

Technological Transformation in Food Retail an Empirical Study on Consumer Behaviour and Convenience in Bengaluru

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Abstract—This study investigates the impact of technological advancements on consumer behaviour and operational efficiency in the food retail sector, with a specific focus on Bengaluru, India. It examines the role of innovations such as self-checkout kiosks, smart shelves, and AI-driven personalization in shaping contemporary retail experiences. A mixed-method research design was adopted, and primary data was collected from 47 respondents using purposive and snowball sampling techniques. The study employs descriptive statistics and regression analysis to evaluate the relationship between technological adoption and perceived consumer convenience.

The findings indicate that while technological integration enhances aspects such as delivery efficiency, digital payment adoption, and overall shopping experience, significant challenges including high delivery costs, platform inefficiencies, and lack of tangible product experience persist. The regression analysis reveals a weak relationship between technological implementation and consumer convenience ($R^2 = 0.0158$), indicating limited explanatory power of the model.

The study concludes that technological adoption alone is insufficient to significantly influence consumer convenience and must be supported by cost efficiency, reliability, and trust-building mechanisms. The research contributes to the existing literature by providing empirical insights into technology-driven retail transformation within an emerging urban market context.

Index Terms—Food Retail, Technological Transformation, Consumer Behaviour, Artificial Intelligence (AI), Smart Retail Technologies, Consumer Convenience, Bengaluru

I. INTRODUCTION

The global food retail industry is undergoing a significant transformation driven by rapid technological advancements and changing consumer expectations. The integration of Industry 4.0 technologies, including Artificial Intelligence (AI), the Internet of Things (IoT), and automated checkout systems, has fundamentally altered traditional retail operations. These innovations have enabled retailers to enhance operational efficiency, optimize supply chain management, and deliver personalized shopping experiences. As a result, the conventional boundaries between physical and digital retail formats are increasingly converging, giving rise to a “phygital” retail environment.

In the Indian context, the food retail sector presents a unique dual structure, where traditional “Kirana” stores coexist alongside modern digital retail platforms. While conventional retail continues to dominate in terms of market share, urban centres such as Bengaluru have witnessed a rapid adoption of technology-driven retail practices. The emergence of Quick Commerce (Q-commerce), characterized by ultra-fast delivery models, and the increasing use of smart retail technologies such as self-checkout kiosks and intelligent inventory systems have significantly reshaped consumer expectations. Contemporary consumers now prioritize convenience, speed, and seamless digital interactions in their purchasing decisions.

However, despite these advancements, the adoption of technology in food retail is accompanied by several challenges. Issues such as high implementation costs, data privacy concerns, technological inefficiencies, and potential labour displacement pose significant

barriers to widespread acceptance. Moreover, the extent to which technological integration translates into enhanced consumer convenience remains empirically underexplored, particularly within emerging urban markets in India.

Existing literature largely focuses either on technological innovation or consumer behaviour in isolation, with limited empirical studies examining their interrelationship in the context of Indian urban retail ecosystems. This study seeks to address this gap by analysing the impact of technological transformation on consumer behaviour and perceived convenience in the food retail sector of Bengaluru. By adopting a mixed-method approach, the research aims to provide comprehensive insights into both the opportunities and limitations of technology-driven retail, thereby contributing to academic discourse as well as managerial decision-making. The study is particularly relevant in the context of increasing digital penetration and evolving consumer expectations in emerging economies, where the balance between technological advancement and accessibility remains critical.

II. REVIEW OF LITERATURE

The evolution of technology in the food retail sector has been widely examined across different phases, reflecting a gradual transition from operational support systems to core strategic drivers of business transformation.

Foundational Phase: Emergence of Retail Digitalization (2016–2019)

During the mid-2010s, technological integration in retail was primarily viewed as a tool for improving operational efficiency rather than a strategic necessity. Hagberg et al. (2016) highlighted that digitalization began transforming key dimensions of retail, including the retail environment, customer offerings, and transactional processes. Similarly, Hagström (2017) emphasized the potential of Internet of Things (IoT) applications in automating inventory management and replenishment systems. However, the adoption of such technologies remained limited due to high implementation costs and infrastructural constraints. Esbjerg et al. (2016) further identified a “strategic paradox,” wherein retailers faced challenges in balancing technological innovation with traditional

consumer preferences for physical shopping experiences.

Acceleration Phase: Digital Adoption and Consumer Behaviour Shift (2020–2022)

The COVID-19 pandemic acted as a catalyst for rapid digital transformation in the food retail sector. Anis et al. (2022) observed that retailers increasingly adopted digital platforms and supply chain technologies to address disruptions and ensure business continuity. This period saw a growing emphasis on the Technology Acceptance Model (TAM), where perceived usefulness and ease of use emerged as key determinants of consumer adoption. Thomas-Francois et al. (2023) expanded this perspective by incorporating cultural acceptance and emotional factors into digital food shopping behaviour. Chatterjee et al. (2022) further highlighted that transparency, traceability, and digital integration became essential components of post-pandemic retail strategies.

Contemporary Phase: AI Integration and Quick Commerce (2023–2026)

The current phase of retail transformation is characterized by the integration of advanced technologies such as Artificial Intelligence (AI), predictive analytics, and automated retail systems. Hassoun et al. (2023) discussed the role of Industry 4.0 technologies in enhancing operational efficiency and enabling data-driven decision-making in food processing and retail. The emergence of Quick Commerce (Q-commerce) has further redefined consumer expectations, emphasizing ultra-fast delivery and convenience. Additionally, the development of autonomous retail environments, supported by smart shelves and self-checkout systems, reflects a shift toward frictionless shopping experiences.

In the Indian context, initiatives such as the Open Network for Digital Commerce (ONDC) are playing a crucial role in democratizing access to digital platforms, enabling traditional retailers to compete in an increasingly technology-driven market. This highlights the importance of inclusive digital transformation within emerging economies.

Research Gap

Despite extensive research on technological innovation and consumer behaviour in retail, existing studies largely examine these dimensions independently. There is limited empirical evidence on how technological adoption directly influences consumer convenience and behavioural outcomes within urban Indian contexts. Furthermore, socio-economic concerns such as data privacy, cost barriers, and labour displacement remain underexplored.

This study addresses these gaps by adopting a mixed-method approach to analyse the impact of technological transformation on consumer behaviour and perceived convenience in the food retail sector of Bengaluru.

III. RESEARCH OBJECTIVES

1. To identify and analyse the key technological drivers, including Artificial Intelligence (AI), Internet of Things (IoT), and Quick Commerce, transforming the food retail sector in Bengaluru.
2. To evaluate the impact of technological adoption on consumer purchase behaviour and perceived convenience among urban consumers.
3. To examine the role of supply chain digitization, including smart shelves and real-time inventory tracking, in enhancing operational efficiency in food retail.
4. To assess the ethical and socio-economic challenges, such as data privacy concerns and labour displacement, associated with technological integration in the retail sector.

IV. HYPOTHESES

Primary Hypothesis

- H₀: Technological integration in the food retail sector has no significant impact on consumer shopping convenience in Bengaluru.
- H₁: Technological integration in the food retail sector has a significant impact on consumer shopping convenience in Bengaluru.

Secondary Hypotheses

- H_{2a}: Supply chain digitization (e.g., smart shelves and real-time inventory systems) has a significant positive impact on operational efficiency in food retail.

- H_{2b}: Consumer concerns regarding data privacy and labour displacement significantly influence the adoption of technology in urban retail environments.

V. RESEARCH METHODOLOGY

The present study adopts a mixed-method research approach to capture both the quantitative extent of technological adoption and the qualitative nuances of consumer behaviour. This approach ensures a comprehensive understanding of technological transformation within the food retail sector of Bengaluru.

1. Research Design

The study follows a descriptive and analytical research design. The descriptive component focuses on identifying the existing technological landscape and demographic characteristics of respondents, while the analytical component employs statistical tools to evaluate the impact of technological adoption on consumer convenience.

2. Sampling Design

- Target Population: The study targets urban food consumers and stakeholders within the Bengaluru metropolitan area.
- Sampling Technique: A non-probability sampling method, specifically purposive and snowball sampling, was employed to collect responses from individuals familiar with digital retail platforms.
- Sample Size: A total of 47 valid responses were collected and analysed. A significant proportion of respondents (72.3%) belong to the student demographic, representing early adopters of retail technology.

3. Data Collection Tools

- Primary data was collected using a structured questionnaire administered through digital platforms.
- Scaling Technique: A 5-point Likert scale (1–5) was used to measure perceived convenience, usefulness, and consumer attitudes.
 - Instrument Structure: The questionnaire was divided into two sections: demographic profiling and technology-related behavioural assessment.

4. Scope and Variables

The study examines modern retail technologies, including online grocery platforms, self-checkout kiosks, and smart shelves. The geographical scope is limited to urban Bengaluru.

- Independent Variable: Technological adoption in food retail
- Dependent Variable: Perceived consumer convenience

5. Statistical Analysis Framework

Data analysis was conducted using Microsoft Excel.

- Descriptive Statistics: Used to analyse demographic characteristics and response patterns through frequency distributions, pie charts, and bar graphs.
- Regression Analysis: Employed to examine the relationship between technological adoption (independent variable) and consumer convenience (dependent variable), and to test the primary hypothesis. The primary hypothesis was tested using regression analysis, while descriptive statistics were used to support secondary hypotheses.
- Interpretation Metrics: The study utilises the coefficient of determination (R^2) and standard error to assess the explanatory power and accuracy of the regression model.

6. Methodological Limitations

The study is limited by a relatively small sample size of 47 respondents, which may affect the generalisability of the findings. Additionally, the use of non-probability sampling techniques, including purposive and snowball sampling, may introduce sampling bias. The dominance of student respondents may also influence the overall results, as it may not fully represent the broader population. Furthermore, the study is geographically limited to Bengaluru, which may restrict the applicability of findings to other regions.

VI. DATA ANALYSIS

Table 1: Occupation of Respondents

Occupation	Respondents	Percentage
Student	34	72.3%
Business	5	10.6%
Self-Employed	4	8.5%
Housewife	3	6.4%
Employed	1	2.1%

Source: Primary Data

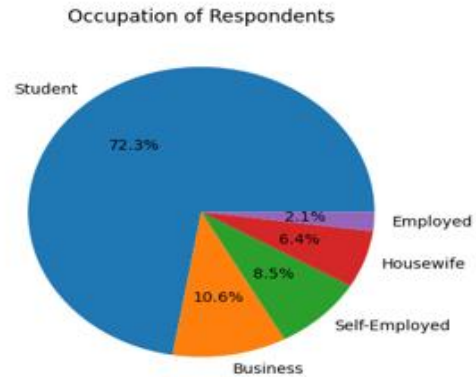


Figure 1: Occupation of respondents

Source: Primary Data

Interpretation:

The data indicates that a majority of respondents (72.3%) belong to the student category. This suggests that the findings of the study are largely influenced by younger, digitally active consumers who are more likely to adopt technological innovations in food retail.

Table 2. Frequency of Online Grocery Purchase

Response	Respondents	Percentage
Never	6	12.8%
Occasionally	22	46.8%
Sometimes	13	27.7%
Always	6	12.8%

Source: Primary Data

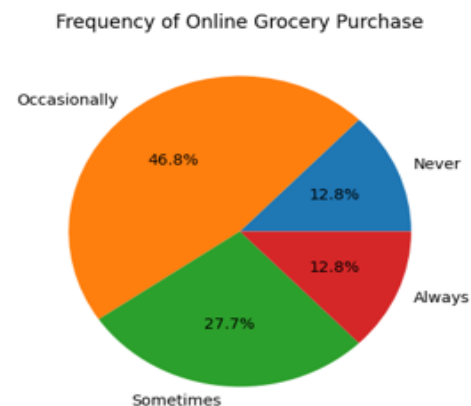


Figure 2: Frequency of Online Grocery Purchase

Source: Primary Data

Interpretation:

The findings reveal that a majority of respondents (46.8%) occasionally purchase groceries online. This

indicates a moderate level of adoption of online food retail platforms, suggesting that while digital channels are widely used, traditional purchasing methods still remain relevant.

Table 3. Factors Influencing Online Grocery Shopping

Factors	Respondents	Percentage
Faster Delivery	30	63.8%
Convenience	26	55.3%
Ease of Shopping	25	53.2%
Wide Product Range	23	48.9%
Cost is Less	1	2.1%

Source: Primary Data

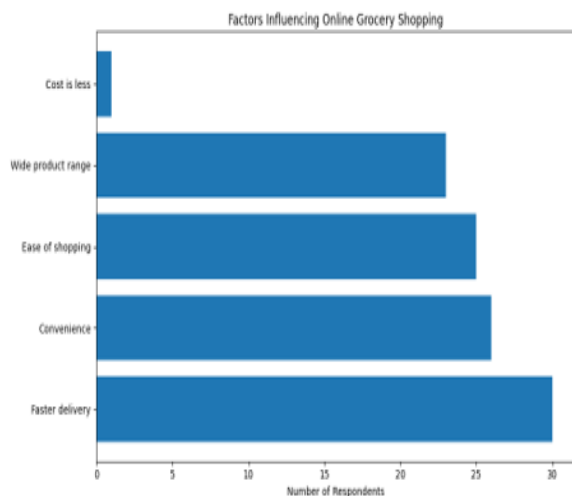


Figure 3: Factors Influencing Online Grocery Shopping

Source: Primary Data

Interpretation:

The findings indicate that faster delivery (63.8%) is the most significant factor influencing online grocery shopping decisions among respondents. Convenience (55.3%) and ease of shopping (53.2%) also play a crucial role, highlighting the importance of time-saving and user-friendly platforms in shaping consumer preferences. Additionally, a wide product range (48.9%) contributes to consumer choice, while cost considerations (2.1%) appear to have minimal influence. Overall, the results suggest that efficiency and accessibility are the primary drivers of online food retail adoption in urban markets.

Table 4: Challenges in Online Food Retail

Challenges	Respondents	Percentage
Delivery Location Issues	12	25.5%
Payment Issues	8	17%
Delivery Speed Concerns	15	31.9%
Technical Faults	27	57.4%
High Delivery Charges	29	61.7%
Lack of Physical Inspection	18	38.3%

Source: Primary Data

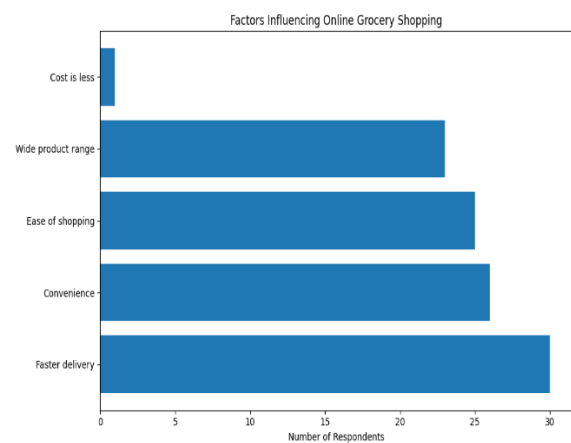


Figure 4: Challenges in Online Food Retail

Source: Primary Data

Interpretation:

The findings show that high delivery charges (61.7%) and technical faults (57.4%) are the most significant challenges faced by consumers. This suggests that cost and platform reliability remain critical barriers to the widespread adoption of online food retail services.

Table 5: Areas Transformed by Technology

Area	Respondents	Percentage
Delivery System	22	46.8%
Innovation in Food Varieties	13	27.7%
Payment Methods	20	42.6%
Industry Competition	29	61.7%
Overall Shopping Experience	20	42.6%

Source: Primary Data

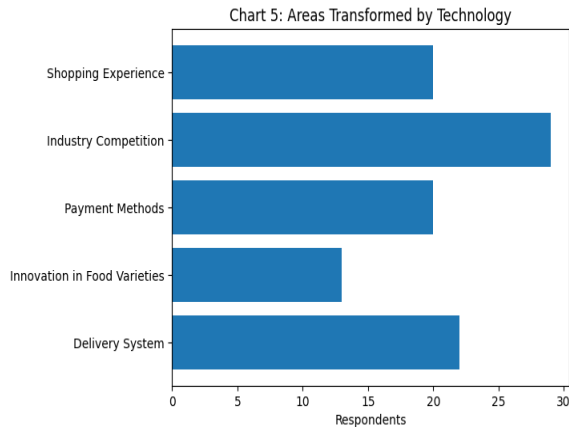


Figure 5: Areas Transformed by Technology

Source: Primary Data

Interpretation:

A majority of respondents (61.7%) perceive that technology has intensified competition within the food retail industry. Additionally, improvements in delivery systems and payment methods indicate that technology has significantly enhanced operational efficiency and customer experience.

Table 6. Impact of Lack of Tangible Feel

Response	Respondents	Percentage
Yes	23	48.9%
No	8	17%
Maybe	16	34%

Source: Primary Data

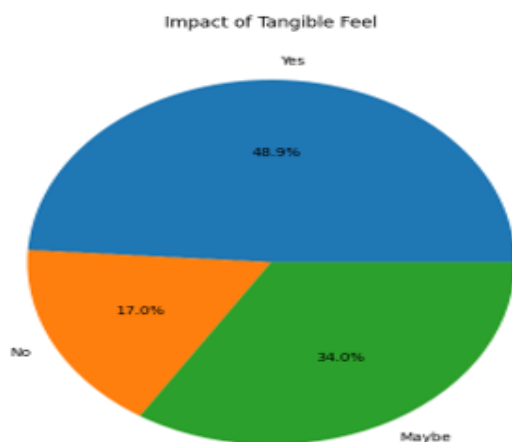


Figure 6: Impact of Tangible Feel on Online Purchase

Source: Primary Data

Interpretation:

The results indicate that nearly half of the respondents (48.9%) believe that the lack of tangible inspection affects their online food purchasing decisions. This highlights the continued importance of physical product evaluation in consumer behaviour, even in digitally driven retail environments.

Table 7. Satisfaction with Food Delivery Apps

Response	Respondents	Percentage
Yes	20	42.6%
No	9	19.1%
Maybe	18	38.3%

Source: Primary Data

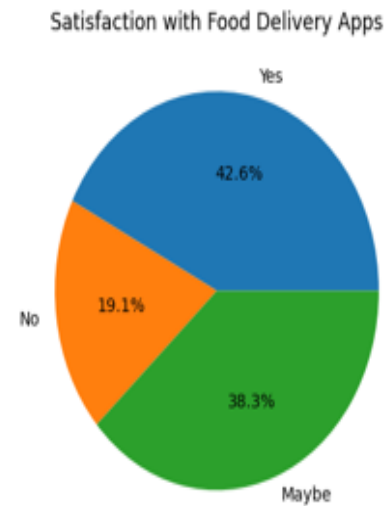


Figure 7: Satisfaction with Food Delivery Apps

Source: Primary Data

Interpretation:

The findings show that 42.6% of respondents are satisfied with food delivery applications, while a significant proportion remains uncertain (38.3%). This suggests that although digital platforms are widely accepted, there is still scope for improvement in service quality and reliability.

Table 8. Impact of In-store Technology on Shopping Decisions

Response	Respondents	Percentage
Yes	40	85.1%
No	7	14.9%

Source: Primary Data

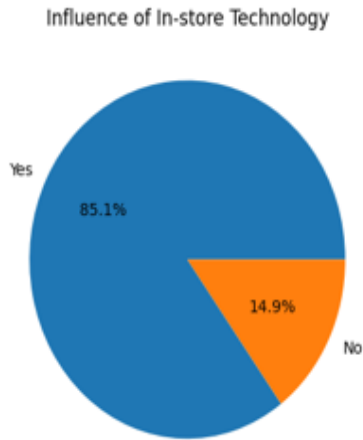


Figure 8: Influence of Smart Retail Technologies

Source: Primary Data

Interpretation:

A substantial majority of respondents (85.1%) indicated that the presence of technologies such as self-checkout kiosks, smart shelves, and personalised recommendations influences their shopping decisions. This reflects strong consumer acceptance of technology-enabled retail environments.

Table 9. Convenience of Self-Checkout Kiosks

Rating	Respondents	Percentage
1	0	0%
2	3	6.4%
3	12	25.5%
4	15	31.9%
5	17	36.2%

Source: Primary Data

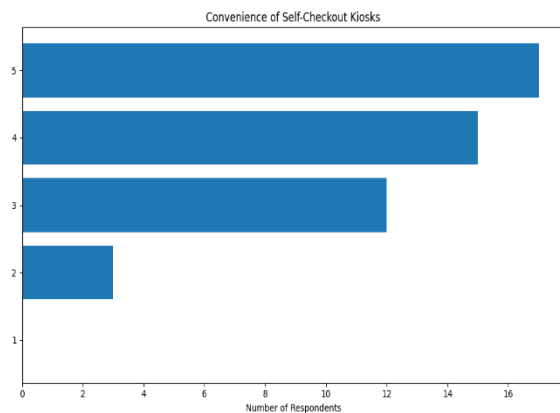


Figure 9: Convenience of Self-Checkout Kiosks

Source: Primary Data

Interpretation:

The majority of respondents rated self-checkout kiosks as highly convenient, with 36.2% assigning the highest rating (5). This indicates a strong preference for automated billing systems that reduce waiting time and enhance shopping efficiency.

Table 10. Usefulness of Smart Shelves

Rating	Respondents	Percentage
1	2	4.3%
2	4	8.5%
3	11	23.4%
4	12	25.5%
5	18	38.3%

Source: Primary Data

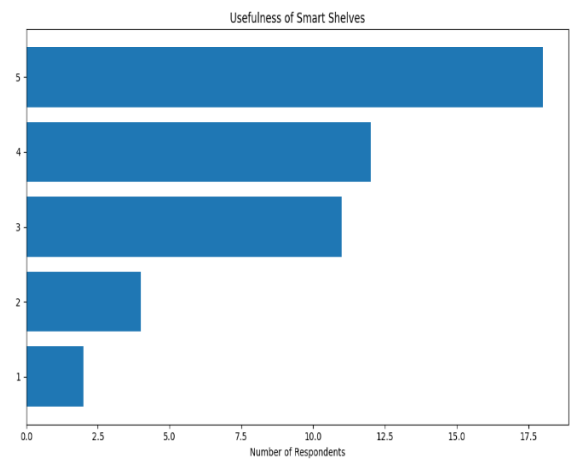


Figure 10: Usefulness of Smart Shelves

Source: Primary Data

Interpretation:

The findings reveal that a majority of respondents perceive smart shelf displays as useful, with 38.3% rating them highly. This suggests that real-time inventory visibility enhances consumer decision-making and improves in-store shopping experiences.

Table 11. Influence of Product Recommendations

Rating	Respondents	Percentage
1	5	10.6%
2	3	6.4%
3	17	36.2%
4	17	36.2%
5	5	10.6%

Source: Primary Data

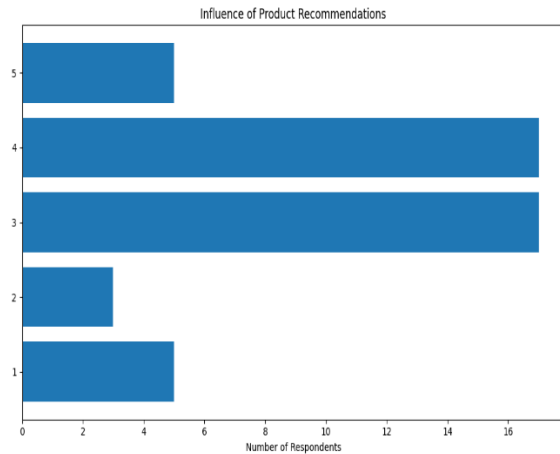


Figure 11: Influence of Product Recommendations
Source: Primary Data

Interpretation:

The results indicate that most respondents fall within the moderate influence category (ratings 3 and 4). This suggests that while product recommendations do impact consumer decisions, they are not the primary determinant of purchase behaviour.

Table 12. Comfort with AI in Food Retail

Rating	Respondents	Percentage
0	3	6.4%
1	2	4.3%
2	4	8.5%
3	16	34%
4	14	29.8%
5	8	17%

Source: Primary Data

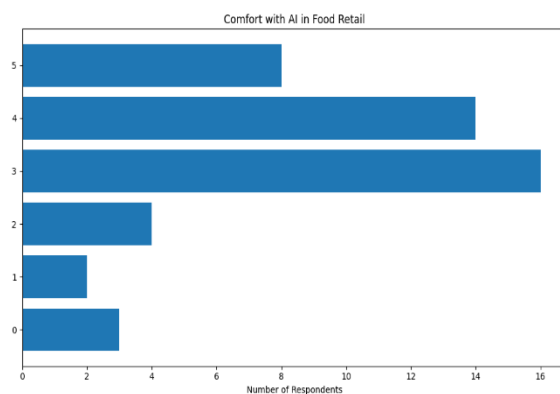


Figure 12: Comfort with AI in Food Retail

Source: Primary Data

Interpretation:

The findings indicate that most respondents exhibit a neutral to moderately positive attitude toward AI in food retail. This suggests cautious acceptance, where consumers recognize the benefits of AI but may still have concerns regarding its implications.

Table 13. Technology and Convenience

Response	Respondents	Percentage
Yes	24	51.1%
No	7	14.9%
Maybe	16	34%

Source: Primary Data

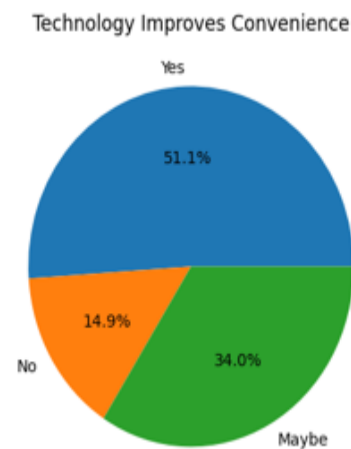


Figure 13: Technology and Convenience

Source: Primary Data

Interpretation:

A majority of respondents (51.1%) believe that technology enhances convenience in food shopping. However, the presence of neutral responses suggests that technological benefits may vary depending on user experience and platform efficiency.

Table 14. Perception of Technology Making Humans Lazy

Response	Respondents	Percentage
Yes	27	57.4%
No	6	12.8%
Maybe	14	29.8%

Source: Primary Data

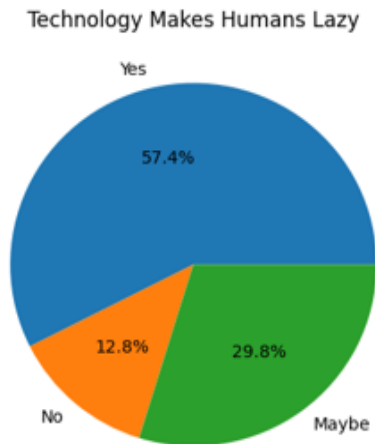


Figure 14: Technology and Laziness

Source: Primary Data

Interpretation:

The results indicate that 57.4% of respondents believe that technology contributes to increased dependency and reduced physical effort. This highlights an emerging socio-behavioural concern associated with technological advancement.

VII. REGRESSION ANALYSIS

To examine the relationship between technological adoption and consumer convenience, a simple linear regression analysis was conducted using Microsoft Excel.

Table 15: Model Summary

Model	R	R Square (R ²)	Adjusted R Square	Standard Error
1	0.125	0.0158	-0.006	0.982

Source: Computed using Primary Data

Regression Equation

The regression model for the study can be expressed as:

$$Y = a + bX$$

Where

Y = Consumer Convenience (Dependent Variable)

X = Technological Adoption (Independent Variable)

a = Intercept (Constant)

b = Regression Coefficient

The equation represents the relationship between technological adoption and consumer convenience, indicating how changes in technology influence consumer perception of convenience.

Interpretation of Regression Results

The regression results indicate a very weak positive relationship between technological adoption and consumer convenience ($R = 0.126$) based on a sample size of 47 respondents. The coefficient of determination ($R^2 = 0.0158$) suggests that only 1.58% of the variation in consumer convenience is explained by the technological factors included in the model.

Furthermore, the adjusted R^2 value is negative (-0.006), indicating that the model does not provide a good fit for the data and lacks predictive power. The standard error of the estimate (0.982) reflects a relatively high level of unexplained variation in the dependent variable.

Overall, these results suggest that technological adoption alone is not a strong predictor of consumer convenience within the sampled population.

Hypothesis testing

H₀: Technological integration has no significant impact on consumer shopping convenience.

H₁: Technological integration has a significant impact on consumer shopping convenience.

Based on the regression results, the null hypothesis (H₀) is accepted, as the model demonstrates weak explanatory power and lacks statistical significance. This implies that technological adoption does not significantly influence consumer convenience in the context of this study.

Inference

The findings indicate that while technology plays an important role in shaping retail experiences, factors such as cost, platform reliability, and consumer trust may have a more substantial influence on perceived convenience. This highlights the need for retailers to focus not only on technological implementation but also on improving service quality, affordability, and overall customer trust.

VIII. FINDINGS AND DISCUSSIONS

The findings of the study provide important insights into the role of technological transformation in shaping consumer behaviour within the food retail sector. The descriptive analysis indicates that convenience, faster delivery, and ease of access are the primary factors influencing consumer preference toward online grocery platforms. This aligns with earlier studies (Chatterjee et al., 2022), which emphasize the growing importance of digital integration in enhancing customer experience.

However, the results also highlight several challenges associated with technological adoption. High delivery costs and technical issues were identified as major barriers, suggesting that while technology improves accessibility, it does not necessarily guarantee a seamless consumer experience. This finding supports the argument presented by Esbjerg et al. (2016), which states that technological innovation must be balanced with operational efficiency and customer expectations. The regression analysis further reveals a weak relationship between technological adoption and consumer convenience. This indicates that technology alone is insufficient to significantly influence consumer satisfaction. Factors such as affordability, reliability of digital platforms, and consumer trust may play a more critical role in shaping perceptions. This finding challenges the common assumption that increased technological integration directly enhances consumer convenience.

Additionally, the study highlights behavioural and ethical concerns associated with technological transformation. A significant proportion of respondents expressed concerns regarding the lack of tangible product experience and increasing dependency on technology. These findings suggest that while consumers appreciate the benefits of digitalization, they remain cautious about its broader implications.

From a managerial perspective, the results imply that food retailers should adopt a balanced approach toward technological implementation. Investments in advanced technologies such as AI, smart shelves, and self-checkout systems should be complemented with improvements in service quality, cost efficiency, and user experience. Furthermore, transparency in the use of AI and enhanced platform reliability can help build consumer trust and encourage wider adoption.

Overall, the study concludes that technological transformation in food retail is not solely a technological challenge but also a behavioural and strategic one, requiring a holistic approach to achieve sustainable growth.

IX. CONCLUSION

The present study examined the impact of technological transformation on consumer behaviour and perceived convenience in the food retail sector, with specific reference to Bengaluru. The findings indicate that technological advancements such as online grocery platforms, self-checkout systems, and smart retail technologies have significantly influenced consumer purchasing patterns, particularly among younger and digitally active consumers.

The descriptive analysis highlights that convenience, faster delivery, and ease of access are key drivers of online food retail adoption. However, challenges such as high delivery costs, technical inefficiencies, and the lack of tangible product experience continue to affect consumer satisfaction. These findings suggest that while technology enhances accessibility, it does not fully address all aspects of the consumer experience.

The regression analysis reveals that technological adoption has a weak relationship with perceived consumer convenience, indicating that technology alone is not a sufficient determinant of consumer satisfaction. This emphasizes the importance of complementary factors such as affordability, service reliability, and consumer trust in shaping overall shopping experiences.

In conclusion, the study demonstrates that technological transformation in food retail offers significant opportunities for improving efficiency and customer engagement. However, for sustainable growth, retailers must adopt a balanced approach that integrates technological innovation with customer-centric strategies. The research contributes to the existing literature by providing empirical insights into the evolving dynamics of technology-driven retail in an emerging urban market context.

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