, it is an even bigger and tougher challenge for rural women. Rural women confront several difficulties like restricted access to science and technology, lack of proper education, socio-economic disparities, traditional gender roles and norms, etc. For rural women to be empowered and for sustainable development, learning and innovation capabilities are essential. To overcome these limitations, creative training programs that fit into women's daily routines should be introduced in rural areas. Sustainable technology is important because it may address issues in rural communities by applying cutting-edge scientific and

technological techniques. Rural innovation is greatly aided by female innovators, highlighting the significance of acknowledging and valuing their contribution. Rural women can gain from innovation and technology training.

Objective

The paper attempts to find out the relationship between learning capability, innovation capability and the customer-based performance of a company. It intends to find out whether the relationship between these components is considerable. The dynamic business environment requires companies to continuously work on their learning capability and innovation capabilities to survive in the competitive market environment. Though the current businesses are improving their learning and innovation capabilities, there is a need for a new business model that will encourage these capabilities on a much larger scale. New, small and medium enterprises should try to implement this model so that they can improve their customer-based performance.

Methodology

The research methodology used for this study was based on primary data collected from the stakeholders of a social enterprise and secondary data also. The study has been built based on the concepts of the Gandhian model. The research paper is based on the theoretical concepts of the Gandhian model of development and the business model of an existing social enterprise. The research paper aims to show that the customer-based performance of a company is influenced by the learning and innovation capabilities that the MSME possesses. The questionnaire about the learning capability and innovation capability was adapted from previous research papers. The questions for innovation capability and learning capability were adopted from Hurley and Hult (1998), Calantone et al. (2002) and Salavou et al. (2004); Customer-based performance was adopted from Morgan et al. (2009). The questions were provided to 200 rural women from textile based MSMEs, out of which 192 people responded. These responses were used for analysis using the Smart partial least squares (PLS) software. The questionnaire was on a seven-point Likert scale. Each component of the study had five sub-components. The PLS algorithm was used on the data collected. It was observed that the outer loadings, as well as the outer weights of the sub-components, were insignificant so they were removed. The number of sub-components was thus reduced.

Literature Review

Several studies explore the relationship between organizational learning capability and innovation (Akgun et al., 2007; Alegre & Chiva, 2008; Fang et al., 2011; François, 2002; Gomes & Wojahn, 2017; Ugurlu & Kurt, 2016). Similarly, there are many studies on firm performance and customer-based performance, but they

are in different contexts like quality management (Modarres, 2023), insurance sector (Rajapathirana & Hui, 2017), etc. There is a need to study the learning and innovation capability in the textile sector, and how it impacts the customer-based performance of the company.

In this study, the relationship between learning capability and innovation capability has been studied on 192 rural women in micro, small and medium-sized textile industry companies. To understand the objective of the paper, there is a need to understand the terms that are used to test the conceptual model. This includes terms like learning capability, innovation capability and customer-based performance.

Learning Capability

The term 'learning capability' of an organization is defined as the characteristic feature or element of an organization that facilitates the learning process or encourages an organization to learn (Goh & Richards, 1997). It has also been described as the ability of an organization to create, acquire, transfer and integrate knowledge. This is used to modify the behaviour of the organization to respond to a new situation to improve organizational performance (Jerez-Gomez et al., 2005). The learning capability of an organization is an important component of the learning process (Alegre & Chiva, 2008; Goh & Richards, 1997). Learning capability is a significant index of an organization's competitiveness (Jerez-Gomez et al., 2005). Moreover, it also promotes the organization's ability to identify opportunities in the market and respond to them in a better, faster and cheaper manner. This will ultimately reflect in the development of new products more efficiently (Prieto & Revilla, 2006; Sok & O'Cass, 2011). This helps the companies to utilize the opportunity in a better manner to achieve superior performance. It also allows the companies to implement new strategies and understand the customers, which will ultimately lead to differentiating themselves from their rivals. Thus, the following hypothesis is framed:

H_1 : Learning capability has a positive relationship with customer-based performance.

Innovation Capability

The term innovation capability is defined as the interrelated processes of an organization that help to implement and develop a product innovation (O'Cass & Sok, 2012). Previous literature indicates that the learning capability of a company is commonly linked to innovation (Dodgson, 1993), and it also suggests that the learning capability has a positive effect on innovation capability (Alegre & Chiva, 2008, 2013; Jiménez-Jiménez & Sanz-Valle, 2011). Moreover, learning capability also has a positive influence on the innovation capability of a company (Hsu & Fang, 2009). Li and Mitchell (2009) and Rosenbusch et al. (2011) found in their studies that organizations with strong innovation capabilities have a competitive

edge, which enables them to achieve better performance. Thus, the following hypothesis is framed:

H_2 : Learning capability has a positive relationship with innovation capability.

Customer-Based Performance

Customer-based performance is the evaluation and quantification of a company's efficacy or success based on the attitudes, actions and experiences of its customers (Mohiuddin Babu et al., 2019). This approach acknowledges the crucial function that customers fulfil in moulding the efficacy and prosperity of an enterprise. Customer loyalty, engagement, overall experience and satisfaction are important components of customer-based performance. Customer satisfaction is connected to various branches and metrics of customer-based performance (Tajeddini & Ratten, 2017). Its many capabilities and strategic plans allow staff members to build relationships with clients. Numerous studies highlight the robust relationship between loyalty and consumer pleasure (Chang et al., 2014). Customers who are happy with a brand are more inclined to use it again and to recommend it to others (Fang et al., 2014). A steady customer base lowers acquisition costs and boosts lifetime value when there is high customer loyalty. Engaged customers are more likely to be loyal and contribute positively to a company's performance. Engagement can be fostered through various means, including social media interactions, personalized communication and loyalty programs. Socially responsible practices positively influence customer perceptions. Companies that are perceived as ethical and socially responsible often enjoy better customer loyalty. Firms need to take decisions and actions based on the resources available, and generate competitive advantages, thereby improving their performance (Ketchen et al., 2007):

H_3 : Innovation Capability has a positive relationship with customer-based performance.

Figure 1 presents the proposed research model of the study. The hypotheses that must be tested and studied among the rural women workers of textile-based MSMEs.

Learning and Innovation Capability in Textile-Based MSMEs

The global textile business is changing in tandem with technological breakthroughs. MSMEs need to constantly learn about and implement new technologies to increase productivity, improve product quality and stay competitive in the market (Eisenhardt & Martin, 2000). MSMEs can maintain an advantage in the fierce market by utilizing their learning and innovation capabilities. MSMEs can set themselves apart and draw in more business by adopting cutting-edge goods, procedures, or design features. MSMEs with significant capabilities for innovation and learning might be able to broaden the range of products that they offer. This

will enable them to examine new markets and respond to evolving consumer inclinations. MSMEs will benefit from continuous learning by seeing an increase in overall efficiency, waste reduction and operational efficiency. Process innovations in production can result in lower costs and better use of resources.

Quality can be improved in textile products by learning about and using creative approaches. Quality-focused MSMEs are more likely to establish a solid reputation, which breeds client loyalty and trust. MSMEs in the textile industry need to be aware of global trends and standards due to the globalization of markets. Opportunities for international trade may arise from learning about the needs of the global market and developing innovative solutions to suit those needs. Innovation in environmentally friendly and sustainable techniques is becoming more and more significant. MSMEs may support sustainability and attract eco-aware customers by investing in educating themselves about and implementing eco-friendly technologies and procedures. Building a robust supply chain can benefit from innovation and learning. MSMEs can more effectively negotiate supply chain uncertainty if they can swiftly adjust to disturbances, such as shifts in the availability of raw materials or difficulties with transportation. Employee engagement and morale can be increased in MSMEs by fostering a culture of learning and innovation. Additionally, it offers chances for skill improvement, resulting in a workforce that is better prepared to adjust to changes in the sector. Long-term viability in a business climate that is changing quickly depends heavily on an organization's capacity for innovation and learning. MSMEs are better equipped to handle difficulties, take advantage of opportunities and guarantee steady growth when they invest in developing these qualities. Thus, textile MSMEs must strategically possess learning and innovation capabilities to adjust to shifting market conditions, boost competitiveness, increase operational effectiveness and guarantee long-term sustainability in a changing and dynamic sector (Charry et al., 2017).

Analysis

The PLS path modelling method was run on the data collected, and Figure 2 represents the diagram of the model that was obtained. The coefficient of determination, R^2 , is 0.300 for the CP (customer-based performance) endogenous latent variable. This means that the two latent variables, that is, learning capability (LC) and innovation capability (IC) together moderately explain 30% of the variance in CP. Also, LC explains the 28.4% variance of IC.

Based on Figure 2, it can be said that the inner model suggests that LC has the strongest effect on IC (0.533), followed by the effect of LC on CP (0.325) and the effect of IC on CP (0.300). The hypothesized path relationship between LC and IC; IC and CP; and LC and CP are statistically significant. This is because all the standardized path coefficients are higher than 0.1. This figure further shows that the sub-component of learning capability, that is, diagnosing our staff training and educational needs (LC1) and analysing the firm's unsuccessful activities (LC4) are good indicators of learning capability. Similarly, exploiting the most

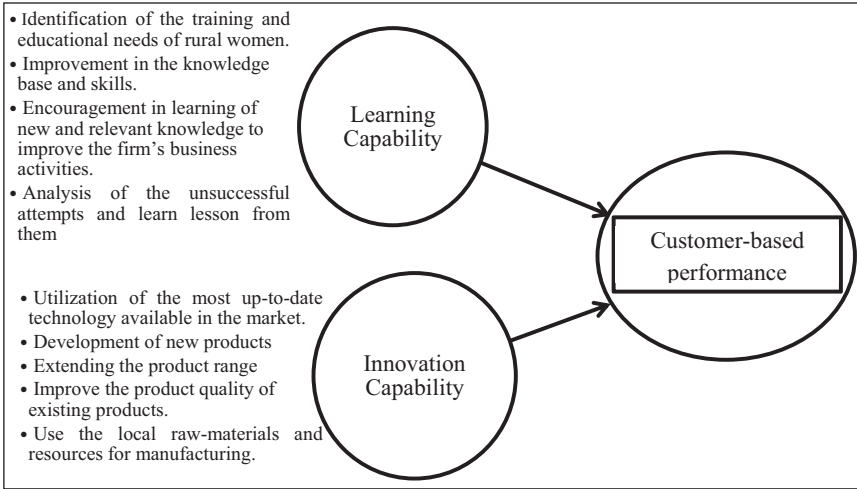


Figure 1. Proposed Research Model.

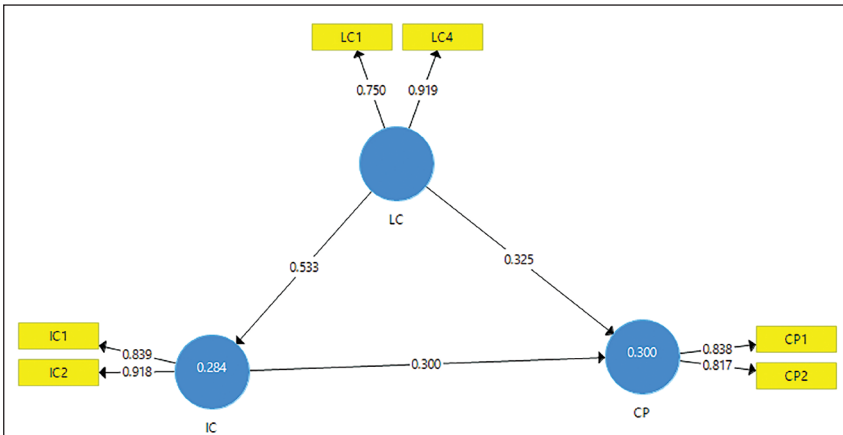


Figure 2. Result Research Model.

up-to-date technology available (IC1) and developing new products (IC2) are good indicators of innovation capability. Also, acquiring new customers (CP1) and increasing sales to existing customers (CP2) are good indicators of customer-based performance.

The diagram also shows that ‘diagnosing our staff training and educational needs’ and ‘analysing the firm’s unsuccessful activities’ have loadings of 0.750 and 0.919, respectively. This implies that they are good indicators of learning capability. Similarly, ‘exploiting the most up-to-date technology available’ and ‘developing new products’ are good indicators of Innovative capability and have a loading of 0.750 and 0.919, respectively. On similar lines, ‘acquiring new customers’ and ‘increasing sales to existing customers’ have loadings of 0.838

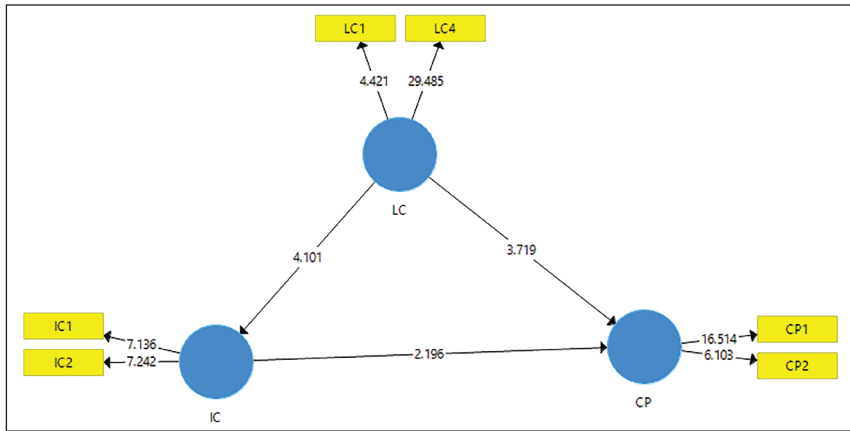


Figure 3. Bootstrapping Results of the Research Model.

and 0.817, respectively, which makes them good indicators of customer-based performance. Thus, it can be concluded that learning capability and innovation capability are both moderately strong predictors of customer-based performance. Moreover, learning capability predicts innovation capability directly.

Figure 3 shows the bootstrapping of the components that have been listed in this model. The bootstrap procedure can test the significance of a structural path using *t*-statistic. In SmartPLS, bootstrapping can also be used to test the significance of formative indicators' outer weight. Using a two-tailed *t*-test with a significance level of 5%, the path coefficient will be significant if the *t*-statistics is larger than 1.96. According to Figure 2, the *t*-statistic value of all three paths, that is, is significant. The value of the *t*-statistic between LC and IC is 4.101, between LC and CP is 3.719 and that between IC and CP is 2.196. This shows that the hypotheses that have been stated earlier are accepted and there is a significant relationship among the components of the model, that is, innovation capability, learning capability and customer-based performance.

Findings and Suggestions

This research study shows that innovation capability is influenced by the learning capability of the business. The result of the learning and innovation capability can be seen in the customer-based performance. This suggests that the newly set-up companies like start-ups should focus on improving their learning and innovation capabilities so that their customer-based performance can improve. Continuous improvement in the performance of the company will occur when its learning and innovation capabilities are high. The study emphasizes improving learning and innovation capability. This has helped them to expand and sustain their business. The research paper suggests that new start-up businesses should focus on improving their learning and innovation capability so that the business can have a good customer-based performance.

Theoretical and Practical Implications

This research study highlights a link between innovation capability and the learning capacity of a business. This suggests that companies should not view innovation as an isolated process because there is continuous learning within the organization. The study establishes a theoretical foundation that shows learning and innovation as drivers of customer-based performance. This implies that organizations seeking to enhance customer satisfaction and loyalty should prioritize investments in learning initiatives and foster a culture of innovation. Companies should thus embrace a philosophy of ongoing learning and innovation to adapt to changing market dynamics and customer expectations.

The study implies that learning should be integrated into the overall business strategy of the company. Companies, especially those in their early stages, should consider learning not just as a byproduct but as a deliberate strategy for fostering innovation and, subsequently, improving customer-based performance. Organizations should be flexible and adaptable as the business landscape is constantly evolving. A commitment to continuous learning and innovation allows companies to adapt to changing customer preferences and market conditions. Companies can learn from industry best practices in terms of fostering innovation and continuous learning. This involves benchmarking successful companies known for their innovative approaches and incorporating relevant strategies into their operations.

The creation of localized micro-factories is the way ahead for sustainable growth and development in all places. This will lead to not only balanced regional development but will also provide people with the opportunity to work in their nearby micro-factories as per their skill.

Limitations and Scope for Future Research

The study mainly focuses on the textile industry and its MSMEs in rural areas, limiting its generalizability to other industries. Different sectors may have distinct characteristics, so the findings may not be universally applicable.

The study has a limited sample size, and the participants might not be fully representative of the broader business community. This could impact the study's external validity, making it challenging to extrapolate the findings to a larger population.

Conclusion

The study takes a cue from the Gandhian model and then analyses the business activities of textile-based MSMEs in terms of their learning and innovation capability concerning their customer-based performance. The paper also provides insight into the managers of small and medium scale enterprises that for superior customer-based performance in the marketplace, companies must develop their learning and innovation capabilities. The companies must ensure that they offer products that meet the needs of the customers while seeking to improve the skills

of local people and make use of local resources. This way the whole society will benefit, and there will be balanced development. Thus, aligning the learning and innovation capabilities to achieve superior performance is vital for MSME managers.


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Scale Development and Validation for Green Supply Chain Practices Impact on the Organized Retail Performance Evaluation in India: The ORGRSCALE

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Abstract

Green supply systems are helping several of the world's largest retailers boost profits. Green practices make firms more ecologically friendly. No research has considered all of the green supply chain management (GSCM) methods needed to develop a green supply chain in India's retail business. This investigation seeks to examine GSCM techniques and their effects on Indian organized retail. The ORGRSCALE helps define GSCM in organized retail. The study generated items through literature reading and focus group talks. A total of 554 responses out of 1,800 survey responses were usable. The study indicated that GSCM methods affect organizational performance and environmental, economic and profitability. In Indian organized retail businesses, there is a lack of research on a reliable and valid scale to measure the performance impact of GSCM strategies. This study provides a measure to assess how GSCM practices affect Indian organized retail performance.

Keywords

Organized retail, green supply chain management, scale development

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Introduction

Retailers play a key role in changing clients' buying patterns. Most green supply chain management (GSCM) studies have concentrated on manufacturing enterprises. Systems analysis methods have advanced retailing and proven their usefulness. However, downstream distribution networks and retailers have been less frequently studied than other supply chain members. Green commerce studies focus on consumer interactions. South Carolina retailers are essential, but green and green retailing research is still in its infancy. Retail operations' impact on the community and the environment, which determines what products buyers buy, appears to have affected the conventional markers of a retailer's competitive advantage (pricing, quality, service, and store location). Retailers must assess their environmental effects due to supply chain constraints.

The Indian retail industry has become the world's most attractive and fast-paced due to new participants. It contributes 10% of GDP and 8% of employment. India came in at position 73 on the UNCTAD's 2019 B2C e-commerce index. According to the Global Business 2020 report from the World Bank, India has the fifth-largest retail market and ranks 63rd overall.

Merchants must own supply chain procedures. This accountability raises environmentally conscious practices among supply chains and improves their ecological efficiency and durability. Wiese (2012) provides an in-depth overview of sustainability in organized retailing, noting that while much study has concentrated on certain areas such as corporate social responsibility, corporate social responsibility, more cross-functional studies that take an integrated or holistic approach to GSCM represent future research potential. Due to perishability, refrigeration, and waste management, food preservation is a key area of retail sustainability. This paper answers the following research question:

RQ. *What relationship exists between green in-store procedures, GSCM and outcomes in a well-functioning retail system?*

This study contributes the following: It provides a link between retail operations-related components (green in-store processes) and environment-friendly supply chain processes, as well as environmental, economic, and social performance with overall organization performance implications. It also includes actual data from a well-organized retail store that has been little studied in the literature. As a direct consequence of this, there is a growing interest in, as well as respect for, the field of retail supply chain research in India.

The organization of this report is as follows: The examination of green in-store procedures, GSCM, and sustainable and ecological literature actions in organized retail is done in Section 2. This enables us to create an organized model in Section 3 and develop hypotheses for research. We then describe the scales utilized to quantify each structural model. Section 4 discusses the data acquired during the data collection, and the validation of the suggested model was accomplished using the PLS structural equation modeling approach. Section 5 compares the model's conclusions to existing state-of-the-art expertise in the area. Finally, Sections 6 and 7 summarize the major theoretical and managerial contributions, the research's limits, and exploration ideas.

Literature Review and Hypotheses Development

Green retailing studies customer views of environmental retailing and retail sustainability issues. Green consumer behavior performance. Retail research must also consider logistics and in-store operations. Youn et al. (2017) mention green retailing measures, and Erol et al. (2009) are among the pioneers in the field who proposed environmentally friendly practices for the retail industry.

Sustainability includes social performance, environmental performance, and economic performance. Sustainability research is mature. We prioritize environmental responsibility. Environmental supply chain management, according to Seuring (2004), 'manages material and information flows along the supply chain to meet customer demand for green products and services created through green processes'.

Managers will make decisions to integrate and coordinate GSCM practices throughout the supply chain as they become aware of consumer demand for environmentally friendly services and products. Organizations and supply chains can benefit by adopting GSCM and environmental sustainability. Preuss (2002) emphasizes SCM's 'cross-boundary' aspect in applying environmental rules upstream and downstream in the supply chain.

In addition to the demands of consumers, environmental policy and legislation have been key drivers in the application of environmentally friendly practices. Environmental laws and business competitiveness are disputed. Jorgensen and Wilcoxon (1990) examine how pollution control costs affect US product and service prices. According to Jaffe et al. (1995), there is scant evidence that environmental regulations harm competitiveness. To determine the influence of environmental sustainability standards on business company attractiveness, more research is needed.

Most GSCM literature is theoretical and anecdotal. Several scholars also developed environmental sustainability measurement scales. King and Lenox (2001) question environmental sustainability's benefits. They discover inadequate evidence to establish a clear and decisive conclusion. Environmental sustainability methods and financial and environmental performance need more empirical research. Research is informative but not conclusive.

Hypotheses

As a result, internal metrics drive the greening of supply chain processes, which investigate the following hypotheses presented in figure 1:

Green Information Systems and Internal Environmental Management

Businesses can establish green information systems once they prioritize environmental sustainability. Information systems are necessary for supply chains. Green information systems are needed to achieve environmental sustainability. For environmental sustainability, GSCM requires monitoring manufacturing, purchasing, and sales. Information systems allow supply chain actors to connect and commit. Organizations employ information systems to

facilitate collaboration. Management support for information system implementation was found by Jiang and Klein (1999).

Internal environmental management has a Positive relationship with green information systems.

Internal environmental management has a Positive relationship with green purchasing.

Internal environmental management has a Positive relationship with Cooperation with customers.

Internal environmental management has a Positive relationship with eco-design and green Marketing.

Internal environmental management has a Positive relationship with Green Logistics.

Internal environmental management has a Positive relationship with investment recovery.

Internal environmental management has a Positive relationship with Reverse Logistics.

Green Supply Chain Techniques and Internal Environmental Management

After establishing environmental sustainability as a strategic aim and getting mid-level management and top-level commitment and support, the firm can begin implementing the GSCM processes of customer cooperation, eco-design, green marketing, green purchasing, green logistics, reverse logistics, and investment recovery. The organization's overarching strategy must include the imperative as part of it in order to properly implement the procedures. Senior management support is essential for implementing activities, programs, and new technology. Environmental success demands top management support.

Green Information Systems confidently impacts green purchasing.

Green Information Systems confidently impacts green purchasing. Cooperation with customers.

Green Information Systems confidently impacts eco-design and green Marketing.

Green Information Systems Confidently impacts Green Logistic.

Green Information Systems Confidently impacts investment recovery.

Green Information Systems Confidently impacts Reverse Logistics.

Green Purchasing Confidently impacts Environmental Performance.

Green Purchasing Confidently impacts Economic Performance.

Green Purchasing Confidently impacts Social Performance.
 Cooperation with Customers Confidently impacts Environmental Performance.
 Cooperation with Customers Confidently impacts Economic Performance.
 Cooperation with Customers Confidently impacts Social Performance.
 Eco-design & Green Marketing Confidently impacts Environmental Performance.
 Eco-design & Green Marketing Confidently impacts Economic Performance.
 Eco-design & Green Marketing Confidently impacts social Performance.
 Green Logistics has a Confidently impacts Environmental Performance.
 Green Logistics has a Confidently impacts Economic Performance.
 Green Logistics has a Confidently impacts Social Performance.
 Investment Recovery has a Confidently impacts Environmental Performance.
 Investment Recovery has a Confidently impacts Economic Performance.
 Investment Recovery has a Confidently impacts Social Performance.
 Reverse Logistics has a Confidently impacts Environmental Performance.
 Reverse Logistics has a Confidently impacts Economic Performance.
 Reverse Logistics has a Confidently impacts Social Performance.
 Environmental Performance Confidently impacts Firm Performance.
 Economic Performance has a Confidently impacts Firm Performance.
 Social Performance has a Confidently impacts Firm Performance.

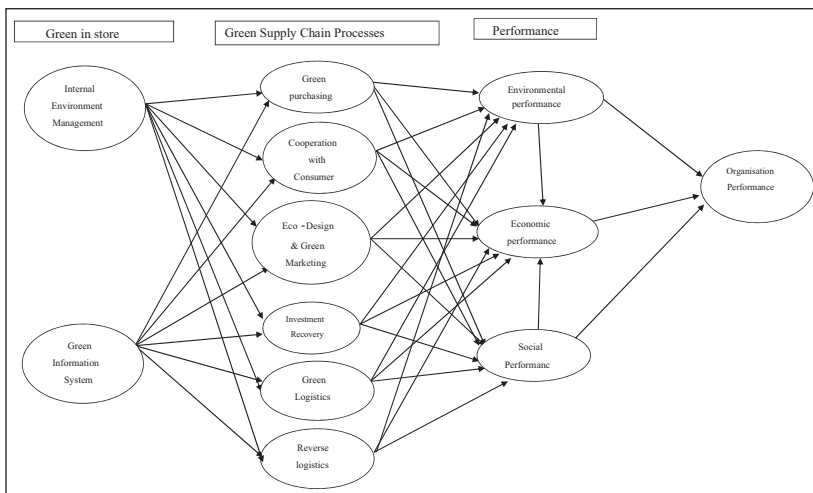


Figure 1. Conceptual Model for GSCM in Organized Retailing.

Designing of a Study

Data Collecting and Research Environment

Hypothetical relationships are tested empirically. Our study applied to organized retailing because of its economic importance and dominance in India. Six Gujarat retail specialists were interviewed for exploratory research.

The exploratory study examined retail retailers' supply chain and store sustainability measures. Semi-structured interviews were used. The semi-structured interviews permitted us to examine the spectrum of environmental measures adopted in-store by organized retailers and supply chain. Based on existing metrics and fresh information from practitioners, we created a GSCM questionnaire for organized retailing, to account for our respondents' diverse roles, from store owners to supply chain managers. To ensure validity and comfort, the questionnaire was pretested.

The survey has three parts. The first component uses a five-point Likert scale to assess firms' green efforts. The second portion uses a five-point Likert scale to evaluate GSCM techniques' effects on effectiveness. Finally, the third element gathers organization data.

Our study included 554 respondents from eight Gujarat municipal corporations, with a 51.29% response rate. After partial least square SEM fitting, 554 of these were ready for further study. Retailers and logistics directors responded. Online directories such as Just Dial and company directories like Yellow Pages under various chambers of commerce provided example information. Data collection took place from April to September 2021. Supermarkets (20.0%) and hypermarkets (12.0%) are followed by department stores, convenience stores, and discount stores (68.00%).

The Measurement Consistency

In every instance when it was feasible to do so, each of the measurement scales that were used in our survey were reflective, multi-item frameworks that were constructed from previously used items and scales. The items were translated and then retranslated to ensure that they had the correct meaning. A five-point Likert scale was used (1 indicating not considering and 5 indicating implementing successfully). The questionnaire was pretested, and small wording changes were made. The constructions and their internal coherence are summarized in Table 1.

Reliability

To purify the scales, we utilized an exploratory factor analysis. Items with a communality of less than 0.4 were removed. Items with loadings of less than 0.5 and low variance were also removed. Following Hulland (1999), we tested indicator reliability, employed standardized indicator loadings of 0.7, and checked loadings of 0.4. Cronbach's thresholds are met for all measures, and composite reliability (CR) and average variance extracted (AVE) demonstrate convergent

Table 1. consteucts and internal consistency of measures.

	Loadings	Cronbach's α	Composite reliability	AVE
IEM1	0.876	0.872	0.912	0.723
IEM2	0.888			
IEM3	0.830			
IEM4	0.804			
GIS1	0.811	0.847	0.897	0.685
GIS3	0.833			
GIS4	0.861			
GIS5	0.806			
GP2	0.873	0.817	0.891	0.731
GP3	0.842			
GP4	0.850			
CWC1	0.861	0.840	0.904	0.758
CWC2	0.863			
CWC3	0.888			
EDGM1	0.841	0.872	0.913	0.723
EDGM2	0.865			
EDGM3	0.868			
EDGM4	0.828			
GL1	0.857	0.819	0.892	0.735
GL2	0.871			
GL3	0.844			
IR1	0.850	0.843	0.894	0.678
IR2	0.831			
IR3	0.834			
IR4	0.778			
RL1	0.867	0.829	0.898	0.745
RL2	0.886			
RL3	0.838			
EP1	0.808	0.884	0.915	0.684
EP2	0.832			
EP3	0.856			
EP4	0.842			
EP5	0.795			
ECP1	0.803	0.851	0.893	0.625
ECP2	0.821			
ECP3	0.759			
ECP4	0.802			
ECP5	0.767			
SP2	0.821	0.919	0.937	0.713
SP3	0.856			
SP4	0.855			
SP5	0.854			

(Table 1 continued)

(Table 1 continued)

	Loadings	Cronbach's α	Composite reliability	AVE
SP6	0.847			
SP7	0.833			
FP1	0.747	0.835	0.879	0.547
FP2	0.787			
FP3	0.737			
FP4	0.728			
FP5	0.715			
FP6	0.723			

Notes: Thresholds: Cronbach's $\alpha = 0.7$ (Nunnally, 1978); composite reliability ≥ 0.7 (Bagozzi and Yi, 1988); AVE ≥ 0.5 (Bagozzi and Yi, 1988).

validity and internal consistency reliability. The Fornell–Larcker criterion is used to verify discriminant validity. The AVE of every construct is greater than the squared correlation of any other construct. Cross-loadings were also examined.

Results of Data Analysis

Common Method Bias

To examine common method bias, Harman's single-factor test was used. The test found that a single-factor solution only explained 44.533% of the total variation, which is much less than the 50% threshold number. This finding recommends that common technique bias is minor in this investigation.

Reliability and Validity

As part of the measurement model evaluation, six items (IEM5, GIS2, GP1, GP5, GL4, and SP1) with a low factor loading (< 0.600) were eliminated from the assessment. Cronbach's alpha and composite reliability were utilized in order to perform reliability tests on the constructions.

All constructs' dependability exceeded the acceptable 0.700. Each construct's Cronbach's alpha value exceeded the 0.700 cutoff. Convergent validity was acceptable because AVE was more than 0.500. Table 2 shows the reliability and validity results, as well as the factor loadings for the items. The Fornell–Larcker criterion assessed discriminant validity. The square root of AVE for the construct was bigger than the inter-construct correlation, as seen in Table 3. The ratio of correlations between heterotraits and monotraits was also used to evaluate the discriminant validity of the test, with values below the threshold of 0.90. Hence, it is proven that discriminant validity exists (see Table 4).

SmartPLS 3 SEM analysis shows route coefficients (Table 2) and total effect size (Table 3). Business research now uses SEM to determine latent component cause–effect correlations. Business researchers utilize SEM to examine ideas and hypotheses. Five thousand bootstrap draws were used to find non-significant moderating effects.

Table 2. Loadings, Validity, and Reliability.

	Loadings	Cronbach's α	Composite Reliability	Average Variance Extracted
IEM1	0.876	0.872	0.912	0.723
IEM2	0.888			
IEM3	0.830			
IEM4	0.804			
GIS1	0.811	0.847	0.897	0.685
GIS3	0.833			
GIS4	0.861			
GIS5	0.806			
GP2	0.873	0.817	0.891	0.731
GP3	0.842			
GP4	0.850			
CWC1	0.861	0.840	0.904	0.758
CWC2	0.863			
CWC3	0.888			
EDGM1	0.841	0.872	0.913	0.723
EDGM2	0.865			
EDGM3	0.868			
EDGM4	0.828			
GL1	0.857	0.819	0.892	0.735
GL2	0.871			
GL3	0.844			
IR1	0.850	0.843	0.894	0.678
IR2	0.831			
IR3	0.834			
IR4	0.778			
RL1	0.867	0.829	0.898	0.745
RL2	0.886			
RL3	0.838			
EP1	0.808	0.884	0.915	0.684
EP2	0.832			
EP3	0.856			
EP4	0.842			
EP5	0.795			
ECP1	0.803	0.851	0.893	0.625
ECP2	0.821			
ECP3	0.759			
ECP4	0.802			
ECP5	0.767			
SP2	0.821	0.919	0.937	0.713

(Table 2 continued)

(Table 2 continued)

	Loadings	Cronbach's α	Composite Reliability	Average Variance Extracted
SP3	0.856			
SP4	0.855			
SP5	0.854			
SP6	0.847			
SP7	0.833			
FP1	0.747	0.835	0.879	0.547
FP2	0.787			
FP3	0.737			
FP4	0.728			
FP5	0.715			
FP6	0.723			

Internal environmental management positively impacts all seven GSCM processes. Green information systems positively affect all six GSCM activities. Green purchasing affects two GSCM performances but not social performance. All three GSCM performances benefit from customer cooperation. All three GSCM performances positively impact eco-design and green marketing. All three GSCM performances are not affiliated with green logistics. Social performance affects investment recovery more than economic and environmental performance.

Reverse logistics is crucial to all three GSCM performances. Economic, environmental, and social performance improve business performance.

GSCM practices increase environmental performance except green purchasing, which improves social performance. This supports prior studies on GSCM's environmental benefits. Businesses investing in linked activities internally and with suppliers can create win-win scenarios. This is remarkable and contradicts prior data that explicitly link green logistic with economic, social, and environmental performance. Cost and accounting-related factors drive economic performance. Thus, cost savings may be overemphasized compared to performance outcomes, which may improve service.

Model of Structure

The structural model depicts the study framework's postulated routes. The R2, Q2, and importance of the routes are used to evaluate a structural model. The model's goodness is determined by each structural path's strength, which is determined by the dependent variable's R2 value, which should be 0.1 or above. Table 4 shows that all R2 values are more than 0.1. As a result, the ability to predict is established. Q2 also establishes the endogenous components' predictive relevance. A Q2 greater than 0 indicates that the model is predictive. The findings demonstrate that forecasting the constructs is important (see Table 4). SRMR was also utilized in order to assess how well the model fits the data. The SRMR score was 0.043, which is below the minimum requirement of 0.10, indicating that the model fit was adequate.

Table 3. Fornell & Larcker criterion.

	CWC	ECP	EDGM	EP	FP	GIS	GL	GP	IEM	IR	RL	SP
CWC	0.870											
ECP	0.701	0.791										
EDGM	0.749	0.681	0.850									
ENP	0.716	0.772	0.709	0.827								
FP	0.525	0.599	0.510	0.545	0.740							
GIS	0.754	0.701	0.739	0.705	0.519	0.828						
GL	0.730	0.660	0.738	0.656	0.518	0.723	0.857					
GP	0.732	0.715	0.712	0.716	0.488	0.742	0.678	0.855				
IEM	0.712	0.704	0.720	0.702	0.554	0.774	0.726	0.720	0.850			
IR	0.617	0.556	0.652	0.580	0.467	0.592	0.633	0.583	0.587	0.824		
RL	0.707	0.738	0.690	0.697	0.509	0.736	0.718	0.689	0.735	0.597	0.863	
SP	0.492	0.513	0.476	0.520	0.451	0.491	0.453	0.407	0.452	0.422	0.459	0.844

Note: The square roots of the AVE are shown by diagonal elements (average variance extracted).

Table 4. Heterotrait Monotrait Method (HTMT) criterion.

	CWC	ECP	EDGM	ENP	FP	GIS	GL	GP	IEM	IR	RL	SP
CWC												
ECP	0.824											
EDGM	0.875	0.785										
ENP	0.830	0.886	0.806									
FP	0.624	0.698	0.593	0.626								
GIS	0.894	0.821	0.859	0.812	0.611							
GL	0.880	0.783	0.872	0.769	0.617	0.867						
GP	0.883	0.854	0.840	0.839	0.582	0.890	0.827					
IEM	0.832	0.809	0.825	0.797	0.644	0.899	0.857	0.851				
IR	0.726	0.646	0.754	0.664	0.545	0.693	0.757	0.693	0.676			
RL	0.847	0.872	0.812	0.813	0.609	0.878	0.870	0.835	0.863	0.706		
SP	0.560	0.578	0.530	0.576	0.508	0.555	0.520	0.468	0.504	0.475	0.524	

To determine the significance of the association, the goodness-of-fit hypotheses were reevaluated. H_1 evaluates whether IEM significantly impacts CWC, EDGM, GIS, GL, GP, IR, RL ($p < 0.001$). The results revealed (see Table 5) that internal environmental management (IEM) significantly impacts cooperation with consumers (CWC), eco-Design & Green Marketing (EDGM), green information systems (GIS), green logistics (GL), green purchasing (GP), investment recovery (IR), and reverse logistics (RL). Hence, H_1 was supported.

Table 5. Result Summary.

	β	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Result
IEM → CWC	0.320	0.057	5.564	0.000	significant
IEM → EDGM	0.369	0.059	6.276	0.000	significant
IEM → GIS	0.774	0.022	35.165	0.000	significant
IEM → GL	0.413	0.058	7.184	0.000	significant
IEM → GP	0.363	0.058	6.298	0.000	significant
IEM → IR	0.322	0.059	5.504	0.000	significant
IEM → RL	0.414	0.055	7.564	0.000	significant
GIS → CWC	0.507	0.055	9.269	0.000	significant
GIS → EDGM	0.453	0.058	7.743	0.000	significant
GIS → GL	0.404	0.060	6.774	0.000	significant
GIS → GP	0.461	0.058	7.972	0.000	significant
GIS → IR	0.342	0.057	5.957	0.000	significant
GIS → RL	0.416	0.054	7.685	0.000	significant
GP → ECP	0.255	0.050	5.117	0.000	significant
GP → ENP	0.245	0.053	4.642	0.000	significant
GP → SP	0.046	0.055	0.829	0.204	Not Significant
CWC → ECP	0.151	0.055	2.741	0.003	significant
CWC → ENP	0.196	0.057	3.439	0.000	significant
CWC → SP	0.218	0.066	3.304	0.000	significant
EDGM → ECP	0.112	0.054	2.056	0.020	significant
EDGM → ENP	0.194	0.057	3.427	0.000	significant

(Table 5 continued)

(Table 5 continued)

	β	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Result
EDGM → SP	0.142	0.065	2.181	0.015	significant
GL → ECP	0.043	0.053	0.806	0.210	Not Significant
GL → ENP	0.019	0.058	0.334	0.369	Not Significant
GL → SP	0.057	0.065	0.881	0.189	Not Significant
IR → ECP	0.009	0.039	0.240	0.405	Not Significant
IR → ENP	0.052	0.033	1.567	0.059	Not Significant
IR → SP	0.105	0.055	1.915	0.028	significant
RL → ECP	0.342	0.053	6.472	0.000	significant
RL → ENP	0.211	0.054	3.894	0.000	significant
RL → SP	0.135	0.058	2.312	0.010	significant
ENP → FP	0.154	0.068	2.267	0.012	significant
ECP → FP	0.392	0.063	6.194	0.000	significant
SP → FP	0.169	0.045	3.773	0.000	significant
	R²	Q²			
GIS	0.599	0.407			
GP	0.603	0.437			
CWC	0.610	0.458			
EDGM	0.600	0.430			
GL	0.592	0.430			
IR	0.392	0.259			
RL	0.610	0.451			
ENP	0.643	0.432			
ECP	0.651	0.399			
SP	0.288	0.202			
FP	0.395	0.211			

SRMR is the model's observed–suggested correlation matrix difference. Thus, the (model) fit criteria can be measured by the average difference between actual and expected correlations. A fit under 0.10 or 0.08 is good. Henseler et al. (2014) established the PLS-SEM goodness-of-fit metric SRMR to avoid model misspecification. Dijkstra and Henseler (2015) used squared Euclidean distance (ULS) and d_G (geodesic distance) to calculate this disagreement in Table 6.

Data analysis provides NFI values from 0 to 1. Fit increases NFI. Good matches have NFI scores over 0.9. Lohmöller (1989) describes the NFI computation of PLS route models in detail. RMS theta determines outer-model residual correlation. The score should be near zero to indicate a good model fit and low correlations between outside model residuals (close to zero).

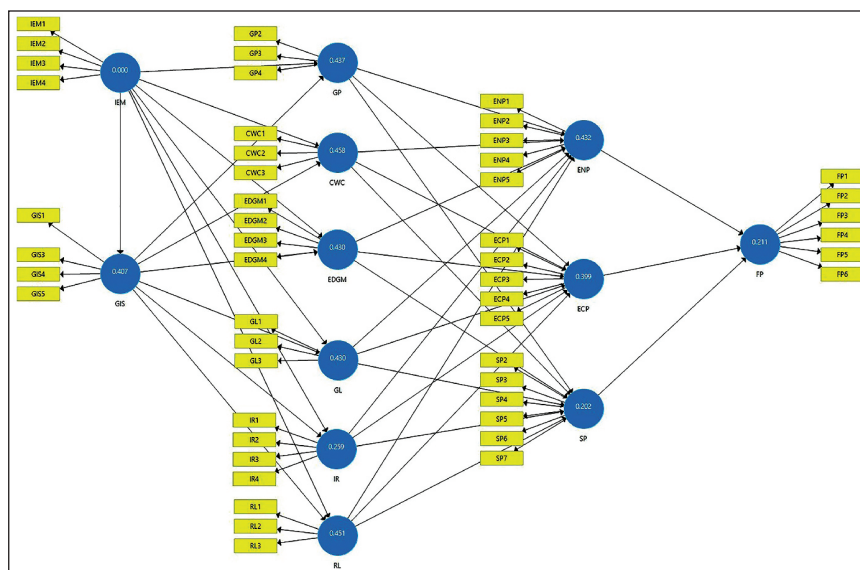


Figure 2. Hypotheses Test Results.

Table 6. Model Fit Measures.

	Saturated Model	Estimated Model
SRMR	0.043	0.072
d_ULS	2.384	6.613
d_G	1.035	1.211
Chi-Square	3366.116	3624.87
NFI	0.830	0.817
rms Theta	0.103	

We looked at the aggregate effects of green in-store operations and performance outcomes in addition to verifying the hypotheses. Green information systems have a large beneficial overall impact on green supply chain practices. This is a classic example of a situation in which both parties benefit, in which increased information technology use reduces environmental impact and costs. There is a good association between environmental, economic, and social performance while working with consumers.

Contributions in Theory and Practice Through Discussion

We have never seen GSCM in organized retailing empirically proven. It empirically proves that greening in-store operations greens SCM practices, combining downstream and upstream supply chain activities. According to the statistics, there is a correlation between the installation of environmental protection

measures in a store and an increased likelihood of that store's participation in GSCM, which improves environmental performance. By studying the overall structural model, we used GSCM to organize the supply chains for both retailing and services, two areas in which it is hardly ever employed. The model is the first approach to analyze the general supply chain management practices and performance of organized merchants. This was accomplished by operationalizing a component of the conceptual model.

Second, this study emphasizes eco-friendly in-store activities such as trash and energy management. The two models simplify and cover a portion of retail activity during this time. Similar structures and objects were utilized in manufacturing and retailing investigations.

Third, retailers' green supply chain operations are holistically viewed through green purchasing, customer cooperation, eco-design and green marketing, green logistics, investment recovery, and reverse logistics, which summarizes the studied constructs. Zsidisin and Siferd (2001) studied environmental buying, whereas Zhu and Sarkis (2004) examined operational methods. Wong et al. (2015) examine cooperation. An empirical investigation examining all six categories and their correlations had not yet been conducted. The literature review describes these essential processes as operational (logistics), tactical (purchasing), and strategic.

Limitation

Despite GSCM and organized retail contributions, this study has disadvantages. This study must consider several constructs. The methodology helps merchants discover causes, behaviors, and performance. Testing the conceptual model suffices. Many Gujarati shops consented to generalize this sample. The SEM-PLS study has two limitations. First, the analysis checks theories, not patterns. Explanatory component analysis shows no model data structure differences. Second, PLS may improve prediction; however, it just does a superficial comparison of theoretical hypotheses. Our exploratory research is unrestricted.

Conclusions

Retailers handle the most complicated supply chains. GSCM research evaluates secondary data including merchants' green activities on their websites, CSR reports, and industrial groups' viewpoints. The organized sector has not investigated internal and external supply chain greening. Thus, this study evaluated how organized retail, green in-store, GSCM practices, and social, environmental, and economic performance are linked. Structural equation modeling in organized retail studied green in-store practices, green supply chain performance. Lack of research on the relationship between in-store greening and activities, GSCM practices, and the organization's overall performance as a well-organized retail supply chain. The study adds empirically to the rising debate about retail durability from the perspective of key retailers in supply chain management. This answers our research question. Green store processes help

GSCM. Consumer collaboration, eco-design, green marketing, green logistics, investment recovery, and reverse logistics enable green purchasing. Environmental, social, and economic factors affect the relationship concerns. However, retailing and GSCM service have been improving.


Declaration of Conflicting Interests

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Current Status of Swadeshi Enterprises of Bengal

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Abstract

This paper analyses in detail, the Swadeshi enterprises/institutions of Bengal that were established during British rule. The study focuses on the present status, (as of 2019), of the Swadeshi enterprises of Bengal for the period between 1820s and 1947. Data consisting of 1946 Swadeshi enterprises, segregated into 26 different categories/sectors, has been collected using secondary sources. The survival status of the Swadeshi enterprises has been analysed based on the nature of technology used in the production process and the production objectives of the Swadeshi firms. To understand the dominant traits of the current owners of the presently active Swadeshi firms based on entrepreneurs' social identity, primary data have been collected, with a set of questionnaires, by the in-depth direct interview of at least one owner of each 26 different categories of industries documented in the study of the surviving Swadeshi entrepreneurs.

Keywords

Swadeshi entrepreneur, Bengal industry, indigenous technology, social identity, Bengal partition

Introduction

This paper analyses in detail, the Swadeshi enterprises/institutions of Bengal that were established during British rule. 'Swadeshi entrepreneurs' include small, middle and big bourgeoisie who were neither brokers nor intermediaries of colonial foreign capital.

From the point of view of economics and business, the Swadeshi movement aimed at the regeneration of the production of indigenous goods. During the long

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period of the anti-colonial movement, Swadeshi ideas of different aspects took shape: handicraft industries showed signs of revival, modern industries were set up and technical education was disseminated through the newly constructed technical institutions (Sarkar, 2013).

These enterprises operated in different sectors like textile, chemical, pharmaceutical (Ayurveda, homeopathy and allopathy), perfumery, hair oil, ink, type, leather, tobacco, paper, match sticks, iron-foundries, pottery, shipping, banking, insurance shipping, soap, milk products, umbrella, nib, pen, pencil, penholder, comb, button, waterproof, hurricane, lantern, electric lamp, fan, flashlight, glass, conch bangles, etc.

The production and regeneration of indigenous goods and services by the Swadeshi enterprises can broadly be put into the following four different categories:

- (i) Swadeshi enterprises with local technology
- (ii) Swadeshi enterprises with borrowed technology
- (iii) Swadeshi enterprises for substituting imported products
- (iv) Swadeshi enterprises to meet basic needs and demands

The small and middle bourgeoisie played a very important role in the Swadeshi movement. Unlike the big bourgeoisie, they were neither brokers nor intermediaries of foreign capital. They were self-reliant in capital, management and marketing. Although they depended to some extent on foreign machinery, there were many examples of self-reliance in this field too. Despite their limitations, they sought to be self-reliant in the field of technology (Bhattacharya, 2005). In any study of the indigenous enterprise in the Swadeshi era, the small and middle bourgeoisie deserve special importance.

Idea of Swadeshi

The Oxford English dictionary describes 'Swadeshi' as an adjective that originated from the Sanskrit word 'svadesiya' meaning 'of one's own country'. Literally, it means 'of one's country'; movement to encourage the consumption of goods made in India (Misra, 1999).

The term Swadeshi was used originally with reference to a nationalist movement advocating Indian-made products. When we speak of *Swadeshi*, we generally think of the period which was directly linked with the third partition of Bengal (1905).¹ In a broader sense, however, it embraces a larger period. The idea of Swadeshi gets its roots in the early 19th century when Bengal was ruled by the British East India Company.

Period of the Study

The study focuses on the present status, (as of 2019), of the Swadeshi enterprises of Bengal, which were built between 1820s and 1947.

The origin of the Swadeshi awakening among educated upper-caste Hindu Bengalis can be traced to the Charter Act of 1813 where it was decided that the Company's commercial monopoly in India should go. The Charter Act of 1813 deprived the Company of its commercial monopoly.

The other most important clauses of the Charter Act of 1813 were that a sum of rupees one lakh annually was provided for the revival and improvement of the literature and encouragement of the learned natives of India and for the introduction and promotion of knowledge of the sciences among the inhabitants of the British territories in India.

This was the first step towards acceptance of the principle of State responsibility for education and wellbeing. In 1817 Hindu College was established in Calcutta. A young Anglo-Indian, Henry Vivian Derozio, who taught at the Hindu College in 1826, launched the Young Bengal Movement, a radical movement for the reform of Hindu Society, with his students. Young Bengal played an important role in carrying forward the reformist movement that had already emerged in the province. The Hindu college and Young Bengal emerged as the torch bearers of Bengali renaissance of the early 19th century (Ghosh, 1979).

In 1947, Bengal got divided into two parts. East Bengal became part of Pakistan and the other part, the West Bengal remained with India.

Enterprises of Bengal

'Enterprises of Bengal' are the ones that were/are managed by entrepreneurs who lived/live in Bengal,² have settled in the state for their living and consider Bengal as their first home.

Geographical Boundaries

The pre-independence period of the study (1820–1947) focuses on the geographical space of the Bengal Presidency that existed till 1911. Bihar and Orissa were also part of the Presidency. From 1912 to 1947, Bengal comprised of the present-day Bangladesh and West Bengal.

Objectives

In this paper, we shall explore answers to the following questions:

- (i) What is the current survival status of the Swadeshi enterprises Bengal?
- (ii) Did nature of technology used in the production process have impact on the survival rate of Swadeshi enterprises?
- (iii) Did production objectives of the Swadeshi firms have impact on their survival rate?
- (iv) What are the dominant traits of the current owners of the presently active Swadeshi firms?

Methodology

Data Collection

Data have been collected from primary and secondary sources. Though the lists of Swadeshi firms are not exhaustive, utmost efforts have been put to identify the registered firms of the period under study.

The Primary Data. To address the last question, a set of questionnaires, developed by Alsos et al. (2016) to study the entrepreneurs' social identity and the preference of causal and effectual behaviours in start-up processes, has been used for in-depth direct interview of at least one owner of the surviving Swadeshi enterprises of 26 different categories of industries documented by the study.

The feedback received from 30 respondents is being analysed applying exploratory factor analysis method. SPSS Statistical package has been used. A snowball survey method has been used for identifying the sample respondents.

The Secondary Sources of Data.

- (i) Old advertisements in magazines: Various issues of 'Bharati Masik Patrika', Editor: Swarna Kumari Devi, Bangabda 1321 Kartik-Chaitra.
- (ii) Books: Tripathi (1954), Bagchi (1972), Ray (2011), Bhattacharya (2007, 2014), Tripathi (2013), Misra (1999), Sarkar (2014), Biswakarma (n.d.), Ghosh (1960) and Ghosh (1979)
- (iii) Trade and business directories: Ministry of Corporate Affairs, Swadeshi Directory 1933, Directorate of Factories (www.wbfactories.com), Just Dial App, Archival documents at various Chambers of Commerce, Calcutta Stock Exchange Directory 1946.
- (iv) Websites: www.zaubacorp.com, <https://www.dnb.com/business-directory>

A database of the Swadeshi enterprises has been created using an excel spreadsheet. Descriptive statistical methods have been used to analyse the collected data.

Data points on 1946 Swadeshi enterprises have been documented in the following fields: (i) Serial no; (ii) name of the enterprise; (iii) year of establishment; (iv) name of promoter; (v) sector (vi) sub-sector; (vii) main products/services (viii) status; (ix) address; (x) production objective (import substitution/domestic market and export) (xi) product type (traditional/new product); (xii) type of technology used (indigenous/oriental/western)

Survival Status

In total, 1,946 Swedish firms are documented in our period of study and those have been segregated into 26 different categories/sectors. From Table 1, we find that out of these large number of Swadeshi firms, only 348 (17.88%) are presently *Active*, 20 (1.03%) have been *Merged*, 472 (24.25%) of them have the status of either *Closed Under liquidation or Strike off or Dormant* and the rest 1,106 (56.83%) no information has been found and hence can be considered as not active or being merged with others.

Table I. Present Status of Swadeshi Firms.

Sl No.	Sectors	Status						Total	Percentage Active*
		Active	Closed	Merged	No Information	Strike Off	Under Liquidation		
1.	Appliances	3	11		9	8	1	32	9.4
2.	Chemicals	31	12	2	107	17	6	175	19
3.	Confectioneries, beverages and eateries	49	3	1	63	7		123	40.6
4.	Cooking ingredients	14	1		16	2		33	42.4
5.	Film and music	11	12		3	2		28	39.3
6.	Fine art	3	1		12			16	18.8
7.	Health	53	6		61	4	2	126	42
8.	Hosiery	16	29		31	4		80	20
9.	Jewellery and ivory	14	1		10	3		28	50
10.	Leather goods	3	1		46		1	51	5.9
11.	Lubricants and paints	8	1		10	8		27	29.6
12.	Matchsticks and fireworks		10		74		2	86	0
13.	Metals	10	3		124	15	1	153	6.5
14.	Miscellaneous	10	11	1	74	4	2	102	10.8
15.	Paper cardboard	8	2	1	34	4	1	50	18
16.	Potteries, ceramics and glass	20	7	1	26	7	2	63	33.3
17.	Printing and publishing	21	25	1	73	10	4	134	16.4
18.	Rubber	7			8	4	1	20	35
19.	Services	5	8	10	21	26	76	146	10.3
20.	Textile	24	8		23	27	7	89	27
21.	Textiles accessories	3	3		46	1		53	5.7
22.	Tobacco	2	4		19	1		26	7.7
23.	Toiletry and cosmetics	15	8	3	152	12	1	191	9.4
24.	Tools and machineries	8	4		37	2	1	52	15.4
25.	Transportation	4	18		9	6	1	38	10.5
26.	Waterproofs	6			18			24	25
	Grand total	348	189	20	1,106	174	109	1,946	17.8

Source: Pivoted from the main database, prepared by the authors. *Percentage active in terms of total no. of firms in each sector has been calculated by the author.

Sector-wise Analysis

Table 2 documents the percentage of active firms in each sub-sector—within the broad sector. If we analyse sector and sub-sector data of Table 1 and Table 2, we find:

1. There are overall 9.4% identified Swadeshi appliance companies which are presently active. Two sub-sectors have been identified within appliances: (a) Electrical appliances where 12.5% firms are presently active; (b) Non-electrical appliances, where 6.25% firms are presently active.
2. In the chemicals sector overall 19% of the identified Swadeshi firms are active. It has the following sub-sectors: (a) Acid and battery, where 35% are found active; (b) Ink, boot polish and metal polish, where 14% of the firms are active; (c) Insecticides and fertilisers, where 16.67% of the firms are presently active; and (d) Cement and lime, where 25% of the firms are active. In total, 17% of the other Swadeshi Chemical manufacturers are active.
3. Overall 40.6% of the identified Swadeshi confectioneries, beverages and eateries are presently active. It has the following sub-sectors: (a) Confectioneries and bakeries, in which 28.9% are found active; (b) Beverages, in which 55% of the firms are active; and (c) 100% Eateries are active.
4. In cooking ingredients sector, overall 42.4% of all Swadeshi firms are presently active. The number of active firms in the sub-sectors are (a) salt, where 75% of the firms are active, (b) sugar, where 35% of the processing firms are active, (c) spices, where 80% manufacturers are active, and (d) all the documented oil mills are closed.
5. In film and music sector, 39.3% of all the identified Swadeshi companies are presently active. It has the following sub-sectors: (a) 30% of the Swadeshi film production houses are active, (b) all music record companies are closed, and (c) 80% of musical instrument manufacturers are active.
6. In total, 18.8% of all the identified Swadeshi fine art firms are presently active. Its sub-sectors include (a) art work and canvass producers, where 12.5% of the firms are active and (b) clay model, where 25% of the Swadeshi idols making studios are active.
7. In the health sector, ayurveda firms and institutions came up as an indigenous method to treat diseases in parallel to the allopath, which was introduced by Europeans. Allopath was used to treat the Europeans and the higher-class society. Hence, ayurveda was extensively used for the common people of Bengal. Presently, 48% of the documented Swadeshi ayurvedic companies and institutions are active.
Later many Bengalis studied allopath, thus allopath was also practiced in Bengal and a few institutions were started by the Bengali doctors. Presently, 36% of the documented Swadeshi allopath companies and institutions are active. Homeopathy was also practised by eminent doctors

- like Dr Mahendra Lal Sarkar. Presently, 42% of the Swadeshi homeopath companies and institutions are active. In the surgical instruments sub-sector, 55% of the Swadeshi firms are active. In the overall health sector, 42% of the documented firms and institutions are still active.
8. In the hosiery industry, 20% of the identified firms are active.
 9. In total, 50% of the overall documented Swadeshi jewellery and ivory are active. It includes the following sub-sectors: (a) 68.75% active gold item manufacturers, (b) 33% active silver item manufacturers, and (c) 16.7 % ivory item manufacturers.
 10. In total, 5.9% of the overall documented leather goods manufacturers are active. It includes the following sub-sectors: (a) Footwear, which has presently 40% active Swadeshi firms; (b) Tanneries and leather item manufacturers, which has presently 2.18% active Swadeshi firms.
 11. In total, 29.6% of all documented lubricants and paints are presently active.
 12. Most of the matchstick and fireworks manufacturing companies that started during the pre-independence period are either closed or no information regarding them are available hence we can consider them as being closed.
 13. In total, 6.5% of all identified metal companies are active. The metal sector has been divided into the following sub-sectors: (a) Iron and steel, in which, 5.9% of the identified Swadeshi firms are active; (b) Aluminium, brass, bell metal and bronze, in which, 12% of the firms are active.
 14. In total, 10.8% of the identified Swadeshi miscellaneous item manufacturers are presently active. It includes (a) educational accessory manufacturers, in which, 5% of the firms are presently active and (b) miscellaneous accessories, in which, 15% of the firms are presently active.
 15. In total, 18% of the paper and cardboard manufacturing companies are active, which includes the following sub-sectors: (a) Paper manufacturers, where, 11% of the identified Swadeshi firms are active; (b) Paper traders, where 60% of the identified Swadeshi firms are active.
 16. In total, 33.3% of all identified Swadeshi potteries, ceramics and glassware manufacturing companies are active. It includes (a) potteries, where 29% of the firms are presently active, (b) glass works, where 29% of the firms are presently active, and (c) ceramics and tiles, where 39% of the firms are presently active.
 17. The printing and publishing sector had immense importance before independence since, unlike the present day, the print media (newspapers, journals and magazines) was the most important and one of the very few mediums of propagating nationalism. Most of the editors were involved in the nationalist movement. Only 16.4% of the printing and publishing companies are still active out of which advertising companies account to 100% active, printing press account to 17% active, publishing companies account to 15% active and type foundries and block makers account to 8% active companies.

18. In total, 35% of all identified Swadeshi rubber companies are presently active.
19. The banking institutions within the services sector that funded the Swadeshi business were either shutdown, sold off or merged because the owners resided in one part and their business operations remained in another part of Bengal. These institutions incurred huge losses. Only 10.3% of the service sector companies are still active. The banking sector accounts to only 0.926% active, insurance sector accounts to 7.7% active, tourism accounts to 100% active and all the Circus companies are closed.
20. The textile industry had domestic demand but due to the emergence of power looms the handloom sector faced a huge setback. The partition led to unequal division of jute-producing lands and jute-processing factories. Hence, it faced a huge loss. Moreover, the state's share of jute export duty was slashed. Overall 27% of the firms producing textile goods during pre-independence are still active out of which 16% cotton goods manufacturing companies, 56% jute processing companies and 35.7% silk items manufacturing companies are active.
21. In the textile accessories industry, 5.7% of all identified firms are active. This sector has the following sub-sectors: (a) Buttons, in which none of the Swadeshi manufacturing companies are active; (b) Lace, thread and needle, in which 12.5% of the identified Swadeshi firms are active.
22. In Tobacco sector, 7.7% of all identified firms are active. It includes the following sub-sectors: (a) Cigarettes, in which 4.5% Swadeshi manufacturers are presently active; (b) Beedi, in which, 100% of the identified Swadeshi manufacturing firms are active; and (c) All the identified *Zarda* companies are closed.
23. In total, 9.4% of all identified toiletries and cosmetics are active, which includes (a) toiletries, where 5.8% of the identified firms are active and (b) cosmetics, where 10% firms are active.
24. In total, 15.4% of all identified tools and machinery firms are presently active.
25. Ramdulal Dey Sarkar, Motilal Seal, Ramgopal Mullick and Madan Dutta were eminent ship owners who had expertise in the valuation of wrecked ships. Various Swadeshi steamer companies were set by Bengali entrepreneurs. However, the Swadeshi steamers (mainly the passenger vessels) could not compete with the European ones due to lower pricing by the European vessels. The Swadeshi steam engine ferries have been replaced by fuel-powered vessels. The Automated and motorised vehicles diminished the demand of Swadeshi non-motorised means of transportation. Presently 14.3% of the documented Swadeshi motor car companies, 11% of the Swadeshi non-motorised bicycle, tricycle and rickshaws, 9.5% of the shipping companies are active and 0% railway track laying companies are active. Overall, 10.5% of the companies in the transportation sector are still active.
26. We find 25% of the total waterproofs producing companies are still active out of which raincoats account to 100% active, tarpaulins account to 7.7% active, and umbrella account to 33.3% active.

Table 2. Percentage of Active Swadeshi Firms in Each Sub-sector—Within the Broad Sector.

Sl No.	Sectors	Sub-sector	No. of Swadeshi Enterprises	No. of Active Swadeshi Enterprises at Present	Percentage of Active Firms
1.	Appliances	Electrical appliances: Fan, bulbs/electric lamps and electrical supplies	16	2	12.5
		Non-electrical appliances: Clock, cooker, flash-lights, lamps/hurricane/lantern, water filter	16	1	6.25
2.	Chemical	Acid and battery	20	7	35
		Ink, boot polish and metal polish	92	13	14
		Insecticides and fertilisers	18	3	16.67
		Cement and lime	4	1	25
		Others	41	7	17
3.	Confectioneries, beverages and eateries	Confectionaries sweetmeats, bakery, shoti food	90	26	28.9
		Beverages: Tea, syrup	22	12	55
		Eateries	11	11	100
4.	Cooking ingredients	Salt	4	3	75
		Sugar	20	7	35
		Spices	5	4	80
		Oil	3	0	0
		Rice mills	0	0	0
5.	Film and music	Film production house	10	3	30
		Music record	8	0	0
		Musical instruments	10	8	80
6.	Fine art	Art work and canvass	8	1	12.5
		Clay model	8	2	25
7.	Health	Allopath	58	21	36
		Ayurveda	33	16	48
		Homeopathy	24	10	42
		Surgical instruments	11	6	55
8.	Hosiery	NA	80	16	20
9.	Jewellery and ivory	Gold	16	11	68.75
		Ivory	6	1	16.7
		Silver	6	2	33
10.	Leather goods	Footwear	5	2	40
		Tanneries and leather items	46	1	2.18
11.	Lubricants and paints	Lubricating oil and paints	27	8	29.6
12.	Matchsticks and fireworks	Matchsticks and matchbox	84	0	0
		Fireworks	2	0	0
13.	Metals	Iron and steel	136	8	5.9
		Aluminium, brass, bell metal and bronze	17	2	12

(Table 2 continued)

(Table 2 continued)

Sl No.	Sectors	Sub-sector	No. of Swadeshi Enterprises	No. of Active Swadeshi Enterprises at Present	Percentage of Active Firms
14.	Miscellaneous	Educational accessory	56	3	5
		Miscellaneous accessories	46	7	15
15.	Paper and cardboard	Paper manufacturer: Paper, envelope, cardboard box, carbon paper	45	5	11
		Paper trader	5	3	60
16.	Potteries, ceramics and glass	Ceramics and tiles	18	7	39
		Glass work	24	7	29
		Pottery	21	6	29
17.	Printing and publishing	Advertising	3	3	100
		Publishing: Newspaper/ magazine, publishing co.'s	40	6	15
		Printing	54	9	17
		Block makers and type foundries	36	3	8
18.	Rubber	NA	20	7	35
19.	Services	Banking ^a	108	1	0.926
		Insurance	26	2	7.7
		Tourism	1	1	100
		Circus	4	0	0
		Other services	7	1	14.3
20.	Textile	Cotton	57	9	16
		Jute	18	10	56
		Silk	14	5	35.7
21.	Textiles accessories	Button	29	0	0
		Lace, thread and needle	24	3	12.5
22.	Tobacco	Cigarettes	22	1	4.5
		Beedi	1	1	100
		Zarda	3	0	0
23.	Toiletries and cosmetics	Toiletries: Brush, comb, razor, soap and tooth paste/powder	104	6	5.8
		Cosmetics: Cream, hair oil, perfumery, vermilion	87	9	10
24.	Tools and machineries	NA	52	8	15
25.	Transportation	Bicycle, tricycle and rickshaw	9	1	11
		Motor cars	7	1	14.3
		Shipping	21	2	9.5
		Railway track	1	0	0
26.	Waterproofs	Raincoats	2	2	100
		Tarpaulins and other waterproofs	13	1	7.7
		Umbrella	9	3	33.3

Source: Compiled by the authors on the basis of the main data tables prepared by them.

Note: ^aFew banks were merged or sold off and their previous identities have been totally erased. Hence, we cannot consider them as active.

Higher Survival Records of Firms Those Opted for Indigenous Technology

Here, western technology is broadly defined as those technologies which use steam or electric power. By indigenous technology, we define the traditional technology of India those which do not entirely depend on steam or electric power. By oriental technology, we mean the technology that had been adopted from the other parts of Asia.

From Table 3, we observe that out of the 1,191 firms that had implemented western technology of manufacturing process, 193 (i.e., 16.2%) are presently active, and out of 696 firms that had implemented indigenous technology, 150 (i.e., 21.6%) are active.

In order to test whether the survival rate of the firms that implemented indigenous technology is more than the firms that implemented western technology, we tested whether the proportion of active firms to all firms that implemented western technology (P_1) is less than the proportion of active firms to all firms that implemented indigenous technology (P_2).

We thus defined the null hypothesis as $P_1 = P_2$ and alternative hypothesis as $P_1 < P_2$. Here, we have not considered the firms that implemented oriental technology because the number of firms is nominal in comparison to the other technologies.

From Table 3, we find,

$$n_1 = 1,191, n_2 = 696 \text{ and } p_1 = \frac{193}{1191} = 0.16 \text{ and } p_2 = \frac{150}{696} = 0.22 \text{ and (here } p_1 \text{ is}$$

the sample proportion of active firms to all firms that implemented western technology, and p_2 is the sample proportion of active firms to all firms that implemented indigenous technology, n_1, n_2 are the no. of firms that implement western and indigenous technologies, respectively):

$$p = \frac{n_{1p_1} + n_{2p_2}}{n_{1+n_2}} \text{ is the estimate of } P. \text{ The value of } p \text{ is } 0.1819.$$

Table 3. Status of Swadeshi Firms with Respect to Their Technology Usage.

Technology	Status						Grand Total
	Active	Closed	Merged	No Information	Strike Off	Under Liquidation	
Eastern/oriental technology	5	1		53			59
Indigenous technology and process	150	33	15	354	61	83	696
Western technology and process	193	155	5	699	113	26	1,191
Grand total	348	189	20	1,106	174	109	1,946

Source: Compiled by the author on the basis of main data base prepared by them.

As n_1 and n_2 are large the statistic follows standard normal distribution approximately. The value of Z statistic is calculated by the following formula:

$$Z = \frac{P_1 - P_2}{\sqrt{p(1-p)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

The calculated value of Z is -3.26 , which is less than 1.645 , the $Z_{0.05}$ (tabulated) value at the 5% level of significance. Thus, the value of Z statistic lies in the critical region. Hence, the null hypothesis has been rejected.³

Thus, we have sufficient evidence that there is a higher survival rate of the firms that implemented indigenous technology than the firms that implemented western technology.

From this analysis, we can infer that the firms that implemented indigenous technology have better performance and ability to sustain than the ones that implemented western technology. Thus, the type of technology that was implemented in the production process of different items had affected the sustainability of the firms. Firms those applied indigenous technology showed better survival record.

Lower Survival Record of Firms Established with the Objective of 'Import Substitution'

From Table 4, we observe that out of the 1,195 firms that catered to 'domestic demand and export', 235 (i.e., 19%) are presently active and out of 751 firms documented under the category 'import substitution' 113 (i.e., 15.04%) are active.

In order to test whether the survival rate of the firms that catered to domestic demand and export have higher chance of survival than the ones that catered to import substitutes we test whether the proportion of active firms to all firms that catered to 'domestic demand and export' (P_1) is greater than the proportion of active firms to all firms those fall under the category 'import substitution' (P_2). We thus define the null hypothesis as $P_1 = P_2$ and alternative hypothesis as $P_1 > P_2$.

Table 4. Status of the Swadeshi Firms with Respect to Their Production Objectives.

Status/Production Objective	Domestic Demand and Export	Import Substitution	Grand Total
Active	235	113	348
Closed	110	79	189
Merged	16	4	20
No information	651	455	1,106
Strike off	93	81	174
Under liquidation	90	19	109
Grand total	1,195	751	1,946

Source: Compiled by the author on the basis of main database prepared by them.

Table 5. Darwinian Identity Variables.

Variables (V)	Measurement Items
V1	The opportunity to create economic value and to create personal wealth over time has been an important driving force
V2	To me, the focus on profitability is the most important
V3	To me, success is that my business shows better financial performance compared to competitors.

Source: Alsos et al. (2016).

Table 6. Communitarian Identity Variables.

Variables (V)	Measurement Items
V4	Our main motivation is related to offering a good and novel product that we know people have use for
V5	To us, to be true to the original idea and deliver products of high quality to our customer segments, is most important
V6	To us, success is that our products work well for those that are supposed to use them

Source: Alsos et al. (2016).

Table 7. Missionary Identity Variables.

Variables (V)	Measurement Items
V7	Our main motivation is that through our firm, we can pursue values that are important to us or a particular cause (e.g., social, sustainability or other)
V8	To us, success is that the firm can contribute to changes that make society a better place
V9	It is important to us that we manage to show that there are other and better ways to do things in accordance with our values

Source: Alsos et al. (2016).

From Table 4 we find,

$$n_1 = 1,195 \text{ and } n_2 = 751 \text{ and } P_1 = \frac{235}{1195} = 0.197 \text{ and } P_2 = \frac{113}{751} = 0.15 \text{ and (here}$$

p_1 is the sample proportion of active firms to total firms with domestic demand objective and p_2 is the sample proportion of active firms to total firms with import substitution objective and n_1, n_2 are the no. of firms that produced with domestic demand and import substitution objectives, respectively.

$$p = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2} \text{ is the estimate of } P. \text{ The value of } p \text{ is } 0.179.$$

As n_1 and n_2 are large the statistic follows standard normal distribution approximately. The value of Z statistic is calculated by the following formula:

Table 8. Identified Dominant Factors Based on SPSS Output.

Factor (F)	Variables (V1.....V9)	Variable Names	Dominant Factors	Median	Modal Values
F1	V4	Our main motivation is related to offering a good and novel product that we know people have use for	Communitarian and missionary identities	6	7
	V5	To us, to be true to the original idea and deliver products of high quality to our customer segments, is most important		7	7
	V6	To us, success is that our products work well for those that are supposed to use them		6	6
	V7	Our main motivation is that through our firm, we can pursue values that are important to us or a particular cause (for example, social, sustainability or other)		5	5
	V8	To us, success is that the firm can contribute to changes that make society a better place		5	5
	V9	It is important to us that we manage to show that there are other and better ways to do things in accordance with our values		6	6
F2	V1	For us, the opportunity to create economic value and to create personal wealth over time has been an important driving force.	Darwinian identity	5	6
	V2	To us, the focus on profitability is the most important		4	4
	V3	To us, success is that my business shows better financial performance compared to competitors		4	3

Source: SPSS output (refer Annexure 2).

$$Z = \frac{p_1 - p_2}{\sqrt{p(1-p)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Here, the calculated value of Z is 2.63, which is greater than the $Z_{0.05}$ (tabulated) value at a 5% level of significance, that is, 1.645 and hence the value of Z statistic lies in the critical region. Thus, we reject the null hypothesis and have sufficient evidence that firms under domestic demand and export category have higher survival rate than the firms under ‘import substitution’ category.

From this analysis, we can infer that the firms that were established with the objective to substitute imports had less chance of survival than those firms which were formed primarily to serve the basic needs of the people.

Survey on Active Swadeshi Firms

A set of questionnaires to study the entrepreneurs' social identity and the preference of causal and effectual behaviours of the surviving Swadeshi entrepreneurs has been used for the in-depth direct interview of at least one owner of each 26 different categories of industries documented by the study. Nine questions to measure the three types of *dominant identities* (refer Table 5,6,7) of the entrepreneurs, as developed by Alsos et al. (2016), have been used (Annexure 1).

The authors have built on Fauchart and Gruber's (2011) typology of the following three primary types of entrepreneurial social identities: Darwinian, communitarian and missionary identities. The typology was developed based on the following three identity dimensions: basic social motivation, basis of self-evaluation and frame of reference/relevant others. According to them, the *Darwinian identity* represents the identity of the 'classic entrepreneur' who has the primary goal of establishing a strong and successful business and a focus on ensuring the success of the firm. *Communitarian identity* could be developed based on those motivated strongly by a hobby or leisure interest that then develop a business to support a group of like-minded individuals. *Missionary identity* is motivated by starting a firm to advance a greater cause, and acting responsibly is considered to be critical. Hence, their motivation is closely connected to social entrepreneurship (Alsos et al., 2016).

A snowball sampling method has been used to identify samples from business communities. The respondents were the descendants of the Swadeshi entrepreneurs, who are still carrying the legacy of business of their forefathers after several generations.

A 7-point Likert scale has been used to measure their perception. 7 = very strongly agree, 6 = strongly agree, 5 = agree, 4 = neither agree nor disagree, 3 = disagree, 2 = strongly disagree, 1 = very strongly disagree.

Entrepreneurs with a *Darwinian identity* are described as focusing on establishing strong and profitable firms. Although they may be attracted to the industry and the products they produce and deliver, they devote most of their attention to activities aimed at ensuring the firm's success

Communitarian identity is described as being strongly engaged in the products or activities produced and delivered by their firm and enthused by their ability to contribute to the community with their products. They see their entrepreneurial activities as important for the development of the community

Entrepreneurs with a *missionary identity* are described by their strong beliefs in their firm as a vehicle for change for some aspect of society. They see their firms as a platform from which they can pursue their societal goals. This goal orientation is not focused on profit or expected return in the classical sense, but it can still be argued that they are adopting the causal principle of taking the end as their basis for action.

Survey Findings

Responses from the descendants of 30 Swadeshi entrepreneurs have been received. An exploratory factor analysis has given the following output (please refer to Annexure 2 for details).

KMO value: 0.715,

Total variance explained: 70.4%.

Exploratory factor analysis has extracted two principal factors as under:

Variables with high factor loadings (>0.5 , on the basis of the rotated component matrix) have been clubbed into two factors as under.

The SPSS output reveals that

- The entrepreneurs have strong communitarian and missionary identity (F1), which explains over 53% of variance of the input data.
- Their Darwinian identity is rather weak (F2), which explains nearly 17% of the variance of the data.

From these findings, we can infer that the new generation owners of the surviving Swadeshi entrepreneurs of Bengal exhibit strong communitarian and missionary identities (refer Table 8). Their Darwinian identity is weak.

These preliminary findings on the dominant traits of the present generation of Bengali entrepreneurs are noteworthy. Further in-depth research will help to understand the decision-making process of Bengali entrepreneurs. It will add considerable knowledge to the near non-existent management dissertation on Bengali entrepreneurs' social identities.

Significance and Limitation of the Study

The study has revealed the survival status of Swadeshi enterprises in 26 major sectors and 55 sub-sectors. It has also revealed the survival status of enterprises that have used indigenous/oriental/western technology. Moreover, the study has analysed the survival rate of the enterprises on the basis of their production objectives.

This empirical study has provided little basic information on the Swadeshi enterprises of Bengal, which would prompt many more studies in future.

One major limitation of the present study is the small sample size of the primary data collected through questionnaire survey. Due to lack of adequate number of data points, only exploratory factor analysis has been attempted.

Conclusion

Survival rate of Swadeshi enterprises are not good. Baring few sectors like confectioneries, beverages and eateries, cooking ingredients, film and music, health, jewellery and ivory, pottery, etc, in all other major sectors, the survival rate is very low.

The study shows that the firms that implemented indigenous technology have better performance and ability to sustain than the ones that implemented Western technology.

The firms that were established with the objective to substitute imports had less chance of survival than those firms which were formed primarily to serve the basic needs of the people.

An exploratory factor analysis on the traits of the new generation owners of the surviving Swadeshi entrepreneurs of Bengal, exhibits *communitarian and missionary identities*. Their *Darwinian identity* is weak.

Annexure I. Questionnaire for Swadeshi Entrepreneurs of Bengal.

Please indicate your perception on the following statements mentioning any number between 1 and 7. We are using a 7-point Likert Scale to understand your perception.

7 = very strongly agree, 6 = strongly agree, 5 = agree, 4 = neither agree nor disagree, 3 = disagree, 2 = strongly disagree, 1 = very strongly disagree

- For us, the opportunity to create economic value and to create personal wealth over time has been an important driving force.
- To us, the focus on profitability is the most important.
- To us, success is that my business shows better financial performance compared to competitors.
- Our main motivation is related to offering a good and novel product that we know people have use for.
- To us, to be true to the original idea and deliver products of high quality to our customer segments is most important.
- To us, success is that our products work well for those that are supposed to use them.
- Our main motivation is that through our firm, we can pursue values that are important to us or a particular cause (for example, social, sustainability or other).
- To us, success is that the firm can contribute to changes that make society a better place.
- It is important to us that we manage to show that there are other and better ways to do things in accordance with our values.

Name:

Organisation:

Year of establishment:

Present status of the organisation: In operation/merged/ closed

Names of initial promoters:

Any other information:

Date:

Annexure 2.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.778	53.092	53.092	4.778	53.092	53.092	4.722	52.462	52.462
2	1.556	17.287	70.379	1.556	17.287	70.379	1.613	17.917	70.379
3	.895	9.943	80.322						
4	.729	8.095	88.417						
5	.517	5.747	94.164						
6	.293	3.257	97.420						
7	.122	1.351	98.771						
8	.071	.794	99.565						
9	.039	.435	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix^a

	Component	
	1	2
VAR00001	.296	.596
VAR00002	-.169	.857
VAR00003	.074	.629
VAR00004	.940	.059
VAR00005	.958	-.073
VAR00006	.968	-.072
VAR00007	.825	.128
VAR00008	.879	.189
VAR00009	.640	.246

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

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Notes

- (i) In 1824, following the First Anglo-Burmese War, Assam was occupied by the British forces and on 24 February 1826 it had ceded to Britain. In 1826 Assam was included in the Bengal Presidency. The boundaries of different divisions of Bengal Presidency, under British rule, were repeatedly changed to make this region economically and administratively viable for British self-rulers. The first partition of Bengal dates back

- to 6 February 1874, when Assam, was severed from Bengal to form the Assam Chief-Commissionership (also known as the North-East Frontier Agency-NEFA). Historian J B Bhattacharjee (2005) (<https://www.jstor.org/stable/44145915?seq=1>) had termed this as the ‘first partition of Bengal’. (ii) In the same year (1874) Goalpara (present day Kokrajhar, Bongaigaon, Dhubri and Goalpara districts of Assam), which came under the Bengal Presidency in 1765 from its former rulers Koch kings, was annexed (second partition) to Assam (Misra, 2004). In September 1874 Sylhet was separated from the Bengal Presidency and added to the new province (Hossain, 2013). This was the second partition of Bengal.
2. Undivided Bengal.
 3. Ideally there is no need for conducting any test of significance as the proportions are calculated on the basis of population data. However, these tests are done on the presumption that the population data is not exhaustive and proportion has been calculated on a data set which has been collected from various known sources only.

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Analysing the Adoption of Wealthtech by Individual Investors for Investment Services

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Abstract

This research investigates the adoption of Wealthtech among individual investors in India using Partial Least Squares Structural Equation Modeling (PLS-SEM). A convenience sample technique was employed, gathering data from 280 participants through an online survey. The study applies the Theory of Planned Behavior and the Technology Acceptance Model as the theoretical framework to examine the factors influencing the intention to use Wealthtech. Additionally, the role of perceived ease of use and perceived usefulness in shaping attitudes toward Wealthtech adoption is explored. The results from the PLS-SEM analysis show significant positive associations between Attitude and Perceived Behavioral Control with the intention to use Wealthtech. These insights can help financial institutions tailor Wealthtech platforms to meet investor preferences, fostering increased adoption among individual investors. Regulatory authorities can use these findings to enhance accessibility and acceptance of Wealthtech solutions by fostering a conducive environment for technological innovation.

Keywords

Fintech, Wealthtech, technology adoption, technology acceptance model, theory of planned behavior

Introduction

In recent years, the financial services industry in India has witnessed a significant transformation with the rapid advancements in technology (Bhatia et al., 2020;

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Parthasarathy, 2021). One of the most important developments was the emergence of “Wealthtech,” an innovative field that leverages cutting-edge technology to deliver personalized and efficient wealth management solutions to individual investors. Wealthtech includes a wide range of digital platforms, automated advisors, investment apps, and online brokerage services, allowing investors to access a wide range of financial products and easily manage their portfolios (Belanche et al., 2019). Wealthtech adoption has exploded globally, changing the landscape of traditional investing practices. In India, a country known for its booming economy and booming investor population, there is huge potential for Wealthtech adoption (Manrai & Gupta, 2022).

Wealthtech has created several significant benefits and opportunities for individual investors in the Indian capital market. Democratizing access to financial markets is one of Wealthtech’s major contributions to the retail investor segment (Sood & Singh, 2022). Retail investors can conveniently access a wide range of investment choices through user-friendly mobile applications and online platforms, including stocks, mutual funds, bonds, and other financial instruments (Abroud et al., 2013). Retail investors, including those from smaller towns and distant locations, now have more access to the capital market, enabling them to invest and expand their wealth. Retail investors, particularly those from smaller towns and outlying places, are now more able to participate in the stock market and expand their wealth owing to this improved accessibility. Wealthtech platforms provide inexpensive and often commission-free investment solutions, lowering entry barriers and allowing investors to begin with small sums.

However, the acceptance and adoption of these technology-based financial solutions among individual investors in India are still subject to a number of complexities and behavioral patterns. Considering the opportunities created by Wealthtech for individual investors and the concerns about its slow adoption, it is critical for financial service providers, regulators, and researchers to gain a better understanding of the factors that drive Wealthtech adoption. In order to understand Wealthtech’s adoption by individual investors in India, it is imperative to understand the gap between its promise and its implementation. The purpose of this study is to better understand the complex interplay of factors influencing Wealthtech’s slower-than-expected adoption rate, despite its obvious advantages. It is essential to bridge this gap not only in order to fully utilize the benefits of technological innovations in the investment landscape, but also to inform tailored strategies for financial service providers and regulators.

There is a need for research that not only identifies the barriers preventing Wealthtech adoption but also explains the behavioral patterns and complexities shaping investor decisions within the current financial environment in India. It is imperative that this gap is addressed, as it directly impacts the optimal utilization of technological innovations and the formulation of strategic approaches by financial service providers and regulators. Additionally, this research seeks to provide a comprehensive understanding of the multifaceted determinants that influence Wealthtech adoption by integrating established frameworks such as the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM). Insights like these have the potential to catalyze innovation, shape

regulatory frameworks, and foster symbiotic relationships between investors, service providers, and the broader financial ecosystem.

In view of these factors, this study is not only timely but also indispensable as a guide to navigating the evolving contours of the Indian financial system. By employing robust frameworks such as the TPB and the TAM, this research endeavors to unravel the behavioral factors guiding investors' decisions. Ultimately, this study's findings stand to drive innovation, refine policies, and optimize the integration of Wealthtech, benefiting investors, service providers, regulators, and the financial ecosystem as a whole.

Review of Literature

Many researchers have attempted to define Wealthtech and its constituent parts (Belanche et al., 2019; Nair et al., 2022). According to Cao et al. (2021), it is a subset of fintech that uses technology like artificial intelligence, data analytics, and machine learning to offer tailored wealth management services. This comprises automated portfolio management tools, digital investing platforms, and robot advisers that cater to the demands of individual investors (Chong et al., 2021). Wealthtech provides investing solutions that are less expensive, more transparent, and user-focused than traditional financial advice services. Wealthtech has been recognized for its potential to democratize access to financial markets and wealth management services. According to Sood and Singh (2022), technology integration promotes financial inclusion by enabling retail investors of various financial backgrounds to take part in investment opportunities that were previously only open to institutional investors. Additionally, studies indicate that using digital platforms and robo-advisors can improve portfolio performance and result in lower management fees than using traditional advisory services (Lee & Wang, 2022).

Despite being relatively underexplored in existing research, Wealthtech, which encompasses technologies that offer investing, portfolio management, and tailored financial services, has the potential to revolutionize the financial industry, particularly wealth management. For a comprehensive understanding of the adoption dynamics of this emerging technology and its transformative impact, it is imperative to examine the factors driving its adoption among users.

The integration of TAM with TPB offers a comprehensive framework for predicting and understanding the adoption of technology among users (Hakimi et al., 2023; Nguyen-Phuoc et al., 2024). The TAM, which emphasizes perceived usefulness (PU) and perceived ease of use (PEU), provides insight into how individuals evaluate the benefits and ease of use of technological platforms (Davis, 1989). Technology may be attractive to users if they perceive that it enhances their investment decisions or if they find its interface to be intuitive and easy to use. TPB, on the other hand, focuses on the behavioral and normative dimensions of adoption (Ajzen, 1991). An individual's decision to adopt a particular technology is influenced by factors such as subjective norms, where the beliefs of significant others play a significant role, and attitudes influenced by an

awareness of its benefits (Ajzen, 1991). In addition, perceived behavioral control (PBC), which entails a person's confidence in their ability to utilize Wealthtech tools effectively, plays a crucial role in the evaluation of the technology (Ajzen, 1991).

Extant studies have integrated TAM and TPB in different contexts, including social media acceptance (Armah & Jin-Fa, 2023), mHealth (Mao et al., 2023), and food delivery services (Leong & Koay, 2023). These studies consistently demonstrated the models' strong predictive capabilities for technology adoption intentions. However, the integration of TAM and TPB in the Wealthtech context remains largely unexplored, pointing to an existing gap in the literature concerning the determinants of Wealthtech adoption. Drawing from this foundational literature, it is anticipated that applying the TAM and TPB integration to the realm of Wealthtech adoption will offer enhanced insights, addressing the current research gap in Wealthtech adoption literature. Thus, this study aims to analyse the factors affecting individuals' Wealthtech adoption by integrating TAM and TPB in the theoretical framework.

Theoretical Framework and Hypothesis Development

Theory of Planned Behavior (TPB)

According to Icek Ajzen's TPB, an individual's behavioral intentions are influenced by three factors: attitudes toward the behavior, subjective norms, and PBC. According to TPB, these factors collectively shape an individual's willingness to adopt a specific behavior (Ajzen, 1991). In the context of Wealthtech adoption, attitudes toward digital financial services, social and peer influence, and perceived behavior control of the technology are crucial components that may drive or hinder adoption.

Technology Acceptance Model (TAM)

The TAM, devised by Fred Davis, is a model that examines an individual's perception and acceptance of technology. TAM emphasizes two primary factors: PU and PEU. As a result, the theory suggests that a positive attitude toward technology adoption is likely if the individual perceives the technology as useful and easy to use (Davis, 1989).

Perceived Usefulness (PU)

PU is the perception of how well a particular technology or innovation will assist an individual in achieving specific goals (Davis, 1989). It is likely that investors who perceive Wealthtech platforms as valuable tools that offer personalized and efficient wealth management solutions will consider them beneficial in their investment endeavors. PU encompasses factors such as improved investment decision-making, access to a diversified range of financial products, real-time

monitoring, and enhanced portfolio performance. Investors perceive Wealthtech platforms to be useful and valuable tools for managing their wealth effectively, they are more likely to develop positive attitudes toward adopting these technologies (Chong et al., 2021; Laksamana et al., 2022).

H_1 : Perceived usefulness is positively associated with the attitude toward Wealthtech adoption.

Perceived Ease of Use (PEU)

An individual's perception of PEU refers to how much effort is required to use a particular technology or system. In the case of Wealthtech adoption, investors who perceive Wealthtech platforms as user-friendly, intuitive, and easy to navigate are more likely to view them as accessible and approachable tools for managing their investments. Factors influencing PEU may include the platform's design, functionality, learning curve, and support resources available to users. The proposed hypothesis suggests that as investors perceive Wealthtech platforms to be easy to use and navigate, they are more likely to develop positive attitudes toward adopting these technologies (Chong et al., 2021; Laksamana et al., 2022).

H_2 : Perceived ease of use is positively associated with the attitude toward Wealthtech adoption.

Perceived Behavioral Control (PBC)

PBC refers to an individual's belief in their ability to perform the behavior successfully. In the context of Wealthtech adoption, investors who perceive themselves to have sufficient technical skills, knowledge, and access to resources necessary to use Wealthtech platforms are more likely to have a higher intention to adopt these technologies. Higher PBC would lead to greater confidence and self-efficacy in navigating the digital financial landscape, encouraging investors to embrace Wealthtech solutions (Arkorful et al., 2022; Diéguez et al., 2023).

H_3 : Perceived behavioral control is positively associated with Wealthtech adoption.

Attitude (ATT)

Attitude in the TPB represents an individual's overall evaluation or positive/negative feelings toward the behavior in question. In the case of Wealthtech adoption, investors with positive attitudes toward digital financial services, such as robo-advisors and online investment platforms, are more likely to express a stronger intention to adopt Wealthtech. Positive attitudes can be influenced by perceptions of convenience, ease of use, cost-effectiveness, and the potential for improved financial outcomes through technology-driven wealth management (Arkorful et al., 2022; Belanche et al., 2019).

*H*₄: Attitude is positively associated with Wealthtech adoption.

Subjective Norms (SN)

Subjective Norms refer to an individual's perception of social pressure or influence from significant others regarding the behavior. In the context of Wealthtech adoption, investors who perceive that their peers, family members, or financial advisors endorse or promote the use of Wealthtech are more likely to develop a positive intention to adopt such technologies. The influence of subjective norms can play a crucial role in shaping investors' perceptions of the social acceptance and appropriateness of Wealthtech usage (Belanche et al., 2019; Diéguez et al., 2023).

*H*₅: Subjective norm is positively associated with Wealthtech adoption.

Research Methodology

Measurement Development

We designed a survey instrument segmented into two sections: Part A and Part B. Part A focused on capturing respondent demographics, encompassing factors like gender, age, educational background, and awareness levels. Part B comprised 18 questions, addressing various constructs of the proposed model. To ensure content validity, we adapted all measurement tools from established literature sources. To measure all items, we used a five-point Likert scale ranging from "strongly disagree" to "strongly agree." For measuring each variable three questions were asked. All the items for TPB variables were adapted from Wu and Chen (2005). The items for TAM and adoption intention are adapted from Belanche et al. (2019). Before the final survey, a pre-test was conducted among 20 Wealthtech users. This helped in ensuring the reliability and understandability of the questionnaire. Detailed information on the measurement items for each construct is given in Table 1.

Sample and Data Collection

We followed a quantitative, cross-sectional approach to conduct the empirical study. In this study, the population consists of investors who use Wealthtech platforms in India. Given the absence of a comprehensive sampling framework for Wealthtech users, as commonly indicated in prior Information System research, a convenience sampling method was adopted to select respondents (Khayer & Bao, 2019). A structured questionnaire is administrated using Google Forms and shared with social media groups of investors in India. The respondents were assured that their feedback would remain confidential and solely used for research purposes, ensuring that no information would be disclosed or used for other purposes.

Table 1. Measurement Items and Sources.

Construct	Item	Source
Attitude	ATT1 Using Wealthtech for managing investments seems like a good idea	Belanche et al. (2019)
	ATT2 I like the idea of using Wealthtech for managing personal investments	
	ATT3 Using Wealthtech for implementing my investments seems like a wise idea	
Intention	INT1 I intend to use Wealthtech for managing investments	Belanche et al. (2019)
	INT2 Using Wealthtech for managing investments is something I would do	
	INT3 I intend to use Wealthtech rather than any traditional financial advisor	
Perceived behavioural control	PBC1 I would be able to use the Wealthtech	Wu and Chen (2005)
	PBC2 Using the Wealthtech is entirely within my control.	
	PBC3 I have the resources and the knowledge and the ability to make use of the Wealthtech	
Perceived ease of use	PEU1 Learning to use Wealthtech would be easy for me	Belanche et al. (2019)
	PEU2 I would find it easy to manage investments using Wealthtech	
	PEU3 I would find Wealthtech easy to use	
Perceived usefulness	PU1 Using Wealthtech would improve my performance in managing investments	Belanche et al. (2019)
	PU2 Using Wealthtech would improve my productivity in managing investments	
	PU3 I would find Wealthtech useful in managing investments	
Subjective norms	SN1 People who are important to me think that I should use Wealthtech	Wu and Chen (2005)
	SN2 People who influence my behavior think that I should use Wealthtech	
	SN3 People whose opinions I value think that I should use Wealthtech	

Before collecting data, minimum sampling criteria were calculated using G*Power software. The required sample size for this study is 138 based on an effect size of 0.015, a power level of 0.95, and a maximum allowable error of 0.05. Furthermore, a sample size of 200 responses is required to conduct Structural Equation Modeling (SEM) analysis effectively. Data were collected between April and May 2023. A total of 280 usable responses were received at the end of the survey which met the minimum sampling criteria. Hence, we proceeded with

SEM analysis. A majority of the investors in this study are male (62.5%) and most of them are young investors from 18 to 25 years of age (42.5%). Nearly 79% of investors are aware of Wealthtech services.

Data Analysis and Results

The Partial Least Squares Structural Equation Modeling (PLS-SEM) approach was used to test the hypothesis. The hypothesis was tested using SmartPLS 4 software (Ringle et al., 2022).

Assessment of Measurement Model

Before testing the hypothesis, we validated the convergent validity, reliability, and discriminant validity of the model. Convergent validity was assessed using factor loadings and Average Variance Extracted. As shown in Table 2 all the loading values are higher than the threshold value of 0.7 and AVE values are higher than the threshold value of 0.6, thus convergent validity of the model is ensured. In addition to that reliability is checked using Cronbach's alpha and composite reliability. As posited in Table 2 the values of Cronbach's alpha and composite reliability for all constructs are higher than the threshold value of 0.7. Further discriminant validity was assessed using the Heterotrait-Monotrait ratio (HTMT) approach. According to the results shown in Table 3, all HTMT values are lower than 0.90, as suggested by Henseler et al. (2016). Moreover, since the VIF values for all the items are less than the maximum allowable limit of three, we ensured there are no multicollinearity issues in the research model.

Assessment of Structural Model

The structural model is assessed using the PLS-SEM approach by bootstrapping to 5,000 sub-samples. To test the structural model, R², path coefficients, and *t*-values were used. Results are listed in Table 4 and Figure 1, which show that the research model explains 36.6% of the variance (*R*²) in the adoption intention of Wealthtech. All the hypotheses except H5 were supported. Table 3 shows that Attitude and PBC are positively associated with intention to use Wealthtech ($\beta = 0.290, p < .001$; $\beta = 0.330, p < .001$) supporting H₃ and H₄. PEU and PU are positively associated with Attitude toward Wealthtech adoption ($\beta = 0.561, p < .001$; $\beta = 0.200, p < .001$).

Discussions

Wealthtech platforms play a key role in reshaping traditional investment paradigms by offering a combination of efficiency and personalization. In parallel with the transformational impact of Artificial Intelligence in education, Wealthtech platforms present a promising avenue for modern investors. We explored factors

Table 2. Measurement Model Analysis.

Construct	Item	Loadings	VIF	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	AVE
Attitude	ATT1	0.862	1.807	0.770	0.771	0.867	0.686
	ATT2	0.829	1.656				
	ATT3	0.792	1.428				
Intention	INT1	0.903	2.302	0.842	0.856	0.905	0.760
	INT2	0.888	2.186				
	INT3	0.822	1.754				
Perceived behavioral control	PBC1	0.812	1.475	0.779	0.779	0.872	0.694
	PBC2	0.824	1.668				
	PBC3	0.863	1.853				
Perceived ease of use	PEU1	0.843	1.717	0.799	0.799	0.882	0.713
	PEU2	0.853	1.747				
	PEU3	0.837	1.658				
Perceived usefulness	PU1	0.862	1.990	0.810	0.835	0.886	0.723
	PU2	0.885	1.853				
	PU3	0.802	1.600				
Subjective norms	SN1	0.846	1.962	0.823	0.833	0.894	0.738
	SN2	0.871	2.056				
	SN3	0.859	1.676				

Table 3. Heterotrait-Monotrait Ratio (HTMT).

	ATT	INT	PBC	PE	PU	SN
ATT						
INT	0.673					
PBC	0.874	0.679				
PE	0.856	0.528	0.860			
PU	0.635	0.474	0.648	0.678		
SN	0.521	0.381	0.465	0.365	0.317	

Table 4. Assessment of Structural Model.

Hypotheses	Path	β	T statistics	p Values	Decision
H ₁	PU → ATT	0.200	3.610	.000	Supported
H ₂	PE → ATT	0.561	8.353	.000	Supported
H ₃	PBC → INT	0.330	2.856	.004	Supported
H ₄	ATT → INT	0.290	2.738	.006	Supported
H ₅	SN → INT	0.076	1.152	.249	Not Supported

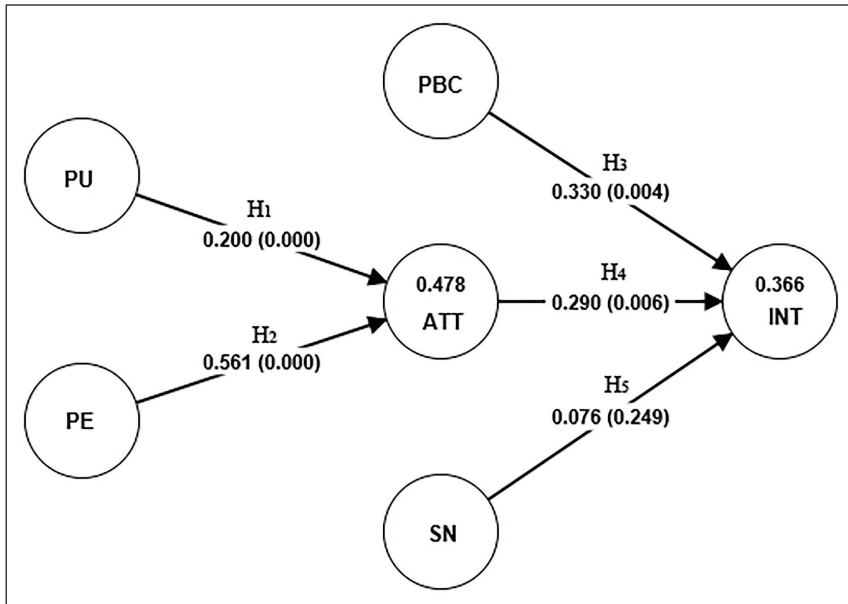


Figure 1. Hypothesis Testing Results.

that guide individual investors to Wealthtech platforms as the focus of this study. Using the TAM and TPB, the research aimed to decipher the intricate dynamics of attitude, PU, PEU, subjective norms, and PBC.

As was the case in previous studies and in accordance with TAM (Belanche et al., 2019; Davis, 1989; Himel et al., 2021), the study's findings highlighted the key role that PU plays in influencing users' attitudes toward Wealthtech platforms. This correlation is supported by the broader literature on technological adoption (Cordero et al., 2023; Kumari & Devi, 2022), which highlights the users' preference for tools that enable them to gain greater financial insight as well as improve their decision-making skills. Furthermore, the study emphasized the importance of PEU in influencing user attitudes toward adoption intention. Similar to existing research (Belanche et al., 2019; Himel et al., 2021), users preferred platforms with user-friendly interfaces and streamlined experiences, emphasizing the importance of intuitive design in technology. The study confirmed the relationship between attitude and intention, which was a notable contribution. In accordance with TAM and TPB's emphasis on behavioral intention (Ajzen, 1991; Cordero et al., 2023; Davis, 1989; Kumari & Devi, 2022), the findings revealed a significant positive correlation between attitude and adoption intentions, indicating the crucial role of attitudes and inclinations in shaping adoption behavior. Using these findings, financial service providers can develop marketing strategies that highlight Wealthtech's advantages and benefits, enhancing investors' overall attitude toward the technology.

However, subjective norms showed an intriguing deviation from the TPB framework. In contrast, the expected relationship between subjective norms and

adoption intentions did not reach statistical significance in the study. This result is contradictory to the existing literature (Aggarwal et al., 2023; Mazambani & Mutambara, 2019). While social influences play an important role in the adoption of many technologies, Wealthtech adoption may be more intrinsically motivated due to its highly individualized nature. Additionally, the study shed light on the role of PBC. Consistent with extant studies (Arkorful et al., 2022; Cordero et al., 2023; Kumari & Devi, 2022), PBC was positively associated with adoption intentions, emphasizing the key role of users' perceived confidence and proficiency in navigating Wealthtech platforms. As a result of this finding, it is crucial to provide educational resources and support to individual investors in order to enable them to develop confidence and competence when using digital financial services.

In summary, the study provides nuanced insights into the dynamics of Wealthtech adoption among individual investors in appose to the tenets of TAM and TPB. As the financial ecosystem undergoes a digital metamorphosis, these insights are indispensable to defining user-centric strategies and ensuring a seamless integration of technology and finance.

Implications

The theoretical implications of this study include refining existing paradigms of technology adoption and behavioral economics within the financial landscape. First, this study attempted to provide a theoretical framework to understand the adoption drivers of Wealthtech in a broader context which encompasses investment platforms, robo-advisory, and personal financial management technology. Second, as a result of this research, a greater understanding of how individual investor behaviors interact with technological innovations in financial services is gained by exploring the intricate factors influencing Wealthtech adoption through established models such as the TPB and TAM. This insight enhances the theoretical frameworks guiding the assessment of technology adoption patterns and behavioral decision-making processes within the financial sector.

The findings of this research have significant practical implications for financial service providers, regulators, and individual investors in India. A better understanding of the behavioral determinants driving Wealthtech adoption will enable service providers to develop more user-friendly platforms and marketing strategies that highlight the advantages of using these digital financial services. Regulators can use this information in order to formulate policies that promote the responsible and secure adoption of technology in the financial sector. Due to Wealthtech's ease of use and PU, individual investors can make informed decisions about their wealth management strategies.

Limitations and Future Research

Despite the fact that the study provides valuable insights, it is important to acknowledge its limitations. First, this study focused on individual investors in India through a cross-sectional analysis. Second, to measure the adoption intention

we used a few constructs only which limit the broader understanding of the context. Finally, the present research was conducted in a particular region only which limits the generalization of the study's results and findings. Future research can expand the scope to include diverse demographic groups and global perspectives. A longitudinal study will also yield better results. Additionally, reliance on self-reported data may introduce response bias, warranting the inclusion of objective measures in future investigations. Future research can also use well-established theories such as UTAUT, Innovation Diffusion Theory, and Task Technology Fit model to better understand user adoption of Wealthtech. The integration of these theories into a single theoretical framework may also help to understand the Wealthtech adoption factor better.

Conclusion

Using the TPB and the TAM, this study examined the adoption of Wealthtech by individual investors in India. These findings provide valuable insight into the factors that influence the intention to adopt Wealthtech and the role that PEU and PU play in shaping attitudes toward its adoption. The study's findings showed that Attitude and PBC are positively associated with the intention to adopt Wealthtech, showing that individual investors who have favorable views about the technology and believe they have control over its use are more inclined to use it. It is clear that PEU and PU are important factors in influencing individual attitudes toward Wealthtech.

In conclusion, the study serves as a stepping stone in understanding the complexities of Wealthtech adoption in India and lays the groundwork for future research in the domain of technology acceptance and behavioral finance. As technology continues to revolutionize the financial services landscape, recognizing the factors that drive individual investors' adoption of Wealthtech becomes increasingly crucial. The integration of the TPB and TAM has provided a holistic framework to comprehend investors' intentions and decision-making processes in the context of digital financial services. Ultimately, by harnessing these insights, stakeholders can collectively foster the growth of the Wealthtech sector, promote financial inclusivity, and empower individual investors in India to make well-informed decisions about their financial future. As the financial industry evolves in tandem with technology, continuous research, and analysis will be imperative to keep pace with the changing dynamics and capitalize on the benefits offered by Wealthtech to both investors and the economy at large.

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Retail Loans for Residential Solar in India: An Alternative Financial Product

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Abstract

The Government of India (GoI) had a target to add a cumulative rooftop solar capacity of 40 GW by 2022 as part of the country's Intended Nationally Determined Contributions (INDC). However, installations only made up about 30% of the target, even after the intended timeline. Within the rooftop solar sector, the household segment holds promise. However, it cannot realize its potential due to economic, regulatory, and structural reasons, including a lack of access to debt financing for households, which hinders progress. Existing solar debt financing products face challenges such as having limited financial performance records and requiring excessive collateral. Addressing these barriers is crucial for the residential rooftop sector's growth. The proposed resolution involves a retail loan product that employs the subsidy allocated to the residential sector to guarantee the solar system loan. This loan product will address access to finance issues in the residential rooftop solar sector using the capital expenditure (CAPEX) model. Banks and Financial Institutions (FIs) will be more comfortable lending to household consumers as there is a guarantee (30% of asset value). Since the subsidy is given back to the customer after the full loan payment, the customers have a greater incentive to repay the loan. Besides, this solution will also help address the lengthy subsidy disbursement issue. The loan product presents a pioneering approach to tackling the financing obstacles in the residential rooftop solar market. It not only aims to offer crucial debt financing but also showcases the commercial feasibility of the residential rooftop sector. By aligning the financial solution with the customers' requirements through

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favorable credit terms, this financing option encourages residential customers to transition to rooftop solar systems.

Keywords

Retail loans, residential rooftop solar, subsidy guarantee

Introduction

The sheer size of India's population and economy and the potential for strong economic growth for the next two decades can make India the world's second-largest emitter after China by 2030. India is leading from the front to fight climate change; under Nationally Determined Contribution (NDC), the Government of India (GoI) has pledged to lower the emissions intensity of GDP by 45% below 2005 levels by 2030 and reach net zero by 2070 (UNFCCC, 2022). India must invest in several low-carbon technologies to achieve this ambition: renewable energy (RE), green hydrogen, electric vehicles, green building, etc. RE will be the most important technological option to decarbonize the economy. The cost of adopting RE as a source of electricity has been declining rapidly between 2010 and 2022, which enables it to be a mainstream source of electricity due to a decrease in the cost of technology, an increase in the efficiency of technology, and a lower cost of capital (IRENA, 2023). The cost of electricity from solar photovoltaic (PV) and wind decreased by 89% and 69% between 2010 and 2022, respectively (IRENA, 2023). In India, it is no different—the cost of solar PV decreased by 80% between 2014 and 2020 (CEEW, 2021). In the RE segment, solar technology has become the dominant technology. Solar PV's technological performance record is already proven. Solar PV's energy source is the sun, so the energy input cost is zero and abundant, making solar a reliable and low-cost energy source. The key components of a solar PV system are solar panels, inverters, and solar batteries. The raw materials for these key components of solar PV are accessible, although there are challenges in certain countries. However, all large economies are investing in identifying new sources of raw materials and alternative raw materials for solar PV technology. Although solar panel production is heavily concentrated in China, other countries, including India, have started manufacturing solar panels, which can reduce supply chain challenges.

In India, solar power contributed to 57% of total RE capacity by the end of April 2024, compared to wind energy, the second-largest RE source, contributing 32% (MNRE, 2024). The rapidly declining cost of solar panels and batteries and the financing cost of solar energy have aided the cost of solar energy adoption, resulting in increased capacity addition (CEEW, 2021). There are two business models in solar technology: OPEX and capital expenditure (CAPEX) (Sarangi & Taghizadeh-Hesary, 2021). In the OPEX model, the project developer owns the solar assets and enters into a power purchase agreement (PPA) with the off-taker. The off-taker pays a monthly bill for all the generated units at the tariff agreed upon in the PPA. In the CAPEX model, the off-taker owns the system by paying the entire cost upfront. In the utility segment, OPEX is the primary business

model where a large solar developer agrees with a distribution company (DISCOM) to supply electricity for a certain number of years at the agreed price. In the distributed solar segment, there is a combination of CAPEX and OPEX; however, CAPEX is the dominant business model (GIZ, 2024). Both these models are commercially viable as the cost of solar energy is competitive with fossil fuel-based energy.

In 2015, the GoI announced a bold target of installing 100GW of solar power by 2022, comprising 60GW from ground-based solar systems and 40GW from solar rooftop systems. The government has had some successes with ground-based solar systems; 60GW of solar was installed by the end of 2022 and touched 82GW by the end of April 2024. The rooftop solar segment holds significant potential. A report by TERI suggests that the potential installed capacity of rooftop solar in urban settlements is about 124GW compared to 280GW of total existing power generation capacity in India (TERI, 2014). Thanks to the declining cost of solar PV systems, electricity generation from rooftop solar installation is already economically viable and, in some markets, cheaper than conventional energy sources. The rooftop solar sector has already achieved grid parity in most states. Despite its potential, few rooftop systems have been built in India, with installations totaling only 10.4 GW as of November 2023 (PIB, 2023), despite its commercial viability. The lack of an effective net metering policy, non-availability, high cost of debt financing, and concerns over enforcement of long-term contractual agreements are slowing down the sector's potential growth.

Within the rooftop solar segment, the residential rooftop solar segment holds significant potential in reaching this target, as it accounts for more than half of the identified rooftop solar potential in India, which stands at 124GW (RETA, 2016), with 72GW coming from the residential sector (Bridgeway to India, 2016). However, installed capacity in the residential rooftop sector was only 2.7GW by the end of June 2023, out of a total installed capacity of approximately 12GW of rooftop solar plants (Statista, 2023). The residential category makes up a mere 17%, which is disproportionately small considering the over 300 million households (IEEFA & JMK Research, 2023). Despite the declining cost of solar PV systems, which position rooftop solar PV as a cost-effective power source, the current installations fail to capitalize on their potential. Certain consumer segments have already achieved grid parity in the rooftop solar sector.

Although factors have been driving the adoption of solar rooftop systems in the residential sector, resulting in approximately 2GW of cumulative installations in FY 2022 (Gulia et al., 2022), the progress has been slow. This sluggish growth raises concerns about the government's ability to achieve its intended objective. The obstacles hindering the sector's expansion are numerous and varied.

Significance of the Study

The government's ambition to decarbonize the economy needs the success of all kinds of low-carbon technologies, including residential rooftop solar. Since residential rooftop solar capacity and electricity generation are far less than

desired to enable India to achieve its desired goal, it is important to address the challenges of adopting residential solar. One of the crucial barriers to low-carbon technologies is access to finance at an affordable rate. We are proposing a financial product that the government can deploy to enable households to raise debt financing, which is essential to buy rooftop solar systems.

Data Collection and Research Methodology

We have employed both primary and secondary research to conduct this study. We have identified key barriers to the residential rooftop solar sector through a literature review but validated and ranked these barriers based on primary research. We interviewed banks, government agencies, banks and financial institutions (FIs), and rooftop solar project developers. We have collected data on electricity consumption and the cost of electricity from secondary research; the sample city is a tier 3 city with maximum rooftop potential. We have collected all the data points for the rooftop solar system, including the cost of the solar PV system, operations and maintenance costs, capacity utilization, and annual degradation of the solar system by conducting primary research. We have interviewed solar developers to collect these data points. We have also collected all the financing-related data points, including bank executives' credit terms, loan cost, and loan tenure, by conducting interviews with bank executives.

Barriers to the Rooftop Solar Sector

The barriers to the growth of the rooftop solar sector are multi-fold, with some of the obstacles common to both OPEX¹ and CAPEX models. Some of them are listed below:

- a) **Lack of awareness:** Insufficient understanding of rooftop solar systems and their financial implications, coupled with a lack of knowledge about government incentive programs, impedes the widespread adoption of rooftop solar. Comprehending the trade-offs involved and being aware of the available incentives are paramount for individuals and resident housing societies to make informed decisions (Quraishi et al., 2019).
- b) **Lack of adequate financing:** The limited scale of deals, low energy tariffs in residential segments, and a lack of track record deter banks from offering debt financing to the solar sector. Additionally, the absence of suitable financial mechanisms further exacerbates the challenge of securing funding for solar projects (Garg & Shah, 2020; Thakur & Chakraborty, 2015).
- c) **Unstable policies:** Frequent updates and policy changes lead to instability, which creates uncertainty for project developers and investors. Furthermore, the complex and time-consuming process of disbursing subsidies, coupled with the unwillingness of electricity DISCOMs to offer net metering connections, acts as an obstacle to the growth and stability of the solar sector (Rathore et al., 2019).

- d) **Natural disasters:** Incidents such as cyclones, forest fires, etc., have the potential to damage or even destroy solar installations, causing a detrimental impact on their efficacy and increasing the perceived risk and costs associated with their implementation (Galvan et al., 2020).
- e) **Opportunity cost:** The economic benefit of implementing solar energy is not particularly strong in cost savings due to the minimal difference in expenses between solar rooftop systems and grid tariffs (Dalal et al., 2023; Singh & Deshmukh, 2019).
- f) **Lack of maintenance:** Neglecting the essential tasks of cleaning, inspection, and repair can lead to diminished efficiency, reduced energy generation, and even system failure, which can impede the overall performance and durability of the solar installation. Consistent maintenance is necessary to ensure the optimal output of the system (Farhan et al., 2021).
- g) **Lack of creditworthiness:** OPEX models are challenged by the possibility of nonpayment or consumer default on payments, as beneficiaries may be unable to honor the contract agreement-based sales. This is further compounded by lengthy payback periods and limited revenue streams, which raise concerns about creditworthiness and the associated risks. Moreover, the institutions may view rooftop projects that lack experience as a creditworthiness risk (Dutt, 2020).

Based on the inputs of stakeholders from our primary research², we have identified six key barriers impeding the growth of the rooftop solar sector. A snapshot of the prioritization of these barriers is highlighted in Table 1 based on the feedback received from stakeholders.

In this report, our focus is on the need for more financing options available to residential customers. A key reason for the lack of growth in solar rooftop installations in the residential segment is the lack of access to debt finance. This is important since rooftop solar systems are asset-heavy and carry a hefty price; thus, residential customers rely on bank financing to cover a portion of their

Table 1. Weighted Scores and the Ranks of the Identified Barriers.

Barrier	Rank
Lack of awareness	1
Lack of financing: high capital cost of projects & long gestation period	2
Evaluation of creditworthiness & contract enforcement	3
Poor public policy implementation and regulatory uncertainty	4
Weak economic case	5
The limited size of the projects	6

Note: Display the six barriers based on the primary research and the respective weights compiled by the authors.

CAPEX. Despite the availability of loan products for solar rooftop installations, they have not gained traction due to the following reasons:

- a) **Collateral requirement:** While home improvement/home equity loans are offered at reasonable rates, banks typically request the house itself as collateral against the rooftop solar loan. Since the rooftop solar system is considered a depreciating asset and lacks a secondary market, assessing its resale value and recovering losses can be challenging. This loan covenant discourages households from borrowing capital to invest in rooftop solar systems, especially when the value of their homes far exceeds the value of the solar installation (Jasmin & Mahesh, 2020).
- b) **Limited loan performance history:** Banks rely heavily on the historical performance records of a class of loan to evaluate associated risks. For instance, debt financing for the rooftop solar sector in the household segment is constrained due to the lack of historical performance records (CEEW, 2022). The lack of a long-standing history in the residential rooftop solar industry makes it difficult for banks to accurately assess performance and associated risks, making lenders apprehensive about providing loans to the residential rooftop solar sector.

Other loan products:

- c) **Personal loans:** Personal loans typically attract high interest rates, have short durations, and are unsecured. These financial terms and conditions do not align with the specific requirements of the residential rooftop solar sector.
- d) **Consumer durable goods loans:** Loans of this type, usually unsecured and meant for purchasing consumer durable goods like air conditioners, refrigerators, televisions, etc., are currently unavailable for buying solar rooftop equipment.

Considering the above barriers, we propose introducing a retail loan product that caters to the needs of households intending to invest in rooftop solar systems while also addressing the concerns of financiers through the efficient utilization of subsidies allocated to the residential rooftop solar sector.

Proposed Product Mechanics

The loan product (specified in Figure 1) possesses a range of features, including the ability to cover approximately 75% of the total installation cost (post-subsidy), with credit terms that are reasonable enough to generate power cost savings greater than monthly cash outflows on the loan. Additionally, only the underlying rooftop solar system will be utilized as collateral. Furthermore, the subsidy, which amounts to 30% of the asset's value, can be materialized by banks and FI and locked in as a guarantee. This guarantee may be returned to the consumer upon fulfilling all debt obligations. In the event

of a default, the FI can resort to the sale of the asset in the secondary market, and the resulting proceeds will be utilized to offset banks' and FIs' loan losses.

The process to implement the financial product is outlined in Table 2.

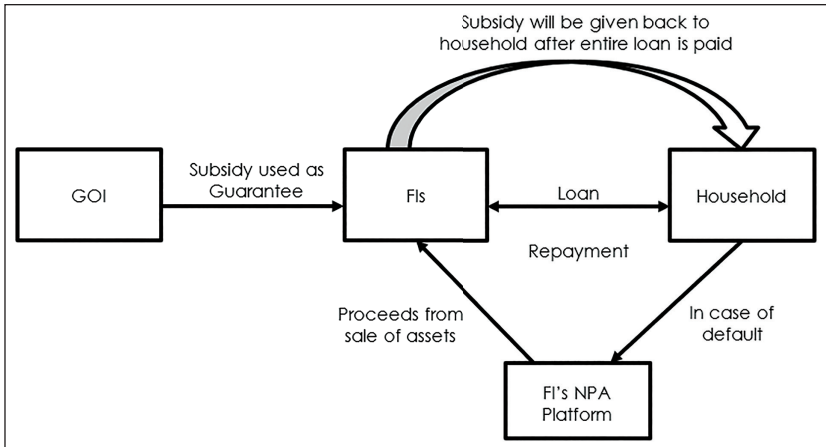


Figure 1. Diagrammatic Representation of the Process.

Note: A diagrammatic illustration of the envisioned procedure formulated by the writers.

Table 2. Steps to Implement the Financial Product.

Step	Process
1	The house owner applies for the loan.
2	Banks and FIs assess the applicant; the applicant must meet the criteria for getting the subsidy from them.
3	Guarantee directed to the FI immediately after FI assessment: FI uses the 30% subsidy by MNRE as the guarantee against the loan for the solar system.
4	FI provides a loan to the rooftop owner against the solar equipment as collateral.
5	Beneficiary makes EMI repayment against the loan.
6	FI transfers the entire subsidy to the household after paying the loan amount.
In case of default on the loan payment	
1	FI seizes the asset.
2	FI sells the recovered asset in a secondary market and recovers the loan amount.
3	In a recovery shortfall, the FI uses the 30% subsidy to cover the shortfall and returns the remaining amount to MNRE.

Considering the barriers (as discussed in the previous section), we suggest the development of a new loan product, whose features are described below:

- a) **Loan amount:** We propose a loan that covers approximately 75% of the total cost of the installation (post-subsidy). The remaining 25% cost is to be borne by the owner upfront.
- b) **Use of subsidy:** The current subsidy given to residential households to install a rooftop solar system would be a guarantee to the bank and FI.
- c) **Collateral:** The bank/FI may seize the underlying rooftop solar system in case of default. We assume the balance of systems (cables, etc.) and installation costs cannot be recovered. Our primary research suggests that 50% of the value of the original installation (without considering depreciation) can be recovered (solar panels + inverter).
- d) **Tenor:** The loan tenor should be such that the monthly power cost savings exceed the monthly interest outflows.
- e) **Interest rate:** Given that the degree of risk associated with the loan product falls between that of personal loans and home loans, we postulate that the loan cost should be reasonable enough to generate savings from the very first year. This feature will encourage customers as they see the immediate realization of savings.
- f) **Suitable financiers:** Most retail banks and FIs may offer loans catering to the personal and home loan market.

The loan product aims to expand the market for residential rooftop solar systems by fulfilling the needs of households. Furthermore, the loan product effectively reduces the potential risks debt financiers face by utilizing the current subsidy as a loan guarantee mechanism.

Innovation

The loan product presents a pioneering approach to tackling the financing obstacles in the residential rooftop solar market. It not only aims to offer crucial debt financing but also showcases the commercial feasibility of the residential rooftop sector. By aligning the financial solution with customers' requirements through favorable credit terms, this financing option encourages residential customers to transition to rooftop solar systems. Furthermore, including a 30% asset value guarantee provides reassurance to FIs, enhancing their willingness to extend loans. In the event of default, this guarantee can be monetized, bolstering the FI's confidence in providing the necessary funds.

Furthermore, the following impediments have been taken into consideration.

- a) **Addressing the financing needs of households:** The retail loan product aims to tackle the prevailing finance accessibility issues in the residential

rooftop solar sector, utilizing the CAPEX model through the provision of credit at more favorable terms.

- b) **Making banks and FIs comfortable to lend to the sector:** Banks and FIs will be more inclined to extend credit to customers with the assurance of a 30% asset value guarantee that may be utilized in the event of nonpayment.
- c) **Better recovery of loan:** Since the provision of subsidy is contingent on the complete payment of the loan, customers are incentivized to repay their loans with greater enthusiasm.
- d) **Addressing lengthy and cumbersome subsidy availability procedure:** This measure will additionally tackle the matter of subsidy allocation, as banks and FIs will receive the subsidy directly from the government, sparing the consumer from having to undergo the lengthy and cumbersome process.
- e) **Mitigating moral hazard issues:** The consumer will be motivated to repay the loan since the complete subsidy shall be availed only upon the full repayment.

Implementation Pathways

The loan program may be rolled out in states that are favorable to the growth of the residential rooftop solar sector. The implementation pathway is depicted in Figure 2. The specific key criteria, such as high electricity tariffs, state net metering policies, and a favorable stance toward the residential rooftop solar sector, can be used to identify states and cities suitable for the pilot implementation. Potential customers will be evaluated within the target states and towns based on various parameters such as income levels, electricity tariffs, customer and home loan records, electricity usage, and home ownership. Considering factors like shorter application processing time and high electricity tariffs—two critical drivers for adopting and installing rooftop solar systems—Maharashtra and Karnataka emerge as two ideal states to initiate this financial solution. Since public sector banks have a better footprint in tier-three cities, they will be suitable for rolling out the product. Additionally, as it is a

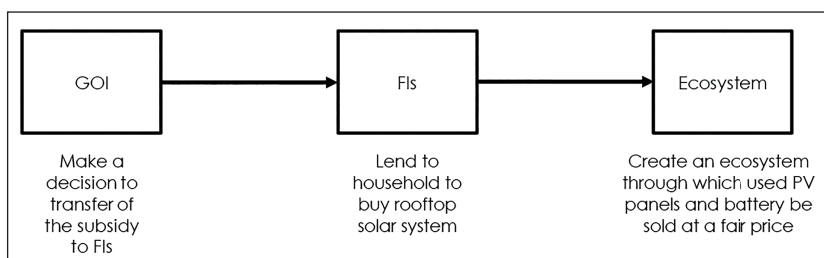


Figure 2. Diagrammatic Representation of the Implementation Pathway.

Note: A diagrammatic illustration of the envisioned pathway formulated by authors.

government scheme, public sector banks are better positioned to launch the loan product.

- a) **Government:** The government must decide to transfer the subsidy allocated for the residential rooftop solar sector to banks and FIs and transform it into a guarantee against loan default.
- b) **Banks and FIs:** FIs need to develop a comprehensive framework that evaluates both financial and behavioral aspects, such as the customer's financial robustness, the feasibility of adopting residential rooftop solutions to economize on electricity consumption, and their standing in the community upon embracing the residential rooftop solution. The specifics of this framework are elaborated in the annexure.
- c) **Ecosystem:** There is a need to establish an ecosystem that enables the sale of used PV panels and batteries at a fair price. We suggest the following steps to facilitate the creation of an effective secondary market for the rooftop solar system.
 - **Create a platform:** MNRE can develop a platform with rooftop solar developers and manufacturers. The platform will act as a marketplace to buy/sell through which secondary rooftop plants and inverters are aggregated and sold over a platform.
 - **Securitize and identification of the assets:** The financiers can create a security interest (through registration at CERSAI³) in the form of solar rooftop assets of standard quality with a proper O&M in place for the loan period. The key assets of solar PV systems are solar panels and inverters. These assets must have a unique identification number (RFID number, e.g.), making it easier to trade used solar panels and inverters in a secondary market.

Quantitative Modeling

In this section, we have analyzed to quantify the potential savings for prospective customers and evaluate loan performance from the perspective of debt financiers. Various factors, which we refer to as variables, can influence the saving potential and the loan performance. These factors include the lifespan of the solar PV systems, efficiency measured by the capacity utilization factor, system degradation over time, operation and maintenance (O&M) expenses, existing tariff rates, and the cost of interest. To assess the financial aspects, we have developed a cash flow model (Table 3) that aligns with the suggested capital structure outlined in the loan product features.

Our analysis indicates that household savings will begin from the first year onwards if the loan's cost is 10% and the loan tenor spans over 10 years. In addition, the FI's loan recovery is anticipated to exceed 100% from the very first year. The assumptions underlying our financial model, derived from primary research, are discussed in Table 4.

Table 3. Cashflow Model of Rooftop Solar System Compared to Access Electricity from the Grid by a Household.

	Y-1	Y-2	Y-3	Y-4	Y-5	Y-6	Y-7	Y-8	Y-9	Y-10
Average yearly consumption	3,600	3,672	3,745	3,820	3,897	3,975	4,054	4,135	4,218	4,302
CoE- DIS-COM	18,900	19,350	19,809	20,277	20,755	21,242	21,739	22,245	22,762	23,290
CoE- Roof-top										
O&M cost	1,500	1,545	1,591	1,639	1,688	1,739	1,791	1,845	1,900	1,957
EMI annu-ally	10,466	10,466	10,466	10,466	10,466	10,466	10,466	10,466	10,466	10,466
Net savings	634	913	1,197	1,486	1,781	2,081	2,386	2,698	2,728	2,674
Loan recovery	104.00%	102.70%	103.90%	106.40%	111.00%	125.30%	140.80%	171.00%	263.20%	NM

Notes: Displays the result of the analysis of the cash flow model performed by the authors. The region assumed: Tier 3 city in India where the rooftop solar segment has maximum potential.

Abbreviations: CoE = cost of electricity; O&M = operations and maintenance; EMI = equated monthly installment.

Table 4. Assumptions of the Model: Capital, Operating, and Financing Cost of Solar PV System for a Household.

Operating Inputs	Unit	Value	Investment Inputs	Unit	Value	Other Inputs	Units	Value
In-stalled capacity	KW	3	Recovery value of assets		50% of the book value	O&M costs	INR/KW/p.a.	500
Capacity factor	%	17.00%	Investment costs	INR/KW		Annual increase in O&M costs		3.00%
Average tariff	INR/kWh	3	Subsidy		30%	Per annum hours		8,760
Tariff escalation rate	%	5%	Debt/total assets		40%	Average monthly consumption		300
Annual degradation	%	1.00%	Loan cost		10.00%	Fixed electricity charges	INR/KW/month	175
			Loan tenor		120			

Source: Based on primary research, we have interviewed rooftop solar developers and bank executives to gather insights on the solar PV system, including modules, inverters, meters, cables, etc., as well as the type of financial institution, such as public sector banks.

Conclusion

As previously mentioned, the lack of consumer financing options and the requirement for collateral in the form of the house have acted as barriers, impeding the widespread adoption of rooftop solar systems in the residential segment. However, this instrument presents an enhanced alternative to existing CAPEX models for rooftop solar, aiming to overcome some obstacles.

Introducing the suggested loan product for residential customers has the potential to facilitate the broader adoption of rooftop solar solutions. This product offers a solution to counter the barriers faced by residential customers, such as the lack of availability and high cost of finance when considering rooftop solar installations. By utilizing the underlying guarantee, banks and FIs can safely diversify their portfolio by lending to a new group of customers. This helps establish a track record for lending in the residential rooftop solar sector and enables the creation of benchmarks for future reference. It can contribute to developing a loan loss curve specifically tailored to funding residential rooftop

solar customers and create a historical record of loan performance, serving as a valuable track record for future lending.

The next crucial phase in adopting the product involves obtaining the government's approval to convert subsidies into guaranteed products for rooftop solar loans. Additionally, it necessitates the creation of a marketplace where secondary solar panels and inverters can be traded at fair prices. Simultaneously, efforts should be made to identify banks and FIs willing to adopt and incorporate the product into their customer offerings. This strategic collaboration with interested FIs will play a pivotal role in driving the widespread implementation and success of the proposed solution in the residential rooftop solar sector.

Annexure

A profile of a typical loan applicant can be:

- a) CIBIL score—that depicts the past credit behavior of the loan applicant (A CIBIL score of 650 and above).
- b) A case for saving on electricity bill using residential solar solution (an average electricity consumption of 600 units per month and above).
- c) Past payment track record (Timely utility payment records, e.g., electricity and phone bills, etc.).
- d) Ownership of assets like the car, refrigerator, air conditioners, etc.
- e) Positive reference check.
- f) Access to the roof of ample size, architecture and minimal shadowing risk.

The above profile provides a strong case for a customer with good financial strength, an economic case for saving on electricity using the residential rooftop solution and good standing in the society adopting the residential rooftop solution.

Declaration of Conflicting Interests

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Notes

1. In OPEX model, the project developer owns the rooftop system and enters into a power purchase agreement (PPA) with the off-taker (household). The off-taker pays a monthly bill for all the generated units at the tariff as agreed in the PPA. In Capex model, the off-taker (household) owns the system by paying the entire cost upfront.
2. The barriers to the growth of residential rooftop solar described were identified by using primary research.

3. CERSAI provides the platform for filing registrations of transactions of securitization, asset reconstruction, and security interest by banks and financial institutions. At present, the portal provides the facility to file security interest in immovables created through all types of mortgages and in units under construction. Besides filing Security Interests in movables, intangibles, and factoring transactions is also available on the portal.

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The Moderating Effect of Digital Literacy on the Digital Financial Services and Financial Behaviour of Manufacturing MSMEs

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Abstract

This study explores the moderating effect of digital literacy on the relationship between digital financial services and financial behaviour in the context of manufacturing MSMEs. It highlights the transformative impact of digital financial services, including expanded access to formal financial services, financial inclusion, simplified payment processes, and improved credit accessibility for MSMEs. The study emphasizes the importance of digital literacy in effectively utilizing digital technologies and accessing digital financial services, which in turn influences financial behaviour, specifically in terms of savings, financing, and investment decisions. Drawing on the Technology Acceptance Model and Perceived Behavioural Control (PBC) theories, the research investigates the complex interplay among digital financial services, PBC, and financial behaviour among manufacturing MSME owners. The findings provide valuable insights for policymakers and financial institutions to enhance digital financial services and promote financial activities among MSMEs. Overall, this study underscores the significance of digital literacy and its role in empowering MSMEs and facilitating their financial growth in the digital era.

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Keywords

Digital literacy, financial behaviour, financial inclusion, investment decisions, digital era, financial growth

Introduction

Digital financial services (DFS) have revolutionized the financial sector for micro, small and medium enterprises (MSMEs), providing them with greater access to formal financial services, simplified processes and better financial management. These services have had a significant impact on MSMEs in several ways. First, they have expanded access to formal financial services, especially for those in remote areas or without physical bank branches (Beck et al., 2009). MSMEs can now open bank accounts, access credit, make payments and manage their finances online, bypassing traditional brick-and-mortar banks (Babajide et al., 2020). Second, DFS have played a critical role in promoting financial inclusion, particularly for MSMEs in developing countries who often face challenges in accessing formal financial services (Eton et al., 2021). They now have access to affordable and convenient banking services that allow them to safely save money, access credit and engage in digital transactions, ultimately increasing their economic participation (Klapper & Singer, 2014; Pazarbasioglu et al., 2020). Third, digital payment systems, such as mobile wallets and online payment platforms, have simplified payment processes for MSMEs, providing faster, safer and more convenient ways to accept and make payments. This efficiency helps MSMEs improve their cash flow management, reduce transaction costs and improve the customer experience (Kumar et al., 2022). Finally, DFS have facilitated access to credit for MSMEs, which have traditionally faced challenges in obtaining credit due to limited collateral and credit history (Buteau, 2021; Pandey & Gupta, 2018; Sudjatmoko et al., 2023).

The financial behaviour of MSMEs varies considerably depending on their circumstances and contexts. In the early stages, many rely on personal savings or funds from business owners to finance their operations. As businesses grow, they may seek external sources of finance. However, MSMEs often lack formal financial training or dedicated staff, leading to potential knowledge gaps in financial planning, accounting and taxation. Fortunately, there is a growing recognition of the importance of financial literacy and an increasing availability of resources to help MSMEs improve their financial management skills (Anshika & Singla, 2022; Atkinson, 2017). The adoption of digital technology and financial services is critical for MSMEs, providing improved financial management, access to digital banking services, online payment platforms and e-commerce channels (Achmad, 2023; Buteau, 2021). MSMEs that embrace technology are better positioned for growth and market competitiveness.

Digital literacy is essential for MSMEs to effectively use digital technologies, leading to improved operational efficiency, expanded market opportunities,

enhanced customer engagement, cost savings, data-driven decision-making and overall adaptability. It is a key driver of MSME growth and competitiveness in the digital age, enabling them to use DFS such as online banking, mobile payments and digital lending platforms (Raj & Upadhyay, 2020). Digital literacy fosters an environment of adaptability and agility, encouraging employees to embrace technological advances, stay abreast of industry trends, and proactively seek out innovative digital solutions.

India's manufacturing sector relies heavily on MSMEs for employment, industrial production and export earnings. The government has implemented policies and revised the definition of MSMEs in June 2020 to encourage their growth. Digital finance has had a significant impact on MSMEs, enabling them to access financial services and manage their finances efficiently (Hermawan et al., 2022).

The study aims to examine the impact of DFS on the financial behaviour of MSME owners, specifically in terms of savings, financing and investment (Amornkitvikai et al., 2021). A moderation analysis will also explore the role of digital literacy in this relationship (Erdem et al., 2023). The findings of the study could be valuable for government and financial institutions to improve DFS and encourage MSME owners to engage in financial activities such as saving, borrowing and investing (Candraningrat et al., 2020). Overall, there appears to be a gap between the use of DFS and the financial behaviour of MSME owners, which this study seeks to address (Monferrer et al., 2023).

Conceptual Framework

This study draws on the Technology Acceptance Model (TAM) and Perceived Behavioural Control (PBC) theories to examine the impact of DFS on the financial behaviour of MSME owners (Awe & Ertemel, 2021; Morales-Pérez et al., 2022). TAM research has identified perceived usefulness and perceived ease of use as primary predictors of technology acceptance, and digital finance has been shown to facilitate strategic decision-making to improve financial performance and sustainability (Al-Okaily et al., 2021; He et al., 2018). In addition, previous research has highlighted the convenience and security of online financial transactions through financial technology (Akinci et al., 2004; Laforet & Li, 2005; Singh & Srivastava, 2020). PBC, on the other hand, describes the factors that influence MSME owners' financial decisions regarding savings, financing and investment. When individuals believe they have control over an action, they are more confident in their ability to achieve desired outcomes (Atkinson, 2017; Chanda et al., 2023; Mutengezanwa, 2018). Thus, PBC appears to be one of the most influential factors that could affect MSME owners' savings, financing and investment decisions (Singh et al., 2018). Overall, this study aims to shed light on the complex relationship between DFS, PBC, and financial behaviour among MSME owners (Thathsarani & Jianguo, 2022).

Review of Literature

Fin-Tech

In recent years, Fintech companies have utilized technology to provide innovative financial products and services, such as mobile payments, peer-to-peer lending and robo-advisors (Puschmann, 2017). This transformative and disruptive innovation has challenged traditional financial markets, attracting a growing number of tech-savvy customers and spurring traditional financial institutions to innovate and adapt to the changing financial landscape (Lee & Shin, 2018).

To study the challenges associated with Fintech, it is crucial to adopt interdisciplinary research designs, theories and methodologies. Researchers can integrate existing knowledge from various interdisciplinary sources, such as finance and economics, strategy and organizations, marketing, statistics and data science, operations management and management science, and computer science, into new Fintech research (Gomber et al., 2018).

MSMEs can attain higher efficiency by adopting FinTechs. Therefore, it is essential for countries to introduce policies that support FinTech startups, which can enhance MSME efficiency (Abbasi et al., 2021).

Digital Services

According to Chanas et al. (2019), digital strategy making diverges from traditional strategic information systems planning as it embodies an extreme manifestation of emergent strategy development. Khin and Ho (2019) emphasize that the presence of both digital orientation and digital capability has a favourable influence on digital innovation, acting as an intermediary between technology orientation and financial/non-financial performance. Brunetti et al. (2020) emphasize that developing digital culture and skills before investing in digital infrastructure and technology is vital for successful transformation. The proposed pillars of strategies are (a) cultivate a digital-savvy culture and expertise, (b) invest in robust infrastructure and cutting-edge technologies and (c) foster collaborative ecosystems for sustained growth and innovation. Aziz and Naima (2021) argue that to achieve digital financial inclusion in developing countries, a comprehensive approach is needed. While digital services have improved access to financial services, their effectiveness is limited by connectivity, financial literacy and social awareness gaps. Abou-foul et al. (2021) suggest that manufacturers must blend physical and digital elements in their market offerings to fully harness the potential of the service model. Finally, Selimović et al. (2021) emphasize that active employee participation is crucial for a successful transformation, and workplace redesigns should be in sync with their expectations and requirements.

Digital Literacy

Digital literacy pertains to the adept and productive use of digital technologies, especially in empowering disadvantaged rural communities to access and utilize these tools for their advancement (Nedungadi et al., 2018). Digital literacy

encompasses various domains, from health, financial and eSafety to technical and social aspects that enable individuals to learn not only technical skills but also essential life skills and services (Nedungadi et al., 2018). Cetindamar Kozanoglu and Abedin (2021) examined the realm of digital transformation and enterprise systems where employees play a pivotal role. It is imperative to evaluate their digital literacy at both individual and organizational levels to understand their proficiency and readiness to adapt to the evolving digital landscape. Sharma et al. (2016) Assessed policies that prioritize digital literacy, digital inclusion and digital participation in knowledge-based societies is essential for fostering sustainable development. Bejaković and Mrnjavac (2020) highlight that the policy interventions are of utmost importance in boosting digital literacy, fostering digital inclusion and providing comprehensive workforce training. On the other hand, Kass-Hanna et al. (2022) observed that the financial and digital literacy can have varying impacts across different populations and locations. However, both forms of literacy can enhance resilience by promoting sound financial behaviours. In addition, Sariwulan et al. (2020) indicated that digital literacy exerts the most significant influence on the performance of MSME entrepreneurs, thus necessitating its prioritization in performance development strategies. This includes fostering digital business relationships, utilizing online facilities and leveraging digital networks for optimal outcomes. Finally, MSMEs in rural and regional areas face challenges in adopting digital technologies for entrepreneurial growth, but training can transfer knowledge, develop skills and foster confidence in adopting digital tools (Ollerenshaw et al., 2021).

Financial Behaviour

The MSME industry exhibits a lack of adequate financial literacy, especially concerning financial decision-making and organizing behaviour. Thus, to enhance learning outcomes, it is essential to train MSMEs in financial literacy using virtual small cash management firms, with a particular focus on creating financial reports (Tolba et al., 2014). Investment decisions in MSMEs depend on the financial knowledge, confidence and attitude of their owners. Both financial literacy and attitude influence their capacity to manage future finances. The capability of MSME owners to handle resources for investment is a reflection of their financial behaviour, evident through their adeptness in budget planning (Pahlevi et al., 2020). However, relying solely on financial behaviour cannot fully mitigate the influence of financial attitudes on investment decisions. This implies that future financial management attitudes could pose challenges for MSMEs in accurately estimating operational costs, potentially affecting their long-term business success (Hanggraeni & Sinamo, 2021).

The MSME sector has a high acceptance rate for financial technology, with many considering themselves moderate fintech adopters. They possess a strong grasp of the different financial services offered by fintech companies and are increasingly incorporating fintech products and services into their financial management (Ratnawati et al., 2022). This emerging scenario creates a lucrative market opportunity for fintech companies, incumbents and non-financial organizations

(Gupta et al., 2022). The root cause of this situation can be attributed to a lack of comprehension of financial concepts and products, coupled with limited access to financial management knowledge. MSME owners in this category also exhibit incomplete willingness and responsibility to manage their financial condition (Agustina et al., 2022).

Prior studies have identified a deficiency in digital literacy as a significant barrier to the adoption of DFS. Specifically, digital literacy refers to an individual's knowledge and skill in using technology. According to the research by Lo Prete (2022), countries with higher levels of digital literacy and GDP per capita tend to have a greater prevalence of internet-based digital payment methods. However, the presence of these payment methods is not solely determined by digital literacy. On the other hand, countries with a larger proportion of technologically capable populations tend to exhibit higher levels of digital literacy. These findings highlight the importance of promoting digital literacy as a means of overcoming barriers to DFS adoption.

The preceding literature suggests that DFS and digital literacy may have a substantial impact on the financial behaviour of MSME owners, thus, we hypothesize the following:

H_1 : The utilization of DFS significantly influences the financial behaviour of manufacturing MSME owners.

H_2 : The level of digital literacy significantly influences the financial behaviour of manufacturing MSME owners.

Drawing from the previous discussion, it is postulated that the financial behaviour of MSME owners can be significantly influenced by the implementation of DFS, alongside interventions that address digital literacy. As a result, we suggest the third hypothesis:

H_3 : The relationship between DFS and financial behaviour is moderated by digital literacy.

Methods

In this study, a causal research design and moderation analysis were utilized to investigate the interplay of digital literacy in the relationship between DFS and the financial behaviour of MSME owners in the manufacturing sector. A total of 732 manufacturing MSME owners from the southern region of India (Karnataka, Andhra Pradesh, Telangana, Kerala and Tamil Nadu) participated by completing an online survey administered through SurveyMonkey. The survey instrument employed a 5-point Likert Scale, focusing on assessing the usage and accessibility of DFS, as well as the financial behaviour of owners concerning saving, borrowing and investing. The data collection instrument was derived from Angeles (2022) and it was divided into three sections, with scales to measure DFS (access and use), digital literacy and financial behaviour. The manufacturing MSMEs'

Table 1. Reliability and Validity Table.

Latent Construct	CA	AVE	CR
DFS	0.814	0.756	0.841
Digital literacy	0.855	0.731	0.840
Saving behaviour	0.963	0.720	0.853
Borrowing behaviour	0.815	0.726	0.809
Investing behaviour	0.849	0.763	0.855

CA: Cronbach's Alpha; AVE: Average Variance Extracted; CR: Composite Reliability.

financial behaviour was determined by assessing their saving, borrowing and investing practices.

The researcher utilized Pearson's correlation analysis to examine the relationship between each variable, and structural equation modelling (SEM) using AMOS was conducted to further test this relationship. To explore the impact of a moderating variable on the relationship between an independent variable and a dependent variable, the Hayes process macro was employed.

Table 1 gives the results of the reliability and validity tests. The items of the variables have Cronbach's alpha coefficient greater than 0.08, indicating good reliability. Discriminant validity and congruent validity were assessed using average variance; extracted values are above 0.5 and the correlated factors are above 0.5 which is said to be satisfactory (Singh & Smith, 2006).

Results

The data from Table 2 reveals that 77.73% of the total respondents were male, while 22.27% were female. The largest age group among the participants was 25–34, comprising 33.20% of the respondents, followed by the 35–44-age group with 18.58% representation. Among the participants, 67.76% belonged to the micro-business category, while the small business category accounted for 20.90% and the medium business category for 11.34%. In terms of educational qualifications, the highest proportion of respondents had a bachelor's degree (44.40%), followed by those with a diploma (29.51%). High school education was reported by 9.43% of the participants, and postgraduate degree holders accounted for 16.67%.

The results from the Table 3 indicate several significant correlations among the variables studied. Digital literacy shows a strong positive correlation with the usage of DFS. Saving behaviour is positively correlated with DFS and digital literacy, while exhibiting a significant negative correlation with borrowing behaviour. Investing behaviour demonstrates significant positive correlations with DFS, digital literacy and saving behaviour. However, there is no significant relationship between borrowing behaviour and the other variables, except for a weak positive correlation with investing behaviour. These findings emphasize the importance of digital literacy in influencing DFS and saving behaviour, providing valuable insights into the relationships between these variables.

Table 2. Demographic Profile ($n = 732$).

Variable	<i>n</i>	%	Variable	<i>n</i>	%
Gender			Small	153	20.9016
Male	569	77.7322	Medium	83	11.3388
Female	163	22.2678	Age of Business		
Age Group			1–2 years	248	33.8798
18–24	149	20.3552	3–5 years	255	34.8361
25–34	243	33.1967	6–10 years	153	20.9016
35–44	136	18.5792	More than 10 years	76	10.3825
45–54	108	14.7541	Educational qualification		
55–64	59	8.06011	High school	69	9.42623
65 and above	37	5.05464	Diploma	216	29.5082
Business category			Bachelor's degree	325	44.3989
Micro	496	67.7596	Postgraduate degree	122	16.6667

Table 3. Pearson Correlation Result.

Variable		DFS	Digital Literacy	Saving Behaviour	Borrowing Behaviour	Investing Behaviour
DFS	Pearson's <i>r</i>	–				
	<i>p</i> value	–				
Digital literacy	Pearson's <i>r</i>	0.632	–			
	<i>p</i> value	<.001	–			
Saving behaviour	Pearson's <i>r</i>	0.238	0.287	–		
	<i>p</i> value	<.001	<.001	–		
Borrowing behaviour	Pearson's <i>r</i>	–0.026	–0.253	–0.742	–	
	<i>p</i> value	0.158	0.169	<.001	–	
Investing behaviour	Pearson's <i>r</i>	0.589	0.158	0.266	0.127	–
	<i>p</i> value	<.001	<.001	0.002	<.001	–

Table 4 presents the goodness-of-fit measures for two models: Confirmatory Factor Analysis (CFA) and SEM. Both models have identical basic goodness-of-fit statistics, indicating a similar fit. The chi-square/degrees of freedom ratio for both models is 1.689, within an acceptable range. The RMSEA values suggest a good fit, with 0.049 for the CFA model and 0.063 for the SEM model. The GFI and AGFI values indicate acceptable fit for both models, with slightly higher values for the CFA model. The CFI is 0.961 for the CFA model and 0.983 for the SEM model, indicating a better fit for the SEM model. The RMR values are below the threshold of 0.08 for both models, indicating a good fit. The SRMR values are 0.036 for the CFA model and 0.007 for the SEM model, with a better fit for the SEM model. Overall, both models meet the commonly accepted criteria for a good fit, suggesting that they provide satisfactory fits to the observed data.

Table 4. Goodness-of-Fit Measures.

The Goodness-of-Fit Measures	CFA Model	SEM Model
The basic goodness-of-fit		
Chi-square	152.335	152.335
Degrees of freedom	731	731
Absolute fit index		
Chi-square/degrees of freedom	1.689	1.689
RMSEA	0.049	0.063
GFI	0.761	0.746
AGFI	0.938	0.925
CFI	0.961	0.983
RMR	0.059	0.043
SRMR	0.036	0.007

RMR < 0.08, RMSEA < 0.08, CFI > 0.95, GFI > 0.90, AGFI > 0.90, SRMR < 0.05.

Table 5. Evaluation of SEM.

Relationship	Standardized	Standardized	<i>p</i> Value	Squared Multiple	Hypothesis
	Regression			Estimates	
	Weight			Coefficient	Test Result
DFS → FB	0.712	0.168	.00*	0.862	Accept hypothesis
DL → FB	0.763	0.589	.00*	0.831	Accept hypothesis

*Significance at $p < .05$; FB – financial behaviour; DL – digital literacy.

Table 5 presents the findings regarding the relationships between DFS and financial behaviour, as well as digital literacy and financial behaviour. The standardized regression weights indicate positive associations, with DFS having a weight of 0.712 and digital literacy having a weight of 0.763. This means that an increase in DFS or digital literacy is associated with a positive change in financial behaviour. The standardized estimates further support these relationships, with DFS having an estimate of 0.168 and digital literacy having an estimate of 0.589. These values suggest that for everyone standard deviation increase in DFS or digital literacy, financial behaviour increases by the corresponding estimate. The p values of .00 for both relationships indicate statistical significance at the $p < .05$ level. The squared multiple correlation coefficients (R-squared) reveal that DFS explains 86.2% of the variance in financial behaviour, while digital literacy explains 83.1% of the variance. These results support the hypothesis that there is a significant relationship between DFS and financial behaviour, as well as between digital literacy and financial behaviour. Overall, the findings suggest that both DFS and digital literacy play important roles in shaping financial behaviour and provide empirical evidence for their associations with financial behaviour.

Table 6. Evaluation of Moderation.

	Coeff	T	<i>p</i>	LLCI	ULCI
Constant	0.7058	0.5469	0.0000	0.1328	0.2114
FB	0.7653	0.3257	0.0000	0.3183	0.1427
DFS	0.1569	0.1243	0.0005	0.8751	0.7129
Int1	0.5229	0.2634	0.0027	0.2473	0.6811

Int1: FB×DL.

Table 6 presents coefficients, *t*-values, *p* values and confidence intervals for multiple variables. The constant term and variables financial behaviour and DFS do not show statistically significant effects on the outcome variable based on their *t*-values. However, the variable Int1 has a statistically significant effect with a positive coefficient. There is a conditional influence of DFS on financial behaviour alters as a result of the adoption of digital literacy.

Discussion

The results from the reliability and validity tests demonstrate that the variables exhibit good reliability, as indicated by Cronbach's alpha coefficients surpassing 0.8. Additionally, these tests establish satisfactory discriminant validity and convergent validity, supported by average variance extracted values and correlations exceeding 0.5. The demographic information reveals that the majority of participants are male, and the 25–34-age group is well-represented. Micro-businesses have the highest proportion, followed by small and medium businesses. Bachelor's degrees are the most common educational qualification. Pearson's correlation demonstrates significant correlations, indicating that digital literacy is positively correlated with DFS and saving behaviour, while saving behaviour has a negative correlation with borrowing behaviour. Investing behaviour shows significant positive correlations with all three variables. Additionally, SEM shows that both the CFA and SEM models have acceptable goodness-of-fit. SEM highlights the positive associations and statistical significance between DFS and financial behaviour as well as digital literacy and financial behaviour. Finally, moderation analysis presents coefficients and statistical results, indicating that the financial behaviour and DFS do not have significant effects, while the variable digital literacy does. In summary, these findings provide valuable insights into reliability, validity, demographics, correlations, model fit and the relationships between digital literacy and financial behaviour, underscoring the importance of digital literacy in shaping individuals' financial behaviour.

Conclusion

This study examines how digital literacy moderates the relationship between DFS and financial behaviour among manufacturing MSMEs. It underscores the crucial

role of digital literacy in effectively utilizing digital technologies and accessing DFS, which in turn affects financial behaviour. The research acknowledges the transformative potential of DFS, providing MSMEs with improved access to formal financial services, promoting financial inclusion, streamlining payment processes and enhancing credit accessibility. Furthermore, the findings emphasize the importance of digital literacy in shaping financial behaviour, particularly in relation to decisions regarding savings, financing and investment.

This research contributes significantly to a comprehensive understanding of the interplay between DFS, digital literacy and financial behaviour within the manufacturing MSME context. The findings hold valuable implications for government policymakers and financial institutions to enhance DFS and encourage active financial engagement among MSME owners, encompassing saving, borrowing and investing. The study emphasizes the necessity of bridging the gap between the utilization of DFS and the financial behaviour of MSME owners, highlighting the pivotal role of digital literacy in shaping financial conduct. Furthermore, the research lays a crucial foundation for future investigations and underscores the importance of digital literacy initiatives and targeted interventions to promote the adoption and effective use of DFS among MSMEs.

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An Exploratory Study on the Evolution of Hybrid Work

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Abstract

This article is an exploratory study into how hybrid work evolved from work from home and remote working and is the way forward for organisations with the advent of Artificial Intelligence. The researchers have studied previously published data and looked at various secondary sources of study especially newspapers and journals to understand the effect of COVID-19 work-from-home mandates and how it was possible as it was already in effect in organisations in a different manner. In this article, the meaning of the three types of work, that is, remote, work from home, and hybrid work, are looked at, with an emphasis on what limitations employers and employees have found in the first two methods that have served as a catalyst to start the modern method of Hybrid work. The article also looked at the origins of the concept of hybrid work and how it was a natural evolution, as a solution to the limitations that exist in remote working and working from home of employees.

Keywords

Management, behaviour management, human resource management, sociology of work and organisations

Introduction

Hybrid work, a form of remote working, is not new to the world of labour management. Hybrid work has been in existence since the 1960s but under different

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means and uses. Flexi-time was the concept that developed into what we now consider as 'work from home'. Hybrid work has its history in the post-World War period of labour shortages, world-over. While originally the idea was more towards the different start and stop timings, having branches and offices for reporting rather than working, the term hybrid work has come through many changes.

One of the major reasons for the development of hybrid work in its various forms was the COVID-19 pandemic. During the pandemic, work needed to get done, but the workers could not come to the factory or office. With governments enforcing strict measures to keep people off the streets, corporate offices realised that work would have to shift from offline to online platforms. One of the reasons this was possible in certain industries and not in all is based on the nature of the industry itself. Technology advancements have been so advanced that they gave certain businesses the chance to keep on an uninterrupted business but slightly differently than done previously. While this may not have been possible for a pure manufacturing industry, it was possible in industries that were more knowledge-driven and labour-intensive at the same time.

Flexi-time work gave the employee freedom to choose their work timings and one of its types was also the freedom to choose to work from home rather than at the office; the concept of remote working truly has its origins in flexi-timing. Flexi-time was a model used in companies like Accenture France as early as 2011, where employees were allowed to work three days from home in a week (Azam, 2018). Accenture has shown that it has always been a pioneer in this system, making the effort to invest in the IT infrastructure required to help people work from home during the COVID-19 pandemic.

Many organisations post-pandemic have adopted and implemented work-from-home policies as a permanent human resource working model, AirBnB, Google, Reddit and Shopify are the companies that have implemented HR policies required to keep employees working from home and have opened up various job profiles for the same (Howington, 2022).

After flexi-time what then came into the forefront is work from home, where the employee worked exclusively from home, which was used extensively by organisations during the pandemic; many fields of work, like academics, have now moved into a mixed mode. Some courses and works remain online but others have now come offline, depending on the level of communication or face-to-face communication required by these organisations, which is why the hybrid work model has now taken the stage.

Remote working meant the employee would check in from time to time at a satellite office close to where their homes were. Companies have invested in the infrastructure required by employees to do this, by providing laptops, internet facilities and even furniture required for employees to work remotely. Office spaces have been rented and leased in locations closer to employees, with less space as they do not need to host all the employees at any point in time. Remote working also adds the advantage of not making sourcing of resources to a specific place.

Hybrid work has a plethora of modes. There is no specific model that has to be used by organisations, but rather a mix of different models for different departments and uses. This flexibility based on needs gives organisations the road forward to better retain their employees and keep them satisfied.

An AT&T study has found that the hybrid work model may grow from 42% in 2021 to 81% in 2024. IWG research has shown that 72% would prefer the option of working remotely over a raise. Post-pandemic with the emphasis on work-life balance and people prioritising health and happiness, there has been a shift in the way employees are looking at the employment models offered by companies, having slightly lesser pay, but the option to work from home is being considered by employees to ensure more fulfilment in their lives.

Lately, as some organisations have started calling their employees back to work, they are implementing a mixed structure and not strictly calling employees to the office, it can also be seen that many are also trying to go completely remote as a cost-saving measure. Recently, Cognizant has converted 3 lakh jobs completely remote to retain its women workers. With a soft recession slowly working through the economy, any form of reduction in costs is seen as a boon by companies, and hybrid work, with less commute, smaller office spaces and more productivity is seen as a better option for organisations, especially in the IT field that can have it completely online.

Organisations have custom-made their version of work from home. In this article, a study is made to identify the need for hybrid working and how has it come into existence.

Review of Literature

Kagerl and Starzetz (2023) noted that as per their sample, work from home has given employees better flexibility and improved their productivity. They did an extensive study on firms and their distribution of the workforce from those who could do work from home and those who could not. They noted that not all job profiles could introduce remote working, but those where it was possible to introduce showed high productivity. It is also noted that when it comes to new employees who need to be introduced into the business, it would work better for the organisation if they had a hybrid model rather than a complete remote work, to better assist them in social acclimation.

Hopkins and Bardoel (2023) discussed that the hybrid work model is a combination of different work models and that it is a mix of flexi-time with some working completely from the office and some working few days at home and few days in the office, which depends on the organisation to find its best model. They have studied the different models applicable in companies through a series of interviews with Australian human resource managers. Through their study, they were able to identify the models for hybrid work and how it must be implemented; the IT infrastructure that will be required for such work and the support structures that would be required to have hybrid work models.

Ozimek (2020) studied the future of remote work when it was initially enforced in the year 2020. He noted that remote work had been adopted by over 50% of the workforce. The author interviewed hiring managers and looked at the success of remote working from their point of view. He noted that the benefits of remote work meant less commute, fewer unnecessary meetings, and fewer overall distractions that existed in workplace settings. He also found that the biggest drawback of working from home was the technological shift that suddenly took place with many companies and employees unable to adapt to the sudden rapid change. This article discussed that hiring managers said that productivity has increased under work from home and going forward it would double from its current 35%.

Yang et al. (2021) conducted a study of remote working at Microsoft and found that while communication mediums had changed during the work from scenarios, it was not by any means inefficient. Employees discussed using email and other asynchronous modes of communication more than the direct form. They also noticed that

while working from home can be an option for some workers, it was not necessarily something that could fit all job descriptions, rather a combination of models a mixed hybrid mode depending on the job profile is what made the most sense to organisations.

Statement of the Problem

Hybrid work is one of the latest movements taking place in today's workforce. With the advancement in technology, organisations are finding it increasingly easier to handle 'work from home' as a permanent option as it is in a better position to analyse the performance of the employees. While the work-from-home option started out as an option that was given to few employees with difficult circumstances, remote working was for businesses that needed a person onsite, now there is a change in the way remote work is offered to employees, with a hybrid approach with employees coming office in a few days in a week. The few disadvantages seen in remote work are being rectified with the hybrid approach. This study seeks to understand the history of hybrid work, its evolution and the models that organisations are using currently.

Need for the Study

It is important for organisations to understand the desire for employees to have the option of flexi-time, with sustainability and less commute, and employee satisfaction from remote working is something to analyse. For organisations where a part of the work can be done remotely, it is a huge boon to reduce office spaces and commute time. But there are certain limitations to completely working remotely or at home and this study seeks to understand those limitations and analyse the extent to which hybrid work acts as a solution.

Objective of the Study

1. To understand the differences between 'work from home', remote work and hybrid work.
2. To examine the limitations of remote working and working from home.
3. To analyse the evolution of hybrid work as a solution.

Research Methodology

This article is based on a review of the secondary data that has been collected from the existing available sources including theoretical papers, case studies and other types of papers, books and journals. Extensive reading and data collection have been done through various online and offline secondary sources, which included books, journals, articles, Google Scholar, newspapers and websites.

Limitations

1. As this is an exploratory study, only secondary data has been used.
2. Largely international sources have been used rather than Indian as more secondary data is available from international than national sources.

The Differences Between Work from Home, Remote Work and Hybrid Work

Remote Work

Remote work is an option for a workforce where the employee would not be logging into the central office that the organisation had rather. They would be given different options of either working from their homes, sharing spaces with co-workers, having a centralised location, or anything that is outside of a traditional workspace.

Remote working was not always possible pre-pandemic, as it required employees to keep in constant communication through phones. After the pandemic, there is a shift in the way this has evolved, so more organisations are able to give this option to their employees. Ten years ago, it was only available to those doing voice processes, those in sales or customer care, as their work did not require as much communication between employees, rather it was between the employee and the customer (Hamingson, 2023).

Shared workspaces were a concept that was used in remote working that slightly differed in practice, with different organisational needs. Remote working cannot always be called working from home, while that can be considered as one of the working spaces, it is not the only choice. Rather it is working from any location other than the office.

While the employee does the work primarily from home, this option would also mean an employee working offsite, closer to locational requirements rather than the office, for example, journalists. Magazine and article writers use this method when connected to one main office, but needing to go to the story.

Work from Home

Telenetworking and teleconferencing became so advanced especially out of necessity during the pandemic that something that was only provided in unusual circumstances and very rarely by organisations is now easily possible to implement. Pre-pandemic, the concept of work from home did exist, but organisations rarely provided opportunities to their workers unless absolutely required.

Companies had been slowly developing their teleconferencing solutions during the late 2000s but only took up the allowance of work from home for employees if a very serious situation prevented the employee from being able to commute to the office. Communal violence, natural disasters and emergencies were the rare situations when organisations offered employees the option to work from home (Livemint, 2023).

This had gone through its largest change during the pandemic and the post-pandemic years when governments shut down all non-essential offices focusing on having people stay home. The organisations that could work virtually completely were easily able to switch their offices. Even those who initially found this hard, for example, academicians, had faculty being trained and upskilled to move their work completely online, so students would not lose out on their learning for a particular year.

The pandemic forced the workforce to adapt to work from home, at the same time, organisations were also forced to put systems in place to monitor the productivity and work performance of the employees. New technology was developed to make it possible; the data could be tracked and upper-level management was trained to monitor these employees to ensure that the work was being completed and their requirements to do the work were met.

Hybrid Work

Hybrid work was a term coined in recent years when employees required differential handling. Some jobs required complete work from home or could be permanently done out of the office, but there were several disadvantages to it. New employee's adaptability, upper-level management checks and even promotional possibilities were hampered when the employee only worked from home.

With these disadvantages, a solution has now been formulated, with a mix of the two options, remote working and work from home, which has now led to hybrid work. The employee may, based on the job requirements, spend the lion's share either at home or at the office, but will have to spend parts of the week at the office depending on requirements.

Hybrid work gives the best options as the employee is also satisfied and has the option to take some days at home, maybe even weeks, and the employer gets the

benefit of having the workers in the office and being able to communicate directly. This option was especially important in organisations where they need higher-level management to be available in the office at certain times.

The hybrid model is now being discussed by organisations, and organisations are creating their own models based on their requirements in the field. The transformation from remote work being applicable only to a few employees in difficult circumstances to every employee due to the pandemic has led to this third option, a mix where the employee does have the option of being remote, but also does have to come from time to time to the office.

Organisations such as Amazon and Meta are following the hybrid work model where employees are expected to work from the office a couple of days a week (Gautam, 2023).

The Limitations in Remote and Work from Home

COVID-19 and its sudden economic shutdown brought a lot of companies to a standstill in the year 2020. Within a month, most companies came up with a fall-back policy and built systems so their processes could go on with employees working remotely. This was something that was already seen in the IT industry with remote working making it possible for people from diverse locations to meet and exchange ideas. Headquarters of major IT companies were in different parts of the globe and with employees deployed to various locations, video conferencing and remote working were necessary for teams to work.

While this was already a practice in IT firms, other online businesses also trained themselves in the same field in 2020. With Zoom opening up its platform for free usage and Microsoft introducing its own Microsoft Teams, the world and businesses could now work remotely. Work from home was easy to adapt in BPO, KPO, and IT industries, but even academic fields adapted to the situation and came up with options for students to study from home. An HR practice that was mostly used in industries with night shifts or needed employees to work remotely now become prevalent in several diverse fields. Many work-from-home opportunities and businesses rose to the forefront in 2020 and kept up its pace in 2021.

Another important factor to be noted is that a lot of employees felt a better work-life balance while working remotely, saved commute hours, with flexibility in timing to run errands. Remote working became a big boon for female employees in organisations as it gave them the work-life balance that they needed. In a survey conducted by McKinsey, 41% of respondents said that they are more productive working from home (Boland et al., 2020).

While this was a stop-gap solution for companies during the lockdown, it has changed and evolved into a model for HR in companies that were able to implement it properly. There are also reasons for the evolution of complete work from home to remote or hybrid work.

Kagerl and Starzetz (2023) in their study carried out in Germany, of the sample size, have observed that organisations are moving on from complete work from home or remote working due to the following reasons.

1. Not all organisations or processes can be modified to work from home, and this is one of the biggest reasons that companies do not prefer the work-from-home policy. While certain elements can be brought into all processes, mostly knowledge process organisations and creative works are the areas that can be done remotely.
2. Cooperation where teamwork is the foundation for the task is slightly more difficult online as certain works need the entire team to be in the same place to catch up and discuss and brainstorming would not be as effective in certain areas.
3. The corporate culture of exchange of ideas, the hierarchy, and succession planning is more difficult when employees work from home.
4. IT requirements in organisations were not as easy to meet as maintaining the culture of work from home. Wi-Fi capacity, network bandwidth, good software, and technical problem solvers are the basic infrastructure requirements that are plausible for all organisations.
5. The expectation of a high increase in productivity is not realised by organisations allowing their members to work from home. Employees perform as they do in the office.
6. There have been concerns about data breaches and how to maintain company secrets.
7. New trainees found it difficult to acclimate to the organisation and its culture while working completely online; although video conferencing has been used extensively, the social credit was not reached while working from home.
8. Some of the difficulties faced by organisations are the skill gap that needs to be filled in the employees. In organisations with younger employees, the learning curve was steeper, but with those with a larger number of older employees, their ability to pick up processes and bridge the gap is difficult. Not all tasks are suitable for work from home.
9. Management had to themselves go through training which revamped existing structures to suit the requirements of productivity and efficiency maintenance. Many existing management structures were unsuitable or the manager lacked the skills required to lead teams that worked virtually. While these look at the situation only from the employer's side, there were problems for employees also working completely from home.

Al-Habaibeh et al. (2021) in their study looked at the situation from the employees' side and found the following issues. They have noted several problems that employees have faced and the pitfalls that existed during the pandemic work-from-home policies:

1. IT infrastructure requirements are noted to be an area where employees felt it was difficult to match. A corporate office's level of structure would far exceed what an employee could have at home.
2. Health issues, managing children, and managing work hours properly were all problems that were felt by employees, whereas office work had a

start and stop time, working from home had no such restrictions leading to the extension of hours of work.

3. Documents and the expertise available to clear doubts were not always accessible in an online or complete work-from-home arrangement.
4. The element of socialisation and informal discussions of ideas and problem-solving is not accessible at home. Team building especially was not possible for employees, although some organisations did try to bridge the gap with online team events, they were not felt as effective as when conducted face to face.
5. The dedicated facilities are available in offices for those doing specialised work, labs, software, and technical infrastructure were sorely missed while working completely from home.

Mainly the overall feeling was that there was no proper line between work and family and work-life balance was missing. Employees also felt that the system did not allow them to have any networking or socialising opportunities, and the connection that is required in a system work created a disconnect in employees.

Based on these limitations, rather than doing away with working from home completely, organisations instead evolved the existing mechanism to create hybrid working, which was a mix of work from home, remote working, and working at the office. This mix depends on the requirements of the organisations and each of them is made to fit the needs of each department or function.

Through this, hybrid work has now come into force. Employees are aware of the practical difficulties faced by organisations, but more than 75% still prefer to work from home and are not ready to work from the office full time. Hence, a medium has been reached where a mix of both called hybrid work has come into existence.

The Evolution of Hybrid Model from Work from Home

Hybrid work is a form of work arrangement where the employee spends a few days in a week or a month at a designated office. Sometimes the arrangement is such that the employees meet together for special occasions or are called into the office for meeting with important clients. Depending on the need, the employer and employee come to an arrangement for the worker to come to the office.

The advantages of working remotely or from home are more than its limitations hence most employees do want to continue to work from home. Hybrid work acts as a solution to this problem, by covering the limitations faced in remote working.

1. The need for commuting is far lesser in the current scenario of being more sustainable, it is one of the biggest benefits of work from home. Hybrid work gives the best of two options because it allows the employee to reduce commuting hours drastically, but still get the benefit of having the employee at the office. With the cut down in travel requirements, it is

easier for employees to schedule their personal lives around the needs of the job while working in a hybrid manner.

2. There are fewer distractions while working at home, such as fewer coffee or lunch breaks, but the negative impact, that is, the lack of socialisation, can be addressed by the employee showing up to work a few times a week.
3. Important client meetings can be arranged and employees are informed to be available as required.
4. Employees can update the management on their requirements. Artificial intelligence has become such a large part of different organisations' infrastructure needs that are being met by these technological changes which has got a large push through remote work.
5. Women employees are increasing in the workforce as hybrid working gives them a chance to manage their families as well as their careers when they can spend the lion's share of their work at home.
6. Hybrid and remote working give better options for disabled workers and those who have health problems, reducing their time at the office.
7. Employees have the chance to base their homes everywhere which adds the advantage of sourcing talents for the organisation not being limited by location and hybrid work continues to add that benefit.
8. Organisations are not limited by way of infrastructure requirements. Less workspace renting reduces the carbon footprint and promotes sustainability. Employees can be sourced from anywhere which further broadens the possibility for organisations.
9. Employee retention increased through hybrid working as the employee still gets the advantages of remote working and the employers' requirements are also met.
10. With the advances made in technology, artificial intelligence is allowing organisations better possibilities to manage their human resources working hybrid hours.

Findings

Through the vast study of various secondary sources, research papers, newspaper articles and statistics, the following observations have been made.

1. A hybrid work concept of flexi-time has been in existence since the 1960s, so this is not a new concept that came into existence during the pandemic but a system that existed in a nascent form.
2. A lot of information technology advancements took place in organisations during the pandemic to meet the needs of the employees working from home. New software was released and adaptation took place for running a department.
3. Remote working is the concept of having a satellite office rather than one designated place of work, while the office could be at home, there is no restriction on the work having to only take place at home, it could be co-sharing or even café and hotels depending on the requirements of the job.

4. Remote working was mostly done by gig workers and those who had to go to the place of work, as work could be anywhere in the city, state or country.
5. Work from home was a necessity that the pandemic created, and as the country or state put restrictions on the travel of any kind, organisations had to adapt themselves to the situation.
6. Work from home was applied extensively in 2020 and 2021, although a form of it had already been in effect prior as a form of remote working by IT companies.
7. Hybrid work is a recent evolution that has come as a solution to problems existing in remote work and work from home.
8. Hybrid work is a form of work, where the employee works some days at the office and the other days at home. Based on the requirements and needs of the job profile, the employee or employer decides the number of days that the employees come into the office.
9. There were limitations in the work-from-home and remote working culture from the employer's point of view as some jobs could not be converted to full offside. New employees were not able to make the connections necessary.
10. IT requirements were deficient. In some cases, employee's productivity while good had not exceeded expectations when the employee worked outside the office. Management had to be trained and come up with new policies to manage the remote workers.
11. Employees feel that exclusively working from home leaves out the social interaction that they require. The network and connections that they get when going to the office are missed.
12. The level of infrastructure and documentation, especially the dedicated lab requirements are met better at work, which employees feel can be accessed when required, if they work more remotely.
13. Hybrid gives organisations employees a lot of advantages in terms of work-life balance, they do not need to move to their jobs and rather can stay where they are and check into the offices some days.
14. Hybrid work meets the needs of the employee and employer, both can compromise on how many days to work at home and at the office.
15. Many of the limitations seen in remote working are solved with organisations using hybrid work as it allows the organisation to meet their requirements, as well as retain employees.

Conclusion

The rapid change in the structure of the workforce when taken a step back and studied can be noted to be a gradual change. What started out as flexi-time and remote working changed to work from home during the pandemic and has now come to its final form of a hybrid work model.

With artificial intelligence further helping in management and more employees preferring a hybrid profile over an office job, organisations need to reconsider

their hiring strategies. A total of 94% of employees working hybrid models want to continue to do so, according to a 2022 Gallup survey.

Hybrid work gives the employees and employers a bridge to compromise on their individual requirements. Companies like Google were already working in these models proving to be ahead of the crowd in all spheres. There were limitations to remote and work-from-home options that have clearly been managed better with hybrid models and it is a natural evolution from an existing system.

Hybrid work gives solutions to the limitations that exist in remote working, provides better flexibility and work satisfaction, reduces commute time and requirement for office space, meets the needs of organisations and provides better job satisfaction to employees.

Research Gap

Further studies on how artificial intelligence can be used to give employees the option to continue to work remotely but meet the industry needs can be studied and how hybrid work has helped retain employees and provide better work-life balance are all avenues that HR in companies can study.

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