International Journal of Management, IT & Engineering
Vol. 14 Issue 8, August 2024
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gate as well as in Cabell's Directories of Publishing Opportunities, U.S.A

A Review on the Impact of Technological Advancements on Organizational Performance in Thread Manufacturing Industries: A Study of Pune District

1Mr.Sachin Suhas Doshi
Research Scholar
Shivnagar Vidya Prasarak Mandal's Institute of Management,
Malegaon BK, Tal-Baramati, Dist-Pune, 413115, India

2Dr. Dnyaneshwar Tukaram Pisal
Research Guide
Professor -Shivnagar Vidya Prasarak Mandal's Institute of Management,
Malegaon BK, Tal-Baramati, Dist-Pune, 413115, India Email- pisaldt@gmail.com

Abstract

Technological development has tremendously transformed industrial sectors in the thread production industry by improving productivity, product quality, and operating efficiency. However, many businesses still find it difficult to integrate new technologies on account of problems such as personnel retention, technology acceptance, as well as integration into production processes. This study examines the influence of technological improvements on organizational performance in the thread manufacturing businesses in Pune District and identifies important obstacles and recommended practices for the adoption of such technology. The study also presents policy proposals and research needs to increase the rates by which people adopt technology.

Keywords: *Technological Advancements, Thread Manufacturing, Pune, Organizational Performance, Technology Adoption Challenges, Policy Recommendations*

1. Introduction

Context: The Value of Technological Developments in Manufacturing Sectors

There are many other ways through which technological advancements have completely transformed manufacturing, namely, automation, AI procedures, Internet of Things-based manufacturing systems, etc. Apart from increasing sustainability and competitiveness (Todorović et al., 2022), these technologies increase cost efficiency, manufacturing efficiency, and control quality. The thread manufacturing industry (Zeebaree et al., 2021) has benefited most from digital tracking technologies, smart equipment, and lean manufacturing approaches using approaches that improve productivity and eliminate waste. Adoption rates, however, are different, and some businesses are limited by budgetary constraints, worker adaptation issues, and technical reluctance.

Problem Statement: Adoption of New Technologies Presents Difficulties for Thread Manufacturing Industries

Although technological improvements offer many advantages, many thread manufacturing firms located in Pune are not able to properly integrate the use of current production technology. The major issues are employee retention, skills shortage, automation cost,

reluctance to change, and challenges of integrating technology in the current production processes (Rohilla et al., 2024). Lack of organized technology adoption models complicates decision-making on its use and will lead to wanton use of the resources (Yahaya, 2016).

Purpose of study

This research is to show the impact of technology on worker efficiency and productivity and quality assurance in the thread production sector. The main contribution of this study is to evaluate workforce training needs, policy support, and the obstacles to the adoption of the technology, valuable suggestions for effective use of the technology integration (Kiptoo & Koech, 2019). The modern manufacturing techniques that could also enhance market competitiveness, profitability, and operational efficiency (Almehairbi et al., 2022) will also be a focus of the project.

Scope: Pune District's Thread Manufacturing Industries as a Case Study

The research is on the thread manufacturing sectors of the Pune District, incorporating a variety of small, medium, and big businesses at different stages of the adoption of technology. Pune is actually a good place to investigate the possibility of technology contributing in some way to the production processes, considering that Pune boasts a strong industrial base and government backing for smart manufacturing (Hee et al., 2018). Duman and Akdemir (2021) indicate that the study shall focus on how businesses address issues of technology, including automation, workforce upskilling, and initiatives in sustainability.

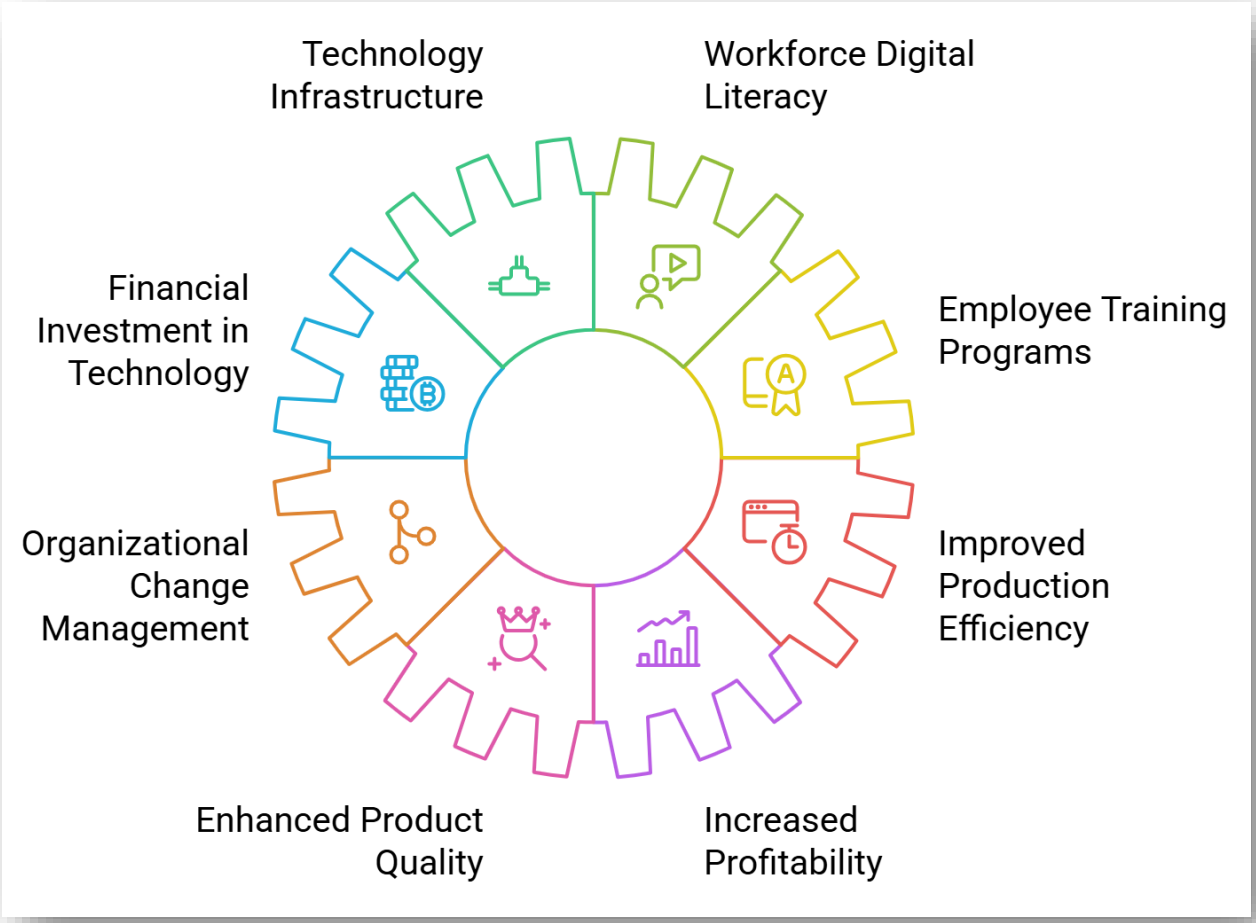
2. Theoretical Structure of Manufacturing Technology Adoption

Models of Technology Acceptance: TAM and UTAUT

Theories of the Unified Theory of Acceptance and Use of Technology (UTAUT) and Technology Acceptance Model (TAM) are theorized for comprehending variables important for technology adoption in manufacturing. Both UTAUT and TAM consider performance expectation, social influence, and enabling factors in their elements of adoption variables (Chen et al., 2019) (Lee et al., 2022), but differ somewhat in what they emphasize as the important adoption variables, viz., perceived utility and ease of use for TAM and performance expectation, social influence, and enabling factors for UTAUT. Having a thorough understanding of these concepts may enable thread manufacturers to intervene in a manner that will induce technological acceptability.

Fig 1: Conceptual Model of Technological Adoption and Organizational Performance in Thread Manufacturing

(Source: Chen et al., 2019)



3. Review of Literature

3.1. Adoption of Technological Advancements in Thread Manufacturing

Global and Indian Trends in Technology Adoption

The advent of Industry 4.0 and automation as well as smart manufacturing has had a significant change in the manufacturing sector's acceptance of technical innovations. Nasir et al. (2022) note that investment in AI-driven manufacturing has taken time among nations, including the U.S., China, and Germany, while India has lagged behind, spending some time hesitating over the change and was inhibited by the high prices. As businesses in the thread manufacturing industry move further to the computerized textile machines, digital tracking, and the AI-powered quality control systems, efficiency and competitiveness are increased (Shahid et al., 2023).

Industry 4.0 and Its Impact on the Textile and Thread Manufacturing Sector

Thus, Industry 4.0 has been applied in thread manufacturing to IoT-based machine monitoring systems, AI-based fault identification, and production process automation. Nevertheless, Indian businesses have different approaches towards its implementation, and only the smaller enterprises are faced with challenges due to the lack of resources and the lack of technology awareness (Zeebaree et al., 2021). Using AI-driven forecasting models,

blockchain-based supply chain management, robotics automation, etc., bigger businesses have made operational effectiveness better and eliminated waste (Fahim et al. 2021).

Table 1: Comparative Analysis of Traditional vs. Advanced Technology in Thread Manufacturing

(Source: Zeebaree et al., 2021. Impact of Innovation Technology in Enhancing Organizational Management. Economic and Environmental Studies, 38(4). DOI: 10.25115/EEA.V38I4.3970)

Parameter	Traditional Technology	Advanced Technology (Industry 4.0)
Production Efficiency	Manual processes, slower output	Automated machines, faster production
Quality Control	Human inspection, error-prone	AI-based defect detection, precision
Cost-effectiveness	Higher operational costs	Reduced costs via automation
Workforce Requirements	High manual labor dependency	Upskilling required for digital operations

3.2. Challenges in Technological Adoption in Thread Manufacturing

Employee Resistance and Training Gaps

AI adoption and organic automation through production through AI will benefit the organization in some sense, but two big obstacles are employee resistance and a lack of digital training. While some people failed to use digital tools and data-driven processes, and some are afraid that their job might be replaced by automation (Yahaya, 2016). To make sure the technology integration is smooth and to surmount the difficulty, the organized training programs and staff re-skilling are essential (Shahid et al., 2023).

3.3. The Internet and Other Technological Developments and Organizational Effectiveness

Enhancement of Product Quality and Production Process Efficiency

Though faults are reduced by technological development and cycle times are shorter, larger efficiency is created by manufacturing. Quality control systems powered with AI, which can detect the defects on the products in real time, help to increase the product uniformity and reduce the waste (Nasir et al., 2022). With the automated process, it has improved the supply chain's effectiveness and stock keeping (Zeebaree et al., 2021).

Table 2: Government Incentives for Technological Adoption in Indian Manufacturing Industries

(Source: Nasir et al., 2022. The Influence of Transformational Leadership on Organizational Sustainability in the Context of Industry 4.0. Cogent Business & Management, 9(1), 2105575. DOI: 10.1080/23311975.2022.2105575)

Government Scheme	Objectives	Industries Benefiting
Make in India	Tech adoption funding	SMEs and MSMEs
PLI Scheme	Incentives for automation	Large-scale manufacturers
National Skill Development Mission	Workforce digital training	Textile, manufacturing

4. Research Gaps Identified

Limited Empirical Research on Technological Adoption in the Indian Thread Manufacturing Sector

Although much has been researched in terms of technical developments in manufacturing, comparatively less has been done in terms of research in the Indian thread production sector in particular because of the paucity of empirical research. Research focusing on Industry 4.0 and smart production in the automotive, pharmaceutical, and general textile industries does not adequately address specific matters pertaining to thread makers (Dutta et al., 2020). With respect to our thread sector, there are very few empirical studies on financial impacts from supply chain management introduced by applying the blockchain, IoT, and AI in the automation flow (Bianchini et al., 2024).

Absence of Research on Workforce Automation Adaptation and Employee Perception

There is so much of a vacuum of knowledge as to how workers within the Indian industrial industry perceive and accommodate their sudden automatization. The use of technology mentioned in these several studies does not mention the mental and skill-based problems in employees (Jena & Patel, 2021). However, there has been little research on how to handle the adaptation to the automation-driven job positions and how training initiatives succeed (Hammer & Karmakar, 2021).

Industry-Specific Case Studies on Effective Technology Integration

Usage of AI, IoT, and smart manufacturing is not discussed well in case studies of Indian thread industries. The majority of existing research on the existing research has been on technology adoption in pharmaceutical and automotive industries (Mukherjee & Sarkar, 2020). Yet, future studies are left to look for cases of the actual use of digital transformation that actually increase productivity and efficiency (Rakshit & Srivastava, 2021).

5. Prospects and Future Courses for Using Technology in the Production of Threads

5.1. Spending on AI-assisted quality control and production monitoring enabled with Io

The outcome of smart manufacturing needs to be enhanced with IoT-based sensors and AI-based monitoring systems in a way that waste is minimized and the output is maximized. Investments in predictive maintenance, real-time data analytics, intelligent logistics, and many more will significantly improve efficiency in the thread manufacturing sector (Dutta et al., 2020).

Cybersecurity Procedures for Safeguarding Data in Intelligent Manufacturing

As industrial automation and IoT infrastructure become more digital, the process and the machines are not differentiated, and any type of cybersecurity risk that could be faced can trouble manufacturing processes such as ransomware attacks and data breaches. Sensitive industrial data security can be provided with the use of encrypted cloud computing and/or the use of blockchain-based security methods (Schuetz & Venkatesh, 2020).

5.2. Workers training and skill development

Preparation of Training Courses to Train Employees in Web Manufacturing

To support technology adoption without any impediment, a system needs to be encouraged for personnel upskilling that focuses on automation, AI literacy, and usage of such digital tools (Hammer and Karmakar, 2021).

Cooperation for Skill Development Between Academic Institutions and Industries

Collaboration undertaken by the public and private sectors can be used to develop training programs for people to upskill in jobs in the smart manufacturing industry (Purohit, 2020).

5.3. Policy Suggestions for the Adoption of Technology

Adoption of Manufacturing Technology at the National Level

In order to ensure a consistent transition across sectors, it is necessary for the rules pertaining to smart manufacturing to be standardized across different sectors (Tripathy et al., 2018).

The financial incentives ensure that the SMEs would invest in the advanced manufacturing technology.

This would help SMEs adopt AI, IoT, and automation more easily (Gupya, 2023), and thus they should also qualify for financial incentives, tax breaks, and subsidies.

6. Conclusion

The research demonstrates that technological enhancements directly affect the performance levels of thread manufacturing businesses throughout Pune District. Productivity rates have improved alongside quality standards while costs have decreased because thread manufacturing companies implement automated systems and AI quality control and Internet of Things monitoring and smart logistics management. The complete technical potential remains difficult to achieve because financial constraints intersect with labor resistance together with insufficient empirical evidence.

Industry trends indicated by research show manufacturers adopt Industry 4.0 technologies at a gradual pace through the combination of blockchain supply chain management and real-time analytics along with smart equipment. The scale-up of adoption remains limited because of insufficient training for personnel and inconsistent official backing and technological skepticism from small businesses, although progress appears to show improvement.

Suggestions for Enhancing Organizational Performance and Technology Adoption

These following suggestions aim to accelerate the efficient technology implementation:

1. Protecting manufacturing processes demands investments in cybersecurity procedures and AI-powered defect detection systems together with predictive maintenance.

2. A collaborative approach between academic institutions and business organizations will develop workforce training programs that enhance staff members' understanding of automation systems and digital technologies.

3. SMEs can be motivated to employ AI-driven automation through government programs that include tax discounts with accessible technological financing and funding benefits.

4. The development of policies needs standardization requirements for technology deployment through improvements in regulatory manufacturing technology rules to ensure sector-wide uniformity.

5. Public-Private Partnerships for Innovation establish industrial alliances between technology providers with manufacturing entities and academic institutions with the goal of developing sustainable technology adoption models.

Prospects for Further Study on Technology-Driven Manufacturing Models

Upcoming studies targeting this research field must focus on three major areas:

1. Longitudinal Research on Technology Adoption: Assessing the long-term effects of automation, IoT, and AI on thread manufacturing production efficiency and organizational sustainability.

2. Change Management for Employees Analyzes worker perceptions of automation besides the effectiveness of training methods and strategies to transition their workforce.

3. Field research based on specific industrial sectors is being performed to create technology adoption models that can scale across the Indian thread manufacturing industry.

4. The analysis investigates worldwide leading manufacturing systems in conjunction with their applicability and relevance to Indian small and medium-sized enterprises manufacturing operations.

5. A policy-focused investigation analyzes governmental policies together with financial supports to examine industrial sector technical innovations throughout India.

References:

1. Todorović, T., Medić, N., Delić, M., Zivlak, N., & Gračanin, D. (2022). Performance Implications of Organizational and Technological Innovation: An Integrative Perspective. Sustainability. DOI: 10.3390/su14052836

2. Zeebaree, M., Ismael, G., Nakshabandi, O. A., Saleh, S., & Aqel, M. J. (2021). Impact of Innovation Technology in Enhancing Organizational Management. Economic and Environmental Studies, 38, 4. DOI: 10.25115/EEA.V38I4.3970
3. Rohilla, N., Vijh, G., Ganguly, I., Nayyar, S. K., & Bathla, S. (2024). The Impact of Technological Innovation on Employee Performance in the Indian IT Industry: An Empirical Study in NCR. Journal of Information and Optimization Sciences. DOI: 10.47974/jios-1476
4. Yahaya, N. (2016). Technology Impact Performance of Employee in Manufacturing Industry. Industrial Research Journal.
5. Kiptoo, L., & Koech, P. (2019). Effect of Strategic Innovations on Organizational Performance. Strategic Journal of Business & Change Management, 6(2), 443-360.
6. Almehairbi, K. M. S. S., Jano, Z., & Mosali, N. A. (2022). Structural Relationship of Technology Adoption and Performance Factors in UAE Manufacturing Industry. International Journal of Sustainable Construction Engineering and Technology. DOI: 10.30880/ijscet.2022.13.04.028
7. Hee, O. C., Ibrahim, N., Rizal, A. M., Kowang, T. O., & Fei, G. C. (2018). Literature Review on Organizational Learning and Technological Innovation and Manufacturing Performance in Malaysia. International Journal of Academic Research in Business and Social Sciences. DOI: 10.6007/IJARBSS/V8-I6/4228
8. Duman, M. C., & Akdemir, B. (2021). A Study to Determine the Effects of Industry 4.0 Technology Components on Organizational Performance. Technological Forecasting and Social Change, 167, 120615. DOI: 10.1016/J.TECHFORE.2021.120615
9. Chen, Q., Wang, C. H., & Huang, S. (2019). Effects of Organizational Innovation and Technological Innovation Capabilities on Firm Performance. Asia Pacific Business Review, 26, 72-96. DOI: 10.1080/13602381.2019.1592339
10. Lee, K., Romzi, P. N., Hanaysha, J., Alzoubi, H. M., & Alshurideh, M. (2022). Investigating the Impact of Benefits and Challenges of IoT Adoption on Supply Chain Performance and Organizational Performance. Uncertain Supply Chain Management. DOI: 10.5267/j.uscm.2021.11.009
11. Nasir, A., Zakaria, N., & Yusoff, R. Z. (2022). The influence of transformational leadership on organizational sustainability in the context of Industry 4.0: Mediating role of innovative performance. Cogent Business & Management, 9(1), 2105575. DOI: 10.1080/23311975.2022.2105575
12. Shahid, M. N., Malik, A., Azhar, T., & Iqbal, M. S. (2023). Technology reshaping the future of industry: The impact of e-HRM on organizational performance with the mediating role of IT training. Pakistan Journal of Humanities and Social Sciences. DOI: 10.52131/pjhss.2023.1102.0572
13. Zeebaree, M., Ismael, G., Nakshabandi, O. A., Saleh, S., & Aqel, M. J. (2021). Impact of innovation technology in enhancing organizational management. Economic and Environmental Studies, 38(4). DOI: 10.25115/EEA.V38I4.3970
14. Fahim, S. M., Inayat, S., Zaidi, S. M. R., Ahmed, D., Hassan, R., & Ali, S. Z. (2021). Influence of organizational culture & intellectual capital on business

performance in textile industry of Pakistan. Journal of Information and Organizational Sciences. DOI: 10.31341/jios.45.1.11

15. Yahaya, N. (2016). Technology impact performance of employee in manufacturing industry. Industrial Research Journal.
16. Shahid, M. N., Malik, A., Azhar, T., & Iqbal, M. S. (2023). Technology reshaping the future of industry. Pakistan Journal of Humanities and Social Sciences. DOI: 10.52131/pjhss.2023.1102.0572
17. Nasir, A., Zakaria, N., & Yusoff, R. Z. (2022). The influence of transformational leadership on organizational sustainability in the context of Industry 4.0. Cogent Business & Management, 9(1), 2105575. DOI: 10.1080/23311975.2022.2105575
18. Zeebaree, M., Ismael, G., Nakshabandi, O. A., Saleh, S., & Aqel, M. J. (2021). Impact of innovation technology in enhancing organizational management. Economic and Environmental Studies, 38(4). DOI: 10.25115/EEA.V38I4.3970
19. Dutta, G., Kumar, R., Sindhwani, R., & Singh, R. (2020). Digital transformation priorities of India's discrete manufacturing SMEs – A conceptual study in perspective of Industry 4.0. Competitiveness Review: An International Business Journal. DOI: 10.1108/cr-03-2019-0031
20. Bianchini, D., Fapanni, T., Garda, M., Leotta, F., Mecella, M., Rula, A., & Sardini, E. (2024). Digital Thread for Smart Products: A Survey on Technologies, Challenges, and Opportunities in Service-Oriented Supply Chains. IEEE Access. DOI: 10.1109/ACCESS.2024.3454375
21. Jena, A., & Patel, S. (2021). Analysis and evaluation of Indian industrial system requirements and barriers affecting Industry 4.0 technologies. The International Journal of Advanced Manufacturing Technology. DOI: 10.1007/s00170-022-08821-0
22. Hammer, A., & Karmakar, S. (2021). Automation, AI, and the future of work in India. Employee Relations: The International Journal. DOI: 10.1108/ER-12-2019-0452
23. Mukherjee, A., & Sarkar, S. (2020). Institutional barriers to technology adoption: The case of silk technology in colonial India. IO: Productivity. DOI: 10.2139/ssrn.2766869
24. Rakshit, P., & Srivastava, P. K. (2021). Cutting-edge IoT technology for smart Indian pharma. 2021 International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE). DOI: 10.1109/icacite51222.2021.9404627
25. Dutta, G., Kumar, R., Sindhwani, R., & Singh, R. (2020). Digital transformation priorities of India's discrete manufacturing SMEs. DOI: 10.1108/cr-03-2019-0031
26. Schuetz, S., & Venkatesh, V. (2020). Blockchain, adoption, and financial inclusion in India. International Journal of Information Management. DOI: 10.1016/J.IJINFOMGT.2019.04.009
27. Hammer, A., & Karmakar, S. (2021). Automation, AI, and the future of work in India. DOI: 10.1108/ER-12-2019-0452

28. Purohit, S. (2020). Technological transition from analog to IoT in Indian petro-retail's customer service. Indian Journal of Science and Technology. DOI: 10.17485/ijst/v13i42.1964
29. Tripathy, A., Shanker, B., & Kabilan, P. (2018). Future of Indian auto industry: Choices and challenges. DOI: 10.2139/SSRN.3147878
30. Gupya, O. (2023). Digital transformation in supply chain India: Challenges and opportunities. DOI: 10.48047/pne.2018.55.1.52