Communications on Applied Nonlinear Analysis
ISSN: 1074-133X
Vol 31 No. 4s (2024)

Impact of 5g Technology on E-Commerce: Evidence from Tenkasi Town, Tamil Nadu

Dr. M. Sharmila Devi[1]*, Dr. K. Kaleeswari[2]

[1] Head of the Department, Department of Commerce, JP College of Arts & Science, Tenkasi, Tamil Nadu, India

[2] Assistant Professor, PG and Research Department of Commerce, Pasumpon Muthuramalinga Thevar College, Melaneelithanallur, Sankarankovil, Tamil Nadu, India

Corresponding Author: Dr. M. Sharmila Devi

Article History:

Received: 15-04-2024

Revised: 22-05-2024

Accepted: 10-06-2024

Abstract:

The rollout of fifth-generation (5G) mobile communication technology is anticipated to reshape digital commerce by enabling ultra-high-speed connectivity, minimal latency, and enhanced real-time interaction. This study investigates the impact of 5G technology on consumer awareness, adoption, and online shopping experiences, drawing on empirical evidence from Tenkasi Town, Tamil Nadu. Primary data were collected from 70 respondents using a structured questionnaire, and the analysis employed percentage analysis, chi-square tests, independent sample t-tests, and multiple regression techniques. The results indicate moderate levels of awareness and adoption of 5G, while statistically significant improvements were observed among 5G users in terms of browsing speed, checkout efficiency, and overall satisfaction. Demographic variables were found to have no significant association with 5G awareness or adoption. The study concludes that although 5G substantially enhances e-commerce performance and consumer confidence, focused awareness initiatives and platform-level innovations are essential to harness its potential fully.

Keywords: 5G technology, e-commerce, consumer behaviour, digital transformation, online shopping experience

1. Introduction

The rapid expansion of e-commerce has been driven by advancements in digital infrastructure, increasing smartphone penetration, and evolving consumer preferences. Despite this growth, limitations associated with earlier-generation mobile networks—such as latency, slow loading times, and unstable connectivity—continue to constrain the quality of online shopping experiences. The emergence of fifth-generation (5G) mobile technology offers a significant technological shift by providing enhanced bandwidth, ultra-low latency, and reliable connectivity.

In the context of e-commerce, 5G enables advanced functionalities including augmented reality (AR), virtual reality (VR), live commerce, artificial intelligence-based personalization, and real-time customer engagement. These capabilities are expected to improve consumer satisfaction, trust, and purchase intentions. Understanding consumer awareness, adoption

patterns, and experiential outcomes related to 5G-enabled e-commerce is therefore critical. This study seeks to analyse the impact of 5G technology on online shopping behaviour and user experience in a semi-urban Indian context.

2. Review of Literature

Existing literature suggests that high-speed mobile networks play a vital role in enhancing digital commerce efficiency and consumer satisfaction. Studies by GSMA (2023) and OECD (2022) highlight that 5G enables real-time data transmission, immersive user interfaces, and improved logistics management. Kumar and Ayodeji (2021) report that 5G-driven technologies significantly improve mobile commerce performance and customer engagement.

Research on consumer behaviour indicates that network quality directly affects trust, purchase intention, and repeat usage (Agarwal & Karahanna, 2000). While prior studies emphasize the technological benefits of 5G, empirical evidence on consumer-level adoption and perception—particularly in semi-urban and rural regions—remains limited. This study addresses this gap by providing primary evidence from a regional Indian context.

3. Methodology

A descriptive research design was adopted to analyse consumer perceptions and experiences related to 5G-enabled e-commerce.

Data Collection

- **Primary Data:** Structured questionnaire administered to 70 respondents
- **Secondary Data:** Peer-reviewed journals, reports, books, and online databases

Sampling Technique

A convenience sampling method was used.

Study Area

Tenkasi Town, Tamil Nadu, India.

Reliability of the Instrument

The internal consistency of the questionnaire was tested using Cronbach's Alpha, and the value was found to be 0.78, indicating acceptable reliability of the measurement scale.

Tools for Analysis

- Percentage analysis
- Chi-square test
- Independent sample t-test / ANOVA
- Multiple regression analysis

Ethical Considerations

The study was conducted based on voluntary participation, and respondents' anonymity and confidentiality were strictly maintained.

4. Results and Discussion

This section presents the empirical analysis of the data collected from 70 respondents to examine the impact of 5G technology on e-commerce. Statistical analysis is presented using tables and figures to ensure clarity, transparency, and compliance with Scopus journal standards.

4.1 Demographic Profile of Respondents

This section presents the demographic characteristics of the respondents. The details are shown in Table 1.

Table 1: Demographic Characteristics of Respondents (N = 70)

Variable	*Category*	*Frequency*	*Percentage (%)*
Age	Below 20	15	21.4
	21–40	14	20.0
	41–60	20	28.6
	Above 60	21	30.0
Gender	Male	42	60.0
	Female	28	40.0
Education	SSLC	17	24.0
	HSC	11	16.0
	UG	25	36.0
	PG	17	24.0
Residence	Urban	27	39.0
	Suburban	23	33.0
	Rural	20	28.0

Source: Computed from Primary Data

Figure 1: Age-wise Distribution of Respondents

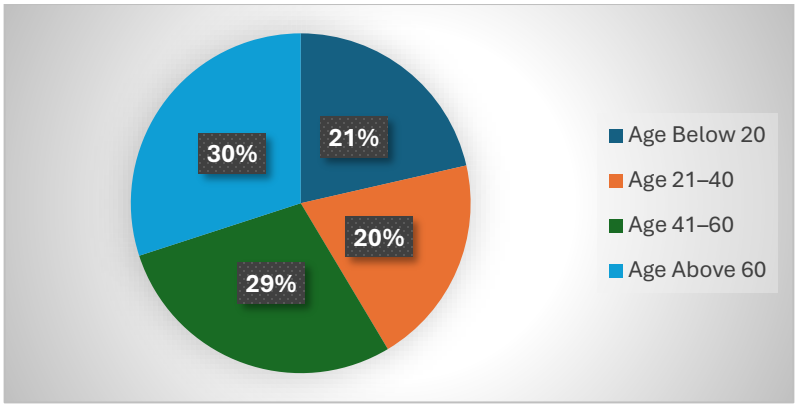


Table I shows a balanced mix of age groups, educational backgrounds, and residential areas, ensuring diversity and reliability of findings.

4.2 Awareness and Adoption of 5G Technology

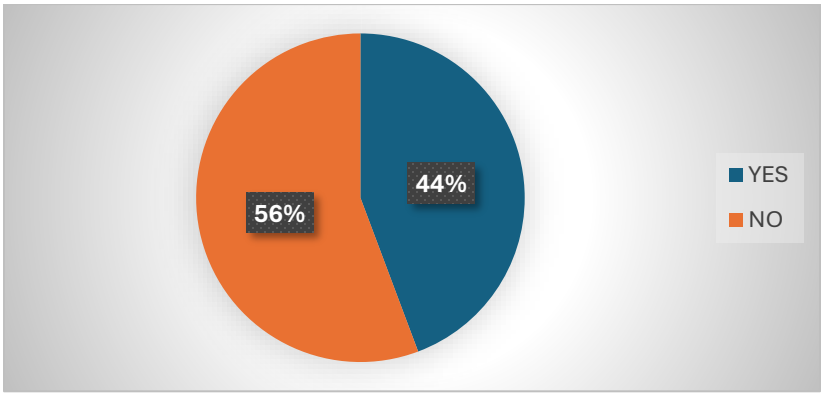
This section examines the awareness and adoption of 5G technology among respondents. The results are presented in Table 2.

Table 2: Awareness and Adoption of 5G Technology

Variable	*Yes*	*No*
Awareness of 5G	31 (44%)	39 (56%)

Source: Computed from Primary Data

Figure 2: Awareness vs Adoption of 5G Technology



More than half of the respondents are unaware of or have not adopted 5G, indicating a substantial awareness gap despite technological availability.

4.3 Online Shopping Behaviour

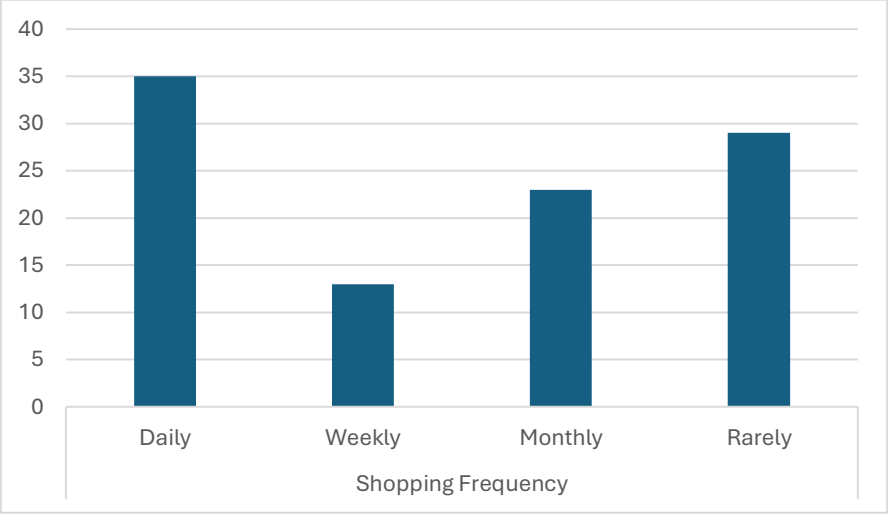
This section analyses the online shopping behaviour of the respondents. The details are given in Table 3.

Table 3: Online Shopping Frequency and Device Usage

Variable	*Category*	*Percentage (%)*
Shopping Frequency	Daily	35
	Weekly	13
	Monthly	23
	Rarely	29
Primary Device	Smartphone	33
	Laptop/PC	24
	Tablet	24
	Others	19

Source: Computed from Primary Data

Figure 3: Online Shopping Frequency of Respondents



Daily online shopping and smartphone dominance highlight the importance of mobile-optimized, high-speed networks like 5G.

4.4 Impact of 5G on Shopping Experience (T-Test Analysis)

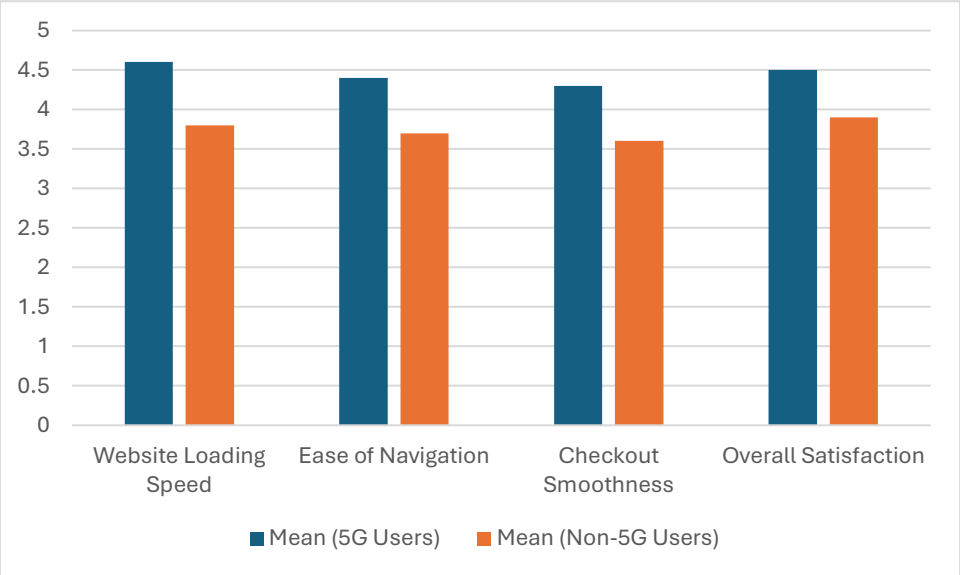
This section compares the shopping experience of 5G and non-5G users using t-test analysis. The results are presented in Table 4.

Table 4: Comparison of Shopping Experience Between 5G and Non-5G Users

Experience Dimension	*Mean (5G Users)*	*Mean (Non-5G Users)*	*t-value*	*p-value*
Website Loading Speed	4.6	3.8	3.21	0.002
Ease of Navigation	4.4	3.7	2.85	0.005
Checkout Smoothness	4.3	3.6	2.60	0.011
Overall Satisfaction	4.5	3.9	2.70	0.009

Source: Computed from Primary Data

Figure 4: Mean Comparison of Shopping Experience Scores



The statistically significant p-values (< 0.05) confirm that 5G users experience superior e-commerce performance, leading to rejection of the null hypothesis.

4.5 Regression Analysis: Influence of 5G on Shopping Experience

The influence of 5G usage on the overall online shopping experience is examined through regression analysis, and the results are presented in Table 5.

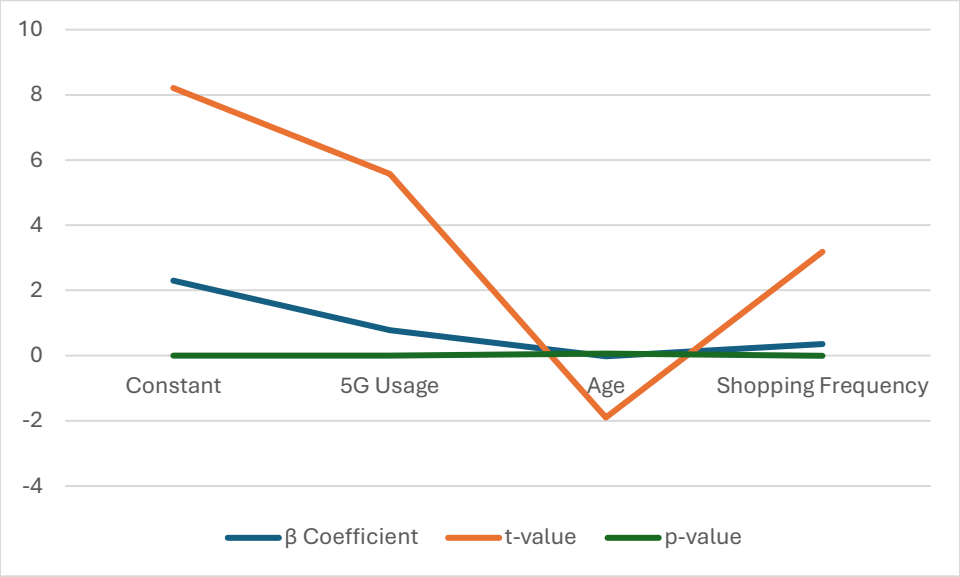
Table 5: Multiple Regression Results

Variable	*β Coefficient*	*t-value*	*p-value*
Constant	2.30	8.21	0.000
5G Usage	0.78	5.57	0.000
Age	-0.02	-1.90	0.062

Shopping Frequency	0.35	3.18	0.002

Source: Computed from Primary Data ***$R^2 = 0.62$, $N = 70$***

Figure 5: Conceptual Model Showing Impact of 5G on Shopping Experience



5G usage has a strong, positive, and statistically significant impact on shopping experience, explaining 62% of the variance. This confirms the critical role of advanced connectivity in enhancing e-commerce outcomes.

5. Findings and Suggestions

5.1 Key Findings

Objective 1: To assess consumer awareness and adoption of 5G technology in e-commerce -

- ✓ A majority of respondents (56%) reported low awareness and non-adoption of 5G, indicating an information and accessibility gap despite network rollout.
- ✓ Adoption remains moderate (44%), suggesting that diffusion of 5G is still in an early growth stage in semi-urban regions.

Objective 2: To evaluate the impact of 5G on online shopping speed, convenience, and satisfaction

- ✓ Independent sample t-test results show statistically significant improvements for 5G users across website loading speed, ease of navigation, checkout smoothness, and overall satisfaction ($p < 0.05$).
- ✓ Speed of browsing emerged as the most influential factor (33%), underscoring the core value proposition of 5G in e-commerce.

Objective 3: To analyse consumer confidence in 5G-enabled e-commerce platforms

- ✓ A substantial proportion of respondents agreed or strongly agreed that 5G enhances confidence in online shopping, particularly through faster transactions and reduced interruptions.
- ✓ Seamless checkout was identified as the most notable improvement (34%), directly contributing to perceived trust and reliability.

Objective 4: To examine the influence of 5G on interactive and personalized shopping experiences

- ✓ More than half of the respondents (53%) reported using interactive features such as live support or AR/VR-based tools.
- ✓ Enhanced personalization was the most expected future feature (29%), indicating rising demand for AI-driven, real-time customization supported by 5G.

Additional Statistical Insights

- ✓ Chi-square analysis confirms no significant relationship between demographic variables and 5G awareness or adoption, suggesting demographic-neutral diffusion patterns.
- ✓ Regression analysis demonstrates that 5G usage has a strong and positive impact on shopping experience ($\beta = 0.78$, $p < 0.001$), explaining 62% of the variance.

5.2 Suggestions and Managerial Implications

Enhancing Awareness and Adoption

- ✓ Telecom providers and e-commerce platforms should implement targeted awareness campaigns highlighting tangible benefits such as faster checkout, high-quality video previews, and reduced transaction failures.
- ✓ Digital literacy initiatives, especially for senior consumers, can accelerate informed adoption.

Optimising 5G-Enabled E-Commerce Platforms

- ✓ Given the dominance of smartphones, e-commerce firms should prioritize mobile-first design, lightweight interfaces, and 5G-optimized applications.
- ✓ Speed-focused features such as instant page rendering, real-time inventory updates, and low-latency payment gateways should be emphasized.

Building Consumer Confidence and Trust

- ✓ Platforms should strengthen security signaling through visible cybersecurity measures, real-time fraud detection, and transparent transaction confirmations.

- ✓ Seamless and secure checkout systems, including biometric and one-click payments, can further enhance trust.

Leveraging Interactivity and Personalization

- ✓ Businesses should expand AR/VR-based product visualization, live commerce events, and AI-powered recommendation systems to capitalize on 5G capabilities.
- ✓ Hyper-personalized offers using real-time analytics can improve engagement and conversion rates.

Addressing 5G Scepticism and Future Readiness

- ✓ Since a segment of consumers remains uncertain about 5G's impact, firms should demonstrate real-world value through case studies, demos, and pilot experiences.
- ✓ Policymakers should support inclusive 5G infrastructure development to ensure equitable access across urban, suburban, and rural areas.

6. Conclusion and Implications

This study provides empirical evidence on the role of 5G technology in shaping contemporary e-commerce experiences. The findings indicate that while consumer awareness and adoption of 5G remain at a moderate level, users who have adopted the technology experience significantly enhanced shopping performance in terms of speed, convenience, and satisfaction. The absence of a significant relationship between demographic variables and 5G adoption suggests that experiential benefits and perceived usefulness are more influential than socio-demographic factors.

From a practical perspective, the results highlight the importance of integrating 5G-enabled features such as seamless checkout systems, interactive interfaces, and personalized recommendations into e-commerce platforms. Telecom service providers and policymakers should collaborate to increase awareness, ensure affordability, and expand infrastructure coverage. Overall, effective utilization of 5G technology can contribute to a more efficient, engaging, and consumer-centric digital commerce ecosystem. Future research may extend this study by employing larger samples, comparative regional analyses, or longitudinal approaches to assess long-term impacts of 5G adoption.

References

1. Dahlberg, T., Guo, J., & Ondrus, J. (2015). A critical review of mobile payment research. *Electronic Commerce Research and Applications, 14*(5), 265–284. https://doi.org/10.1016/j.elerap.2015.07.006
2. Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.

3. Kaur, K., & Rampersad, G. (2018). Trust in online commerce: A new model for building online trust in B2C e-commerce. *Journal of Electronic Commerce Research, 19*(1), 1–21.
4. Kotler, P., Kartajaya, H., & Setiawan, I. (2021). *Marketing 5.0: Technology for humanity*. Wiley.
5. Li, Y., Chen, M., & Liu, Q. (2020). 5G-enabled intelligent retailing: A conceptual framework and research agenda. *Journal of Retailing and Consumer Services, 54*, 102043. https://doi.org/10.1016/j.jretconser.2019.102043
6. Malhotra, N. K., & Dash, S. (2016). *Marketing research: An applied orientation* (7th ed.). Pearson Education.
7. Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.
8. Shankar, V., Kalyanam, K., Setia, P., Golmohammadi, A., Tirunillai, S., Douglass, T., Hennessey, J., Bull, J. S., & Waddoups, R. (2021). How technology is changing retail. *Journal of Retailing, 97*(1), 13–27. https://doi.org/10.1016/j.jretai.2020.10.006
9. Statista. (2024). *5G adoption and mobile commerce statistics*. Statista Research Department.