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Research Article

Impact of Dark Stores and Quick Deliveries on Consumer Behavior

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Abstract: The transition of E-Commerce sector has been marking a significant change in the Consumer Behavior with the advantage of new Technology in catering the products and delievening the services to consumers with speed and accuracy. This made a remarkable change in the mindset and thinking patterns and change in taste and preference of consumers in making decisions as far as new logistics capacities of E-Commerce players and quick deliveries are concerned. The rapid expansion of quick commerce businesses which promise ultra- fast last mile delivery requires an urgent assessment of their environment sustainability. Dark stores have emerged as a revolutionary fulfilment model in India retail landscape driven by the growing need for time efficient and reliable deliveries. Convenience delivery speed and safety are identified as primary motivators influencing usage. This study made an effort to examine the role of dark stores and quick deliveries particularly and the impact of these developments on the consumer behavior.

Keywords: Dark stores, Quick Commerce, Consumer Behavior, Instant Delivery, Last-Mile-Delivery, Delivery Speed, Online Grocery Platforms.

INTRODUCTION

The rapid expansion of quick commerce businesses which promise ultra-fast last mile delivery requires an urgent assessment of their environmental sustainability. This study investigates the sustainability of Q-commerce business model which relies heavily on electric vehicles and dark stores for last mile delivery services assesses the environment impact of express delivery operations particularly in terms of greenhouse gas emission. It examines the ability of EVs and dark stores under Q-commerce to reduce the carbon footprint compared to traditional online delivery methods, and evaluated the environmental pollution potential of increased delivery method and evaluates the environmental pollution potential of increased delivery frequency and faster last mile operations. Urban transportation faces ongoing environmental challenges particularly regarding emission traffic congestion and noise. The rise of quick commerce delivering within minutes or hours has transformed the retail and logistics landscape. Quick delivery services bridge the gap between online and traditional retail, offering customer the convenience of immediate access to products without physical store visits.

Dark stores have emerged as a revolutionary fulfilment model in India's retail landscape driven by the growing need contactless, time-efficient and reliable deliveries. Dark stores are becoming an integral element for urban retail systems and hold the potential to reshape future distribution in India. The retail sector in India has undergoes a digital transformation, accelerated by the need for convenience and safety during the pandemic. Operating exclusively through online platform these stores streamline the process of order placement, payments, and doorstep delivery minimizing human interaction and maximizing efficiency. Major online retailers and delivery platform have adopted the dark stores model to meet consumer demand for faster more reliable service. As customers increasingly favor online shopping for everyday essentials understanding their behavior toward dark store usage becomes essentials. This explores consumer awareness ordering patterns ad preferences regarding dark stores emphasizing their long-term role in shaping Indians modern retail ecosystem. This dark stores in India have undergoing in the form of digital transformation.

This study addresses how quick delivery system under Q-commerce can influence the behavior of consumers in selection of Q-Commerce players to place their orders and factors influencing on particularly in the aftermath of this pandemic and on their decision making and the role of Dark Stores as a supportive environment for their logistics.

LITERATURE REVIEW

The rapid rise of the quick commerce and dark stores has been widely examined across recent academic studies. Matthieu Schorung (2024) highlights that quick commerce has transformed food retailing by introducing micro fulfilling centres ("dark stores") , enabling instant deliveries under 30 minutes, Schorung explains that evolution of omnichannel retail, supported by mobile technologies and gig economy labour, has significantly accelerated the adoption of dark stores , which function as

small , urban warehouses dedicated entirely to online orders . His study further emphasizes how dark stores intensity last mile transport flows, creating new logistical pressures on cities.

In another perspective , Manas sarkar (2024) focus on the environmental sustainability of quick delivery operations . sarkar that although dark stores and EV based deliveries can reduce carbon emissions , the overall environmental footprints remain complex due to increase delivery frequency and high last mile energy consumption. His analysis shows that combustion engine delivery vehicles contribute heavily to greenhouse gas emissions and that the transition toward electric vehicles is essential for sustainable q commerce growth.

Complementing these logistics centric studies , pintado , Coelho de Oliveira , and Esparteiro Garcia (2022) provide insights into operational efficiency within dark stores . their case study in Portugal demonstrates how the use of EPP (expanded polypropylene) boxes with in a dark store can reduce dependence on refrigerated vehicles, lower transport costs, and streamline cold chain logistics . Their findings reinforce the importance of process innovation inside dark stores to improve overall supply – chain sustainability.

On the behavioral side , E. Shirin Hima Bindu , Swetha Kodali , D. Ratna kumari (2021) examines how stores environmental shape consumer behaviour . Although their work is based on physical retail stores, it offers valuable parallels for dark stores by explaining how environmental factors , store layout , and sensory element influence consumer decision making . This broader understanding of retail dynamics supports the idea that even in dark stores where customers do not enter the organization of space , product placement , and operational design play a critical role in fulfilment efficiency and service quality.

The evolution of dark stores and quick commerce has been widely discussed across various studies, especially as digital purchasing behaviour grew rapidly during and after the COVID- 19 pandemic . Khare (2022)provides one of the most detailed discussions on the operations structure of dark stores , explaining that they function as closed warehouses designed specifically for online order fulfilment. His study highlights how dark stores eliminate traditional retail challenges such as crowd management , in store browsing delays, and stock mismanagement . Khare also notes that during the pandemic , customers shifted to app-based ordering primarily due to safety , concerns, convenience , and faster access to perishable features that traditional grocery stores struggled to match.

Khare also refers to earlier institutional models such as Tesco's first dark store in 2009, which became a foundation for subsequent global adoption. These early models demonstrated that dark stores could operate more efficiently than conventional supermarkets by focusing solely on picking, packing, and dispatching . The literature shows that dark stores lead to reduce labour costs , systematic , temperature-controlled warehousing , and improved supply chain optimisation . However , one limitation highlighted by Khare is the challenge of maintaining average order receipts , as customers often purchase small quantities due to easy accessibility.

Khare provides one of the foundational discussions on how dark stores emerged during the COVID 19 pandemic as a virtual model offering faster , contactless grocery delivery . His study explain that dark stores operate without walk in customers, functioning as highly organized fulfilment centers designed to shorten delivery time. He highlights benefits such as improved quick access to essentials ,which significantly influenced customer behavior during lockdowns. How ever also notes constraints such as maintaining average order size and adapting to rising customer expectations for ultra-fast delivery.

The retail format driven by change in consumer behavior, logistics innovation, and digital market expansion. The dark store operates as high-speed micro fulfilment centers , strategically placed in densely populated neighborhood's to support 10–30-minute delivery modes. These stores are optimized for SKU precision, meaning they stock only high demand items that contribute significantly to fast moving consumer goods (FMCG) turnover. How advance technologies such as AI driven demand forecasting , real time inventory tracking , automated picking systems , route optimization algorithms form the backbone of dark store efficiency. These technological tools such as reduce the chance of stockouts, minimize picking errors, and maintain continuous product availability, which is essential for ultra-fast delivery promises.

OBJECTIVES OF THE STUDY

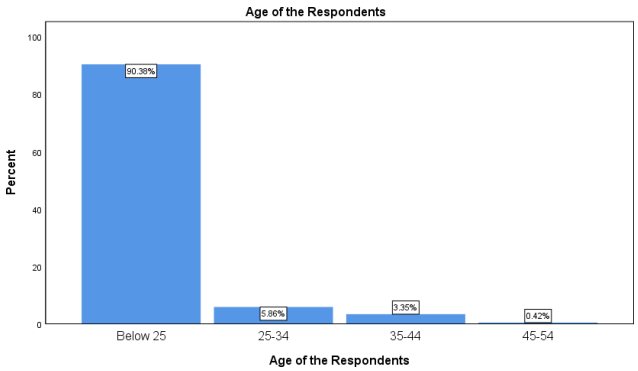
1. To measure consumer awareness and adoption of Dark Stores and quick delivery services.
2. To analyze how quick delivery options influence consumers' shopping patterns and purchase behavior.
3. To assess consumer attitudes, trust, and satisfaction toward Dark Stores compared to traditional retail.

METHODOLOGY OF THE STUDY

The Research methodology adopted for the study is Convivence Sampling Techniques through well-structured online distribution of survey. The study was conducted on online retailers. The study is depending on totally primary data collected from respondents from different demographic characters through distribution of Google Form. Finally, we have collected a total of 239 responses from the respondents in online. The data was processed with the help of SPSS software to draw the insights of Consumers in matters related to factors influencing and the impact of Dark Stores and Quick delivers in Consumer decisions. Based on the collected data we checked the reliability and validity. Further applied descriptive statistics for demographic profile and formulated hypothesis in order to identify relationship among the variables .

Major testes applied here are Kruskal-Wallis Test and Mann-Whitney Test.Data Analysis And Interpretation Age of the Respondents

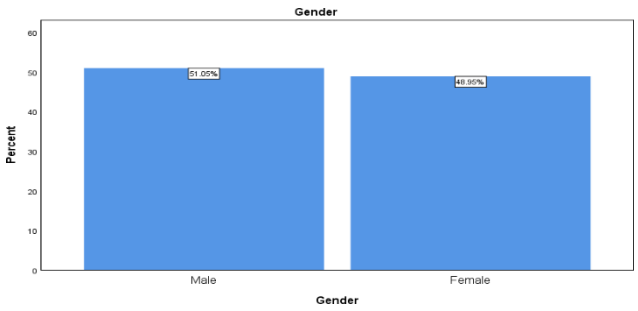
Age of the Respondents					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 25	216	90.4	90.4	90.4
	25-34	14	5.9	5.9	96.2
	35-44	8	3.3	3.3	99.6
	45-54	1	.4	.4	100.0
	Total	239	100.0	100.0	



Interpretation: The data clearly indicates that most participants are from the younger age group. Respondents aged below 25 make up 90.4% of the sample, showing that the study is largely driven by younger users. Only a small share belongs to older groups, with 5.9% between 25–34, 3.3% between 35–44, and 0.4% between 45–54. This uneven distribution reveals that the overall findings mainly reflect the attitudes of younger consumers, who are generally more comfortable with digital platforms and quick-commerce services. Therefore, the results should be considered as predominantly representative of youth perspectives rather than all age groups.

Gender

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	122	51.0	51.0	51.0
	Female	117	49.0	49.0	100.0
	Total	239	100.0	100.0	

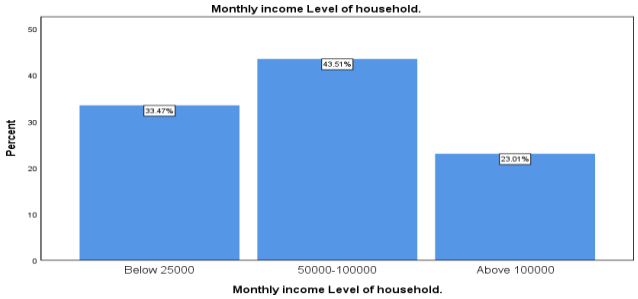


Interpretation: The survey sample shows a nearly even split between male and female participants, with 51% males and 49% females. This indicates that the responses incorporate perspectives from both genders in almost equal measure. The balanced distribution reduces gender bias and enhances the credibility of the findings. It also suggests that both men and women actively engage with the subject under study, making the insights more broadly applicable.

Monthly income Level of household.

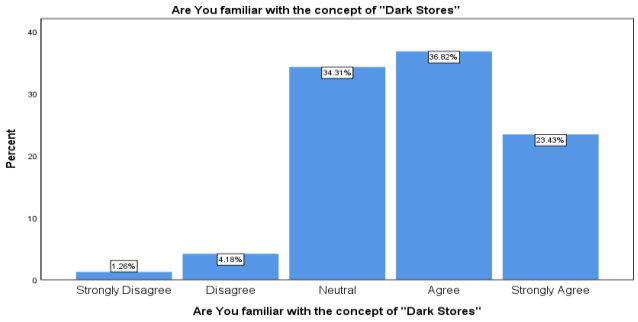
Monthly income Level of household.				
	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Below 25000	80	33.5	33.5	33.5
	50000-100000	104	43.5	43.5	77.0
	Above 100000	55	23.0	23.0	100.0
	Total	239	100.0	100.0	



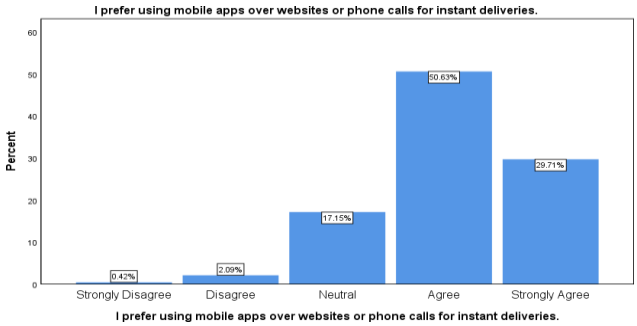
Interpretation: The results indicate that most respondents belong to the middle- income segment, with 43.5% earning between ₹50,000 and ₹100,000 each month. Meanwhile, 33.5% of households fall into the low-income category (below ₹25,000), and 23% are high-income earners (above ₹100,000). As shown by the cumulative distribution, a large majority—77%—earn up to ₹100,000 per month. This distribution highlights that middle-income households form the core of the participant group, while high-income households represent a smaller portion.

Are You familiar with the concept of "Dark Stores"					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	1.3	1.3	1.3
	Disagree	10	4.2	4.2	5.4
	Neutral	82	34.3	34.3	39.7
	Agree	88	36.8	36.8	76.6
	Strongly Agree	56	23.4	23.4	100.0
	Total	239	100.0	100.0	



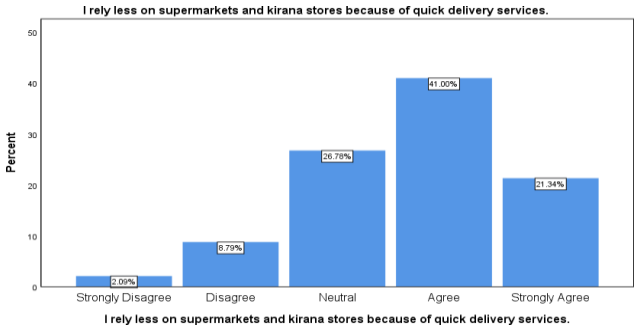
Interpretation: The data indicates a high level of awareness regarding dark stores, with 36.8% agreeing and 23.4% strongly agreeing that they are familiar with the concept. About one-third (34.3%) remain neutral, and only a small segment disagrees. Overall, respondents demonstrate considerable familiarity with dark stores.

I prefer using mobile apps over websites or phone calls for instant deliveries.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	.4	.4	.4
	Disagree	5	2.1	2.1	2.5
	Neutral	41	17.2	17.2	19.7
	Agree	121	50.6	50.6	70.3
	Strongly Agree	71	29.7	29.7	100.0
	Total	239	100.0	100.0	



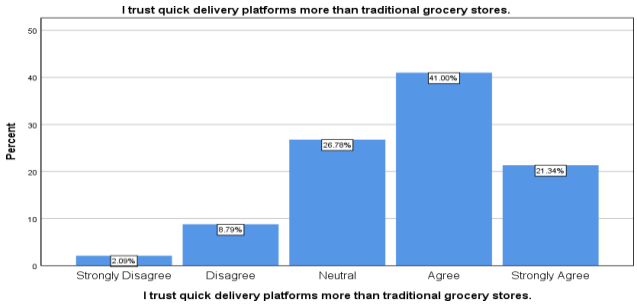
Interpretation: The analysis reveals a strong inclination among consumers toward mobile applications for instant delivery services. Among the 239 respondents, more than half (50.6%) agreed and nearly one-third (29.7%) strongly agreed that they prefer using mobile apps rather than websites or phone calls. Only a minimal percentage showed disagreement, and 17.2% maintained a neutral position. Overall, approximately 80% of participants demonstrated a positive preference for mobile apps, highlighting their convenience, speed, and ease of use as key factors influencing consumer behavior in the context of instant deliveries.

I rely less on supermarkets and kirana stores because of quick delivery services.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	2.1	2.1	2.1
	Disagree	21	8.8	8.8	10.9
	Neutral	64	26.8	26.8	37.7
	Agree	98	41.0	41.0	78.7
	Strongly Agree	51	21.3	21.3	100.0
	Total	239	100.0	100.0	



Interpretation: The results suggest that quick delivery services are reshaping consumer shopping behaviour, reducing reliance on supermarkets and Kirana stores. Out of the 239 participants, a combined 62.3% (41% agree and 21.3% strongly agree) acknowledged that they depend less on physical stores because of the convenience provided by instant delivery apps. While 26.8% of respondents remained neutral, only a small percentage disagreed with the statement. This indicates a clear behavioural shift towards quick-commerce platforms, reflecting their increasing influence on everyday purchasing decisions and traditional retail dependency.

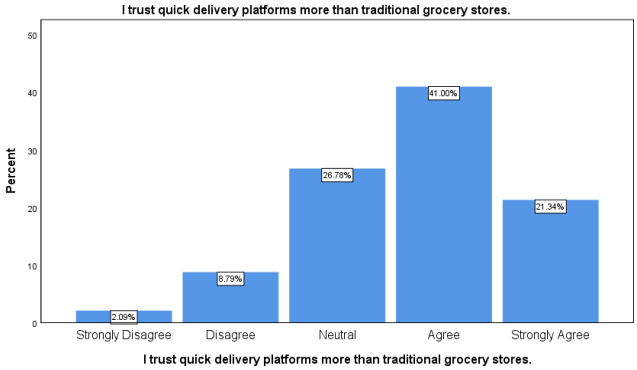
I trust quick delivery platforms more than traditional grocery stores.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	2.1	2.1	2.1
	Disagree	21	8.8	8.8	10.9
	Neutral	64	26.8	26.8	37.7
	Agree	98	41.0	41.0	78.7
	Strongly Agree	51	21.3	21.3	100.0
	Total	239	100.0	100.0	



Interpretation: The survey findings reveal a clear movement in consumer behavior toward favoring quick-delivery services. Most respondents hold a positive attitude, with 41% agreeing and 21.3% strongly agreeing that they place greater trust in quick-delivery platforms than in traditional grocery outlets. Only a small segment (10.9%) disagrees, while 26.8% remain neutral, indicating a group that has not yet formed a strong preference.

The chart further supports this pattern by illustrating that many consumers have reduced their dependence on supermarkets and kirana stores due to the convenience and fast service offered by quick-delivery options. The high concentration of agreement responses indicates that quick-commerce platforms are becoming a preferred alternative to conventional retail. Overall, the results suggest that rising expectations for speed, convenience, and digital accessibility are driving consumers toward quick-delivery channels, signalling continued growth opportunities for this sector.

I trust quick delivery platforms more than traditional grocery stores.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	2.1	2.1	2.1
	Disagree	21	8.8	8.8	10.9
	Neutral	64	26.8	26.8	37.7
	Agree	98	41.0	41.0	78.7
	Strongly Agree	51	21.3	21.3	100.0
	Total	239	100.0	100.0	



Interpretation: The findings indicate that consumers tend to trust quick delivery services more than traditional grocery stores. A total of 62.3% of respondents (41% agree and 21.3% strongly agree) expressed confidence in quick-delivery platforms. Around 26.8% maintained a neutral opinion, showing that they neither fully trust nor distrust either option. Only a small percentage disagreed with the statement, reflecting limited distrust. Overall, the results highlight a growing trust in quick-commerce platforms, suggesting that consumers perceive these services as dependable and efficient compared to conventional grocery outlets.

Null Hypothesis: Data Distribution is Normal(Parametric Tests)
Alt Hypothesis: Data Distribution is not Normal(Non-Parametric Tests)

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Awareness_Adoption	239	100.0%	0	0.0%	239	100.0%

Descriptives				
			Statistic	Std. Error
Awareness_Adoption	Mean		3.8138	.04678
	95% Confidence Interval for Mean	Lower Bound	3.7217	
		Upper Bound	3.9060	
	5% Trimmed Mean		3.8280	
	Median		4.0000	
	Variance		.523	
	Std. Deviation		.72316	
	Minimum		2.00	
	Maximum		5.00	
	Range		3.00	
	Interquartile Range		1.00	
	Skewness		-.059	.157
	Kurtosis		-.497	.314

As the p-value of Shapiro-Wilk Test is 0.000 which is less than 5% level of significance we reject null hypothesis which means that distribution is not Normal. So we will use Non Parametric test.

Mann-Whitney Test:
Null Hypothesis (H_0): There is no difference between Males and Females in Awareness and Adoption of Dark Stores and Quick Commerce Platforms.

Alternative Hypothesis (H_1): Males have higher Awareness and Adoption rate than females.

Ranks				
	Gender	N	Mean Rank	Sum of Ranks
Awareness_Adoption	Male	122	132.56	16172.50
	Female	117	106.90	12507.50
	Total	239		

Test Statistics[a,b]	
	Shopping_Awareness
	Adoption
Mann-Whitney U	5604.500
Wilcoxon W	12507.500
Z	-2.933
Asymp. Sig. (2-tailed)	.003
a. Grouping Variable: Gender	

Interpretation of Result:
As this is a one-tailed test hypothesis with Mann-Whitney U = 5604.500, Z = -2.933, Asymptotic Sig. (2-tailed) = 0.03, Mean Rank (Males) = 132.56, Mean Rank (Females) =

106.90 Since our 2-tailed p-value = 0.003, the one-tailed p-value would be approximately 0.0015 (half of 0.003) which is p = 0. 0015 < 0.05 → Reject the null hypothesis which means that Males have higher Awareness and Adoption of Quick Commerce and Dark stores.

The mean Rank of Male is 132.56 and that of Female is 106.90. As Likert Scale is 5=SA,4=A,3=N,2=D,1=SD. So, if mean rank is towards Higher side it means that opinion is towards agreement side. This means that Males have more Awareness and Adoption than that of females.

Kruskal-Wallis Test:
Null Hypothesis (H_0): The shopping Behaviour is the same across all different Age Group respondents.

Alternative Hypothesis (H_1): At least one Age group differs significantly in their shopping Behaviour compared to others.

Ranks			
	Age of the Respondents	N	Mean Rank
Shopping_Behavio ur	Below 25	216	118.00
	25-34	14	115.46
	35-44	8	193.69
	45-54	1	25.50
	Total	239	

Test Statistics[a,b]	
	Shopping_Behav iour
Kruskal-Wallis H	11.414
df	3
Asymp. Sig.	.010
a. Kruskal Wallis Test	
b. Grouping Variable: Age of the Respondents	

Interpretation of Result:
As the p-value of Kruskal-Wallis H Test is 0.010 which is 5% level of significance we reject Null Hypothesis which means that population medians are not equal. There is a statistically significant difference in Shopping Behaviours among at least one pair of Age groups.

The output indicates the result that Kruskal-Wallis H = 11.414 and Degrees of freedom (df) = 3,Asymptotic Sig. (p-value) = 0.010 with correction of ties and Z score for significant. As the mean ranks of Below 25: 216 (Mean Rank = 118.00), Age of 24-34: 14(Mean Rank = 115.46), Age of 35-44: 8 (Mean Rank = 193.69), Age of 45-54: 01(Mean Rank = 25.50). As Likert Scale is 5=SA,4=A,3=N,2=D,1=SD. So, if mean rank is towards Higher side it means that opinion is towards agreement side. This means that Below 25 Age group people agree more on shopping on Quick Commerce platforms in comparison to other Age Group People.

CONCLUSION

The present study demonstrates that dark stores and quick deliveries platform have become significant contributors to the transformation of consumer purchasing behaviour. The results indicates that awareness and usage of these services are notably high, particularly among younger respondents and those belonging to middle-income households. Mobile applications have emerged as the dominant channel for accessing quick-commerce service , reflecting consumer growing preference for digital interfaces that offer speed , convenience and ease of access.

The findings also highlight meaningful demographic variations. Male respondents exhibited comparatively higher levels of awareness and adoption than their female counterparts. Age based differences were equally evident, with individuals below 25 years showing a stronger inclination towards quick-commerce platforms compare to older participants. These patterns suggest that digital proficiency and lifestyle factors play a decisive role in shaping shopping preferences with the quick-delivery ecosystem.

Overall , the study provides evidence of a substantial shift from traditional retail outlets such as Supermarkets and Kirana stores towards digitally driven , instant-delivery models. Increased trust in quick-delivery platforms further reinforces this transition. The insights generates through this research emphasize the need for retailers and policymakers to adapt to evolving consumer expectations and to develop strategics that enhance the efficiency , reliability, and user experience offered by quick-commerce platforms.

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