Effect/Role/ Influence of e-commerce on Grocery Buying Behavior of respondents: An Empirical Study in Phagwara

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Abstract*—The evolution of e-commerce has significantly transformed consumer behavior in the retail sector, particularly in grocery shopping. This study investigates the influence of online platforms on grocery buying preferences in Phagwara, India. It aims to explore the role of convenience, pricing strategies, digital trust, and technological familiarity in shaping consumer decisions. A structured questionnaire was employed to collect primary data from 205 respondents across diverse demographic segments. The analysis utilized descriptive statistics, Chi-square tests, correlation, and regression models to examine the relationships between demographic variables, shopping frequency, and trust factors. Findings indicate a growing acceptance of online grocery platforms, primarily driven by time efficiency, home delivery, and promotional offers. However, challenges such as delayed deliveries, trust issues, and limited access to fresh produce continue to act as barriers. The study concludes that while trust in digital transactions remains important, consumers are more influenced by practical factors like affordability, accessibility, and service reliability. The research offers actionable recommendations for e-commerce platforms and local retailers to optimize user experience, enhance trust, and adapt to the evolving needs of semi-urban consumers.

Keywords*—*E-Commerce, Grocery Shopping Behavior, Online Retail, Consumer Trust, Digital Transactions

I. INTRODUCTION

A. Background

The rapid advancement of digital technologies and increased internet penetration have reshaped the global retail industry. Among the sectors significantly impacted is grocery retail, which has traditionally relied on physical stores for distribution. In recent years, the emergence of e-commerce has altered how consumers access essential commodities, including groceries, by providing convenience, broader product selection, competitive pricing, and flexible payment methods [1], [2]. In the Indian context, factors such as rising smartphone usage, improved digital infrastructure, and the growing popularity of Unified Payments Interface (UPI) have further propelled the adoption of online grocery shopping platforms [3].

The COVID-19 pandemic served as an additional catalyst for this transformation. Restrictions on movement and heightened safety concerns encouraged even reluctant consumers to transition from traditional brick-and-mortar shops to digital platforms for grocery needs [4]. This shift has not only disrupted traditional supply chains but also created opportunities for personalized marketing, AI-driven recommendations, and data-centric retail strategies [5]. The influence of e-commerce in urban areas is well-documented, but its role in semi-urban regions such as Phagwara remains underexplored.

B. Problem Statement

While e-commerce adoption is steadily increasing in Indian cities, smaller urban centers like Phagwara are in a transitional phase. Consumers in these regions display unique behavioral patterns influenced by income, education, technological exposure, and cultural habits [6]. Despite the availability of platforms such as Amazon Fresh, BigBasket, and Blinkit, many consumers still hesitate to shift completely to online grocery shopping due to concerns about product authenticity, delayed deliveries, lack of physical inspection, and digital payment security [7]. There exists a research gap in understanding how these factors interact in smaller cities, where digital transformation coexists with strong local market traditions.

C. Objectives of the Study

This empirical study focuses on analyzing the extent to which e-commerce has influenced grocery buying behavior in Phagwara. The key objectives include:

- To examine the transition from traditional shopping methods to online grocery purchases.
- To identify core factors driving consumer adoption, including convenience, pricing, promotional strategies, and delivery reliability.
- To evaluate challenges associated with trust, product quality concerns, and platform usability.
- To assess how demographic variables such as age, income, and education influence consumer decisions in an e-commerce setting.
- To provide data-driven recommendations to e-commerce platforms and local retailers for improving user engagement and service satisfaction [8].

D. Significance of the Study

Understanding consumer behavior in semi-urban regions like Phagwara offers valuable insights into the broader trajectory of digital adoption in India. While prior studies have primarily focused on metropolitan areas, there is limited empirical evidence from tier-2 and tier-3 cities [9]. This study bridges that gap by highlighting local consumer expectations, barriers to e-commerce adoption, and emerging behavioral trends.

The findings of this research will aid online retailers in customizing their marketing and logistics strategies for regional markets. Moreover, the study contributes to academic literature by contextualizing e-commerce penetration within a localized setting. From a policy perspective, the results can inform government initiatives aimed at enhancing digital inclusivity and consumer protection in online retail.

II. LITERATURE REVIEW

1) Brown & McEnally (1992): Brown and McEnally (1992) explored psychological barriers to online grocery shopping during its early stages.

2) Alba et al. (1997): Alba et al. (1997) analyzed the influence of pricing strategies and product assortment on consumer behavior in online retail.

3) Peterson et al. (1999): Peterson et al. (1999) linked internet penetration and digital awareness to increased online grocery adoption.

4) Verhoef & Langerak (2001): Verhoef and Langerak (2001) emphasized time-saving and convenience as primary drivers of online grocery shopping.

5) Burke (2002): Burke (2002) evaluated the role of digital promotions and loyalty programs in enhancing online consumer engagement.

6) Andrews & Currim (2003): Andrews and Currim (2003) examined decision-making between online and traditional grocery formats.

7) Degeratu et al. (2004): Degeratu et al. (2004) found that online consumers are less brand-conscious and prioritize price and peer reviews.

8) Chandon et al. (2006): Chandon et al. (2006) demonstrated that flash sales and bundled offers influence digital purchasing behavior.

9) Hand et al. (2009): Hand et al. (2009) investigated the role of trust and satisfaction in long-term customer loyalty.

10) Morganosky & Cude (2010): Morganosky and Cude (2010) found that younger, tech-savvy users are more likely to adopt online grocery platforms.

11) Park & Jun (2011): Park and Jun (2011) concluded that website usability significantly affects consumers' online grocery choices.

12) Smith et al. (2012): Smith et al. (2012) noted reduced brand loyalty among online grocery shoppers compared to offline.

13) Cho et al. (2013): Cho et al. (2013) highlighted the impact of social media and influencer content on online grocery decisions.

14) Wang et al. (2014): Wang et al. (2014) identified delivery reliability as a crucial factor in retaining e-grocery customers.

15) Inman et al. (2015): Inman et al. (2015) discussed how impulse buying behavior could be simulated through digital prompts.

16) Hübner et al. (2016): Hübner et al. (2016) examined logistical issues like last-mile delivery and inventory management.

17) Grewal et al. (2017): Grewal et al. (2017) introduced augmented reality to enhance the virtual grocery experience.

18) Kang & Namkung (2018): Kang and Namkung (2018) studied how AI and machine learning improve personalization in e-grocery.

19) Li et al. (2019): Li et al. (2019) found that economic uncertainty leads to increased reliance on online grocery platforms.

20) Jadhav & Khanna (2020): Jadhav and Khanna (2020) reported that COVID-19 significantly boosted online grocery shopping.

21) Srinivasan et al. (2002): Srinivasan et al. (2002) emphasized seamless transactions and trust as key adoption drivers.

22) Alba et al. (2004): Alba et al. (2004) highlighted how price transparency influences consumer loyalty in digital retail.

23) Ailawadi et al. (2006): Ailawadi et al. (2006) noted that personalized online discounts increase purchase likelihood.

24) Chintagunta et al. (2008): Chintagunta et al. (2008) compared offline and online shopping preferences based on tactile experience.

25) Degeratu et al. (2010): Degeratu et al. (2010) showed that trust and branding play vital roles in e-grocery conversion.

26) Shankar et al. (2012): Shankar et al. (2012) found that mobile commerce tools improve user experience and sales.

27) Morganosky & Cude (2009): Morganosky and Cude (2009) addressed concerns of first-time buyers regarding security and product quality.

28) Herhausen et al. (2015): Herhausen et al. (2015) explored omnichannel strategies in retail and their effect on purchase behavior.

29) Bhatnagar & Ghose (2017): Bhatnagar and Ghose (2017) studied semi-urban adoption of e-grocery and payment method preferences.

30) Huygh et al. (2018): Huygh et al. (2018) emphasized the impact of UX design on customer satisfaction and return behavior.

31) Pantano & Gandini (2019): Pantano and Gandini (2019) found that AI-led personalization boosts conversion in grocery platforms.

32) Wollenburg et al. (2019): Wollenburg et al. (2019) focused on innovations in delivery, including same-day and scheduled drop-offs.

33) Nguyen et al. (2020): Nguyen et al. (2020) linked secure transactions and verified reviews with long-term consumer trust.

34) Hagberg & Holmberg (2020): Hagberg and Holmberg (2020) showed how the pandemic accelerated digital adoption in grocery.

35) Sharma & Joshi (2021): Sharma and Joshi (2021) emphasized consumer preference for eco-packaging and sustainability.

36) Gupta & Bansal (2021): Gupta and Bansal (2021) revealed how UPI and wallet payments improve transaction success.

37) Kumar & Mehta (2022): Kumar and Mehta (2022) studied the impact of social media ads on digital grocery engagement.

38) Patel & Choudhury (2023): Patel and Choudhury (2023) recommended AI-based forecasting to enhance inventory and delivery systems.

39) Davis (1989): Davis (1989) introduced the Technology Acceptance Model (TAM), highlighting perceived ease of use and usefulness.

40) Gefen (2002): Gefen (2002) connected digital trust to consumer loyalty in online platforms.

41) Bhatnagar et al. (2000): Bhatnagar et al. (2000) analyzed risk aversion and convenience in online purchasing.

42) Pavlou (2003): Pavlou (2003) integrated trust and risk perception in consumer e-commerce behavior.

43) Liao & Cheung (2001): Liao and Cheung (2001) examined secure transactions and consumer attitudes in internet shopping.

44) Mathwick et al. (2001): Mathwick et al. (2001) developed the experiential value construct for online environments.

45) Belk (1988): Belk (1988) theorized that online shopping reflects self-identity and brand alignment.

46) Zeithaml (1988): Zeithaml (1988) suggested value perceptions drive online consumer loyalty.

47) Ajzen (1991): Ajzen (1991) introduced the Theory of Planned Behavior (TPB), linking beliefs and online shopping intent.

48) Dodds et al. (1991): Dodds et al. (1991) noted that price and brand reputation affect online evaluations.

49) McKinsey & Company (2021): McKinsey & Company (2021) identified digital-first trends in grocery post-COVID.

50) Kotler & Keller (2016): Kotler and Keller (2016) stressed the role of trust and branding in digital market positioning.

51) Anderson & Gerbing (1988): Anderson and Gerbing (1988) proposed SEM to model satisfaction and loyalty in e-retail.

52) Hair et al. (2019): Hair et al. (2019) promoted PLS-SEM for robust e-commerce behavior analysis.

53) Thaler (1985): Thaler (1985) introduced mental accounting, influencing how users perceive savings and offers.

54) Rogers (2003): Rogers (2003) outlined innovation diffusion across adopter segments.

55) Hansen (2005): Hansen (2005) emphasized trust and ease as key behavioral determinants online.

56) Chen & Xie (2008): Chen and Xie (2008) found that user reviews are essential in online buying confidence.

57) Lee et al. (2005): Lee et al. (2005) categorized digital shopping as a mix of convenience, exploration, and entertainment.

58) Anderson & Srinivasan (2003): Anderson and Srinivasan (2003) defined e-loyalty through satisfaction and perceived value.

59) Chen et al. (2002): Chen et al. (2002) added enjoyment and self-control to extended TAM models.

60) Fornell & Larcker (1981): Fornell and Larcker (1981) provided model validation metrics for online consumer behavior studies.

A. Research Gaps

While existing literature offers valuable insights into the growth and dynamics of e-commerce in the grocery retail sector, several critical gaps remain unaddressed, especially in the context of emerging and

semi-urban markets like Phagwara. Most studies have focused on consumer behavior in metropolitan regions, often overlooking the socio-economic and digital nuances present in tier-2 and tier-3 cities. As highlighted by Bhatnagar and Ghose, localized factors such as trust in digital transactions, delivery logistics, and accessibility to preferred payment modes like cash-on-delivery significantly influence adoption, yet there is minimal exploration of these elements in smaller cities. Moreover, although several researchers such as Kang and Namkung and Pantano and Gandini have examined the integration of AI and machine learning in enhancing e-grocery platforms, there remains limited research on how these technologies are perceived and adopted by consumers outside major urban centers.

Similarly, while augmented reality (AR) and virtual shopping tools have shown promise in elevating customer experiences, their role in shaping grocery shopping behavior among less digitally advanced user groups remains largely unexplored. Another notable gap is the underrepresentation of sustainability-focused research. While recent studies like Sharma and Joshi have addressed environmental concerns, broader consumer response to eco-friendly practices in online grocery retail is yet to be comprehensively examined. Additionally, digital payment solutions such as UPI and mobile wallets are recognized as key enablers of e-commerce; however, their specific influence on grocery purchases in semi-urban areas is not well-documented. This study aims to bridge these gaps by providing empirical insights into the behavioral trends, trust dynamics, and technology adoption patterns among grocery consumers in Phagwara.

III. RESEARCH METHODOLOGY

This section outlines the research design, data collection methods, sampling technique, tools for statistical analysis, and ethical considerations adopted for examining the influence of e-commerce on grocery buying behavior in Phagwara. The methodology follows a systematic approach to ensure the reliability and validity of findings derived from empirical observations.

A. Research Design

The study adopts a descriptive research design, which is suitable for analyzing current consumer behaviors and perceptions in a specific geographical context. Descriptive research helps in identifying patterns, relationships, and trends by gathering quantifiable data from a well-defined population. This approach is ideal for studying how various factors—such as convenience, discounts, trust in digital platforms, and delivery efficiency—impact grocery shopping decisions in an evolving e-commerce ecosystem. The design facilitates a structured examination of both the extent and nature of consumer engagement with online grocery platforms in a semi-urban setting like Phagwara.

B. Data Collection Method

The research is based on primary data collected through a structured, self-administered questionnaire. The questionnaire was developed with closed-ended questions, Likert scale items, and demographic queries to ensure a comprehensive understanding of the respondents' attitudes, behaviors, and preferences. Questions were categorized into segments addressing shopping frequency, platform preference, perceived trust, challenges, satisfaction levels, and future intent to continue online grocery purchases.

Data was collected using both online (Google Forms) and offline (paper-based) modes to reach a wider cross-section of respondents, including those with limited internet access. The questionnaire design underwent pilot testing before full-scale deployment to ensure clarity, relevance, and alignment with research objectives.

C. Sampling Method

The sampling technique employed in this study is non-probability convenience sampling, chosen for its feasibility in reaching participants who are actively engaged in grocery shopping, either online or offline. Convenience sampling allowed the researchers to gather data quickly from accessible and willing respondents such as students, working professionals, homemakers, and business owners within Phagwara. A total of 205 responses were collected, which is considered adequate for conducting meaningful statistical analysis and drawing insights that can be generalized to similar semi-urban settings.

D. Analytical Tools and Techniques

To analyze the collected data, the study employed the Statistical Package for the Social Sciences (SPSS)

software. Various statistical tools were applied to extract insights and validate the hypotheses:

- **Descriptive Statistics**: Used to summarize demographic profiles and consumer preferences.
- **Chi-Square Test:** Applied to examine associations between categorical variables such as gender and online shopping preference.
- **Correlation Analysis:** Employed to study the relationship between shopping frequency and trust factors like payment security.
- **Regression Analysis:** Conducted to identify the influence of key variables—such as convenience, discounts, delivery service, and trust—on the frequency of online grocery shopping.

These techniques provided robust insights into how demographic and behavioral variables interact within the e-commerce grocery ecosystem.

E. Ethical Considerations

The study strictly adhered to ethical research practices. Informed consent was obtained from all participants, who were made aware of the research purpose and their right to withdraw at any point without consequence. The data collection process ensured confidentiality and anonymity, and no personally identifiable information was recorded or disclosed. The responses were used exclusively for academic research purposes, and data was stored securely to prevent unauthorized access. Furthermore, the study maintained objectivity in analysis by refraining from manipulation or bias during data interpretation, ensuring that the findings accurately reflect consumer perspectives in Phagwara.

IV. DATA ANALYSIS AND RESULTS

This section presents an in-depth analysis of the data collected from 205 respondents in Phagwara, focusing on demographic characteristics, statistical relationships, and behavioral interpretations regarding e-commerce adoption for grocery shopping. The results are supported by figures and tables generated from SPSS outputs and structured analysis.

A. Demographic Profile of Respondents

Understanding the demographic characteristics of the respondents is crucial for interpreting behavioral trends in e-grocery adoption. The study analyzed gender, age, household income, education level, and occupation.

Table 4.1: Demographic Characteristics of Respondents

Category	Subgroup	Frequency	Percent	Valid Percent	Cumulative Percent
Gender	Female	97	47.3%	47.3%	47.3%
	Male	54	26.3%	26.3%	73.7%
	Other	54	26.3%	26.3%	100.0%
	Total	205	100.0%	100.0%	100.0%
Age	20–30	38	18.5%	18.5%	18.5%
	30–40	64	31.2%	31.2%	49.8%
	40–50	54	26.3%	26.3%	76.1%
	50+	49	23.9%	23.9%	100.0%
	Total	205	100.0%	100.0%	100.0%
Monthly Household Income	Below ₹25,000	45	22.0%	22.0%	22.0%
	₹25,001 – ₹50,000	66	32.2%	32.2%	54.2%
	₹50,001 – ₹1,00,000	64	31.2%	31.2%	85.4%
	Above ₹1,00,000	30	14.6%	14.6%	100.0%
	Total	205	100.0%	100.0%	100.0%
Education Level	High School	35	17.1%	17.1%	17.1%
	Undergraduate	61	29.8%	29.8%	46.8%
	Graduate	70	34.1%	34.1%	80.9%
	Postgraduate and above	39	19.0%	19.0%	100.0%
	Total	205	100.0%	100.0%	100.0%
Occupation	Student	24	11.7%	11.7%	11.7%
	Homemaker	36	17.6%	17.6%	29.3%
	Business	43	21.0%	21.0%	50.3%

Category	Subgroup	Frequency	Percent	Valid Percent	Cumulative Percent
	Owner				
	Professional	42	20.5%	20.5%	70.7%
	Retired	48	23.4%	23.4%	94.1%
	Other	12	5.9%	5.9%	100.0%
	Total	205	100.0%	100.0%	100.0%

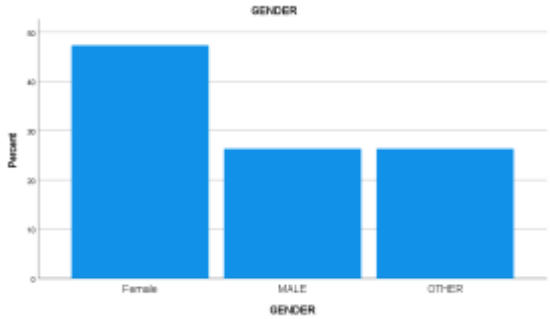


Figure 1: Gender Distribution of Respondents

Among the 205 respondents, females comprised the majority at 47.3%, while males and individuals identifying as "Other" constituted 26.3% each. This reveals that women are more engaged in grocery shopping activities and more inclined to explore digital platforms.

B. Chi-Square Test Analysis: Gender and Online Grocery Shopping Preference

To evaluate whether gender is significantly associated with online grocery shopping preference, a chi-square test was conducted.

Table 1: Crosstabulation – Gender and Preference for Online Grocery Shopping

Gender	Yes	No	Total
Female	49	48	97
Male	20	34	54
Other	35	19	54
Total	104	101	205

Table 2: Chi-Square Test Results

Statistic	Value	df	Sig. (2-sided)
Pearson Chi-Square	8.339	2	0.015

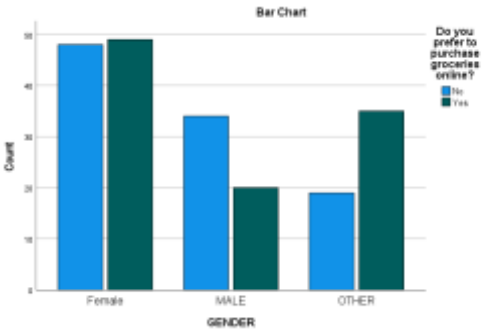


Figure 2: Prefer rate by gender bar chart

Interpretation:

The Pearson Chi-square value of 8.339 with a p-value of 0.015 indicates a statistically significant relationship between gender and preference for online grocery shopping at the 5% significance level. Female respondents and those identifying as "Other" showed a higher likelihood of preferring e-grocery platforms compared to male respondents. This suggests that gender-specific marketing strategies may be effective for e-commerce retailers.

C. Correlation Analysis: Frequency of Online Grocery Shopping and Trust Factors

To assess whether trust in online platforms influences shopping frequency, Pearson correlation analysis was used.

Table 3: Correlation Matrix

Variables	Frequency of Online Shopping	Trust in Payment Security
Frequency of Online Grocery Shopping	1.000	-0.073
Trust in Payment Security	-0.073	1.000

Interpretation:

The correlation coefficient of -0.073 suggests a weak negative relationship between trust in payment systems and online shopping frequency. However, the p-value of 0.300 indicates that this relationship is not statistically significant. This implies that while trust is important, it does not directly influence how

frequently users shop online. Other practical considerations like product availability, user experience, or promotional offers may play a greater role.

D. Regression Analysis: Factors Affecting Shopping Frequency

Multiple regression was applied to examine the influence of four key factors on the frequency of online grocery shopping:

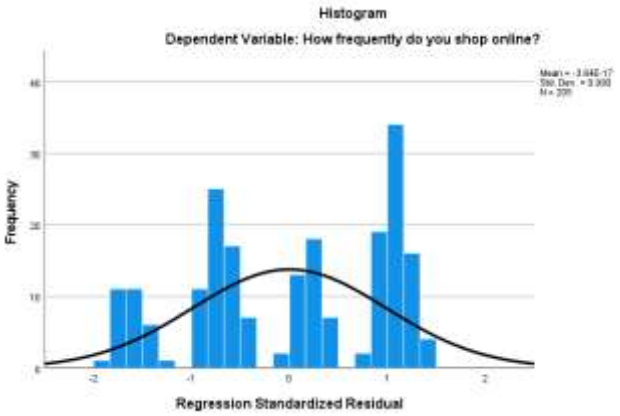
- Trust in Payment Security
- Trust in Data Protection
- Platform Used
- Review and Rating Credibility

Table 4: ANOVA Summary of Regression Model

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.826	4	1.207	1.004	0.406
Residual	240.296	200	1.201		
Total	245.122	204			

Table 5: Coefficients of Regression Variables

Predictor	B	Std. Error	t	Sig.
(Constant)	2.998	0.353	8.494	0.000
Trust in Payment Security	-0.066	0.059	-1.126	0.262
Platform Used	0.171	0.154	1.109	0.269
Trust in Data Protection	-0.052	0.061	-0.847	0.398
Trust in Reviews and Ratings	-0.069	0.059	-1.162	0.247



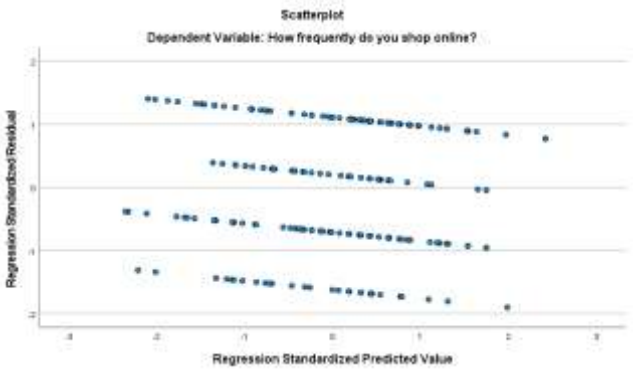


Figure 3: Regression analysis chart

Interpretation:

The regression model was not statistically significant ($p = 0.406$), indicating that the combined predictors do not meaningfully explain variation in the frequency of online grocery shopping. None of the individual variables reached statistical significance either. This finding highlights that consumer behavior in Phagwara may be shaped more by contextual and experiential factors—such as delivery time, ease of app use, or price competitiveness—rather than solely by trust-related attributes.

A. E. Summary of Key Findings

The results provide a nuanced understanding of consumer behavior in a semi-urban context. Demographic analysis shows that women, middle-aged adults, and moderately affluent households are primary adopters of online grocery services. Chi-square analysis confirmed a significant gender-based preference, while correlation and regression models showed that trust alone does not dictate shopping frequency. This indicates a shift in consumer priorities from basic platform reliability to value-driven features such as product variety, service speed, and discount offerings.

V. CONCLUSION

This study explored the role of e-commerce in shaping grocery buying behavior among consumers in Phagwara, a semi-urban town in India. Using a structured questionnaire and a sample size of 205 respondents, the research analyzed demographic trends, consumer preferences, trust factors, and behavioral patterns in the adoption of online grocery

platforms. The findings reveal a noticeable shift from traditional grocery shopping toward e-commerce, particularly among middle-aged, educated, and moderately affluent consumers. While convenience, time efficiency, and promotional offers emerged as major drivers, factors like trust in payment systems and platform reliability did not significantly affect shopping frequency.

Chi-square analysis showed a significant association between gender and preference for online grocery shopping, indicating gender-based variations in adoption. However, correlation and regression analyses revealed that trust-related variables had minimal influence on purchase frequency, suggesting a complex interplay of behavioral and contextual factors beyond security concerns. Overall, the study demonstrates that while online grocery adoption is growing steadily in Phagwara, its full potential remains untapped due to persistent challenges related to delivery assurance, product quality, and user experience.

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