The Impact of Dark Stores on Consumer Behaviour

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Abstract—

Purpose: This study explores how dark stores impact urban consumer behaviour across different age groups in Indore, a rapidly growing retail market in India. It examines their influence on shopping habits, satisfaction, and future adoption, as well as their effect on traditional retail dynamics.

Methodology: A quantitative research approach was adopted to analyse consumer behaviour across different age groups. Correlation analysis was performed to examine the dependency between usage, satisfaction, and future intent regarding dark stores. Additionally, mean analysis was conducted to assess how these variables vary across different age groups.

Keywords— **Dark Stores, Consumer Behaviour, Retail Transformation, Local Retail Logistics, E-commerce Growth.**

I. INTRODUCTION

The rise of the digital age and online markets has led to an increase in the need to generate quick and accessible shopping experiences. To fulfil these increasing needs of the market, online shopping apps are switching to a cloud storage-based model called the "dark store model". This cloud storage can provide efficient delivery of goods to the consumer in as little as a few minutes. In recent years there has been a tremendous switch to online shopping by the upcoming generation due to its convenience and effectiveness. This hyper-efficient model, coupled with the convenience of online shopping, has particularly resonated with younger generations, who increasingly prefer the ease and speed of digital transactions. However, this 'stay at home' version of shopping is seen to decrease the traffic in traditional walk-in store settings. This phenomenon may pose a serious threat to traditional retail shopping establishments. This study focused on the fast-developing economy of Indore and aimed to provide valuable insights about the shift in trend towards dark stores to navigate the challenges of the digital age and ensure their continued success in the evolving retail market.

II. LITERATURE REVIEW

Definition and Operational Models

Dark stores are essentially distribution centres designed to handle online orders efficiently. Unlike traditional walk-in stores, they are optimised for picking, packing, and dispatching products. Hübner, Kuhn, and Wollenburg (2016) catagorise dark stores into hyperlocal and centralised models. Hyperlocal dark stores are smaller and located within cities to enable rapid delivery, often in less than an hour. Centralised dark stores are larger facilities situated on the outskirts of urban areas, focusing on larger volumes with longer delivery durations.

Theory vs. Practice

Dark stores, which were first created to address the increased demand for rapid delivery in e-commerce, are retail establishments dedicated solely to Internet purchases. These establishments do not accept walk-in customers and focus primarily on efficient inventory management and quick shipments. Hidden shops became increasingly significant during the pandemic because they let businesses meet increased online purchasing demand while retaining operational efficiency. (Bittermann, A., & Hess, D. B. 2024)

Traditional Retail

Traditional retail is the practice of selling products and services directly to consumers through physical establishments. These retailers are characterised by their physical store presence, where consumers can visit, browse, and purchase products in person. Traditional shops frequently form deep bonds with their clients, offering personalised support and suggestions based on an awareness of local tastes and requirements. Inventory is handled on-site, guaranteeing that things are ready for purchase. Payment methods in conventional retail are usually versatile, including cash transactions and various credit options.

Traditional Consumer

A traditional consumer is someone who engages in the purchasing of goods and services primarily

through physical outlets rather than online platforms. These customers appreciate shopping because it allows them to physically inspect, feel, and assess things. Conventional shoppers frequently like familiar settings where they can engage with merchants and get tailored guidance and suggestions.

Consumer Psychology

Customer psychology plays an important role in the success of dark stores. Convenience, rapidity, and dependability are all important factors in online purchasing choices. Sheth and Solomon (2014) discover that dark stores solve the psychological need for immediate satisfaction by explaining how fast shipping and availability could greatly improve consumer satisfaction and retention.

Furthermore, Bandura's Social Learning Theory provides a valuable point of view for understanding how customers behave within the setting of dark stores. Bandura (1977) claims that people form habits by observing others, particularly those they see as role models. Peer reviews and influencers have a significant impact on consumer behaviour in the e-commerce industry. Positive comments from reliable sources may increase the credibility and convenience of dark stores, which would encourage more people to make purchases through this method.

Impact on Traditional Consumers

Psychological Impact

1. Behavioral Economics and Decision-Making: Customers' decision-making is influenced by the quickness and convenience that dark establishments provide. The efficiency of online purchasing led to a change in the behaviour of traditional consumers who are used to shopping in person. The idea of constrained rationality states that customers frequently choose solutions that provide maximum convenience and the least amount of obstacles. (Miller, Monica & Clark, Jordan & Jehle, Alayna. 2015).

2. Expectancy Theory and Customer Satisfaction According to expectancy theory, the possibility of reaching desired results determines consumer satisfaction. By guaranteeing faster deliveries and improved stock management, dark stores increase the dependability of e-commerce and meet customer demands for convenience and efficiency.

This improvement in service quality can lead to higher levels of customer satisfaction among traditional consumers who begin to view online shopping as a viable alternative to in-store purchases (Andersone, I., & Gaile-Sarkane, 2010).

Impact on Traditional Retailers

Management and Operational Impact

1. Competitive Pressure and Strategic Adaptation: Traditional retailers are under a lot of strain from the growth of dark shops. To stay competitive, conventional merchants need to change by setting up digital sales channels and improving their logistics. According to strategic management theories like Porter's Five Forces, traditional retailers must innovate and set themselves apart from the competition to counter the potential risks posed by new business models like dark stores (Porter, 2008). Offering unique in-store experiences, individualised services, or mixed approaches that combine online and in-store purchasing might all be part of this.

2. Competition and Impact: Dark stores have been identified as providing unfair competition to small enterprises and retail merchants. The fast expansion of dark businesses, backed by considerable capital investments, has sparked concerns about their impact on the local economy and way of life. Concerns include the potential closure of smaller retail stores, as well as the increase of abandoned properties due to increased losses, which may have a ripple effect on the urban landscape and street environment. (Andersone, I., & Gaile-Sarkane, 2010).

Psychological and Social Impact:

1. Shop Morale: The shift to dark stores may make traditional shop settings less upbeat. Retail establishments may feel endangered by the increasing automation and drop in in-store traffic. They could try to address these problems in two ways: by providing better services and by using contemporary advertising techniques.

2. Community Engagement and Social Capital: Conventional retailers often serve as social hubs that encourage community involvement. The rise of dark companies could undermine this social communication because fewer people are visiting stores. Conventional stores can lessen this effect in

many ways, such as by hosting events, supporting local charities, and creating spaces that encourage social interaction. Building strong ties with the community can help traditional retailers stand out from their strictly transactional internet rivals (Putnam, 1995).

III. FORMULATION OF HYPOTHESIS

Based on the arguments presented, the authors propose the following hypothesis, which addresses consumer behaviour:

H1: The presence of dark stores in Indore significantly affects consumer behaviour across different age groups, leading to increased online shopping and decreased foot traffic in traditional retail stores.

H2: Increased reliance on dark stores correlates with a higher likelihood of future usage.

H3: Consumers who prefer dark stores over traditional retail believe that dark stores will fully replace physical stores in the future.

H4: Customer service satisfaction is the primary driver of frequent usage of dark stores.

IV. METHODOLOGICAL FRAMEWORK

4.1. Research Objectives
This study aims to analyse the impact of dark stores on consumer behaviour in Indore by examining the relationship between age and key variables, including:
- Dark Store Usage Frequency
- Satisfaction Levels
- Future Predictability of Continued Usage

4.2 Research Design
A quantitative research approach was adopted, employing statistical methods to derive insights from the target population. The study relies on structured data collection and statistical analysis to ensure objective and measurable results.

4.3 Population and Sampling
Total Population
The research considers the total population of Indore, which stands at 3,276,697 individuals.

Usable Population
Given that 73% of the population resides in urban areas and is above the poverty line, the usable population for this study was determined to be 2,427,709 individuals.

Sampling Frame
The study focuses on individuals within the usable population who shop online or engage with dark store services.

Sample Size Determination
- The required sample size was calculated based on a 95% confidence level and a 5% margin of error, yielding a minimum sample size of 303 respondents.
- To ensure robustness and representation, a final sample of 330 respondents was collected.

4.4 Data Collection Methods
Primary Data Collection
- Data was collected through structured online questionnaires distributed among individuals within the usable population.
- The questionnaire was designed to assess consumer behaviour in relation to age across the following categories:
  - Dark Store Usage Frequency
  - Satisfaction Levels
  - Future Predictability of Continued Usage

4.5 Data Analysis
Descriptive Statistics
Descriptive statistical methods were employed to analyse the relationship between age and the study's key variables. This analysis aimed to identify underlying trends and patterns within the dataset.

Correlation Analysis
To examine the interdependencies between variables, a correlation analysis was conducted using Pearson's correlation coefficient, which measures the strength and direction of relationships. The analysis focused on the following variables:
1. Dark Store Usage Frequency
2. Satisfaction Levels
3. Future Predictability of Continued Usage

This statistical approach provided insights into consumer behaviour and potential predictors of dark store adoption trends.

4.6 Tools and Software
Statistical Tools
The data analysis was conducted using:
- Google Sheets and Google Docs for data organization and documentation.

- SAS for advanced statistical analysis, including both descriptive and inferential evaluations.

Data Visualization

To enhance interpretability, charts and graphs were utilized to represent relationships between the examined variables. These visualizations facilitated a clearer understanding of consumer behaviour trends and patterns.

4.7 Ethical Considerations
- Informed Consent: Participants were provided with details regarding the study's purpose and gave their explicit consent before sharing their responses.
- Anonymity and Confidentiality: All responses were anonymized to protect participant identities and ensure data confidentiality.

Dataset

The processed data and statistical results are attached below-
Dataset and correlation analysis: Data Set

V. INSIGHTS FOR CORRELATION ANALYSIS

5.1: Usage and Future Variables:

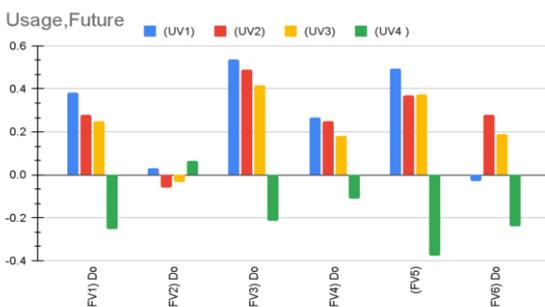Table I. Insights for Usage and Future Variables

Fig. I Correlation of Usage and Future Variables

1. Frequent Users Will Continue Using Dark Stores:
Users who shop often at dark stores strongly believe they'll increase their usage in the next 5 years

(0.53555) and are more likely to recommend them to others (0.49439).

2. Urgency Strengthens Future Usage:
Using dark stores for urgent purchases correlates positively with future intentions (0.417 for increased usage). Convenience for emergencies is a key factor driving loyalty.

3. Scepticism about the Replacement of Traditional Retail:
Frequent dark store users still show a weak or mixed correlation with the belief that dark stores will replace traditional retail (-0.02925 to 0.28022). This suggests that while dark stores are valued, they aren't yet seen as a full replacement.

5.2: Usage and Satisfaction Variables:

Table II. Insights for Usage and Satisfaction Variables

Fig II. Correlation of Usage and Satisfaction Variables

1. Regular Use Promotes Satisfaction:
There is a considerable correlation between regular usage of dark stores for general shopping (0.43826) and urgent purchases (0.45216) and high satisfaction with delivery speed.
Concurrently, frequent usage and product quality satisfaction are positively correlated (0.42777 for overall purchasing). This shows that frequent consumers appreciate these services' dependability and efficiency.

2. Customer acknowledgement second:
Customer service satisfaction is less strongly correlated with usage (0.18085 for shopping

frequency), indicating that although service is important, it is not the primary driver of frequent use.

3. The drawbacks of traditional store visits:
Delivery speed (-0.18124) and product quality (-0.22125) are two satisfaction metrics that have a negative correlation with frequent visits to traditional stores. This implies that consumers who continue to purchase from traditional stores may perceive dark stores less favourably.

5.3: Satisfaction and Future Variables:

Table III. Insights for Satisfaction and Future Variables

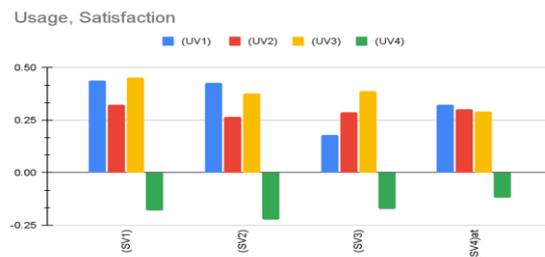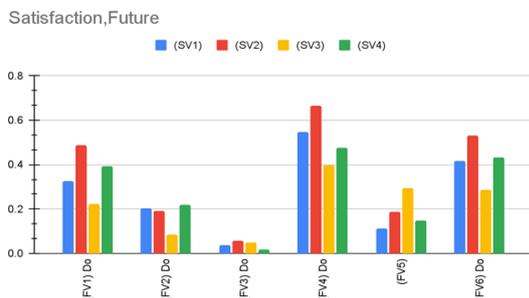| Correlation Analysis: Satisfaction Variables with future Variables Pearson Correlation Coefficients, N = 330				
Satisfaction Variables: SV Future Variables: FV	(SV1)How satisfied are you with the delivery speed of dark stores?	(SV2)How satisfied are you with the product quality from dark stores?	(SV3)How satisfied are you with the customer service provided by dark stores?	(SV4)at what scale ratings and reviews makes your experience better when shopping online, compared to traditional in-store shops where this feedback is not available?
(FV1) Do you feel that dark store services provide better value compared to traditional retail stores?	0.32772	0.48861	0.22137	0.39248
(FV2) Do you think of in-person shopping as a way to engage with the community	0.2047	0.1908	0.08696	0.22067
(FV3) Do you see yourself using dark store services more frequently in the next 5 years?	0.03649	0.05852	0.05125	0.01825
(FV4) Do you think the emergence of dark stores is threatening the employees in a traditional setting?	0.54578	0.66533	0.39695	0.47652
(FV5) How likely are you to recommend dark stores to others?	0.11256	0.18758	0.29471	0.14764
(FV6) Do you think dark stores will replace traditional retail stores in the future?	0.41857	0.53035	0.28788	0.43243

Fig III. Correlation of Satisfaction and Future Variables

1. Satisfaction Drives Positive Future Perceptions:
High satisfaction with delivery speed (0.43826) and product quality (0.42777) is strongly tied to intentions to use dark stores more frequently in the future (0.53555) and likelihood to recommend them (0.49439).
Customers who find dark stores valuable are more confident in their future relevance.

2. Value Perception Influences Threat Perception:
Satisfaction with dark stores correlates with concerns about their impact on traditional retail employment (0.54578 for delivery speed satisfaction and employee threat perception). Customers recognise the societal trade-offs while valuing the service.

3. Inconsistent Beliefs About Replacement:
Despite being satisfied, many customers do not believe dark stores will completely replace traditional retail (correlations around 0.41857 for product quality satisfaction and replacement belief).
This implies satisfaction isn't synonymous with viewing dark stores as the dominant model of the future.

5.4: Collective Insight:
- Usage and Satisfaction: Frequent users are generally satisfied, valuing delivery speed and product quality the most.
- Usage and Future: Regular use, especially for urgent needs, predicts stronger future adoption and advocacy.
- Satisfaction and Future: Satisfied customers are optimistic about the growth of dark stores but remain cautious about their dominance or societal impact.

VI. INSIGHTS OF MEAN ANALYSIS

6.1: Following are the insights of usage, future and satisfaction variables with respect to age:
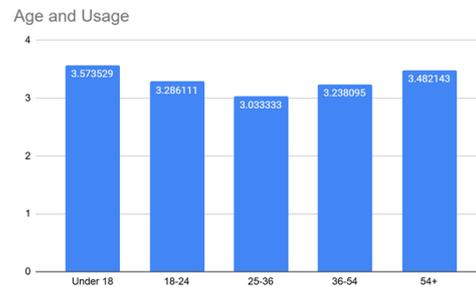

Fig IV. Insights of age with usaae variables
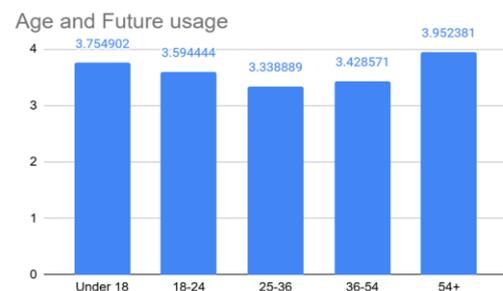

Fig V. Insights of age with future Variable

Fig VI. Insights of age with satisfaction Variables

6.2: Findings of age demographics:

Elders who prefer convenience: Dark stores are mainly used by individuals aged 54 and above, who report high satisfaction with the medium. This suggests a potential shift away from traditional retail stores among older generations.

Tech-Savvy Teens: Teenagers constitute the second-largest user bracket of dark stores. This aligns with the growing trend of online dependency and digitisation of the world.

Middle-Aged Preference for Traditional Retail: While dark stores are gaining traction among younger and older age groups, middle-aged individuals continue to favour traditional retail stores.

6.3: Overall Implications:

The findings highlight a significant trend toward the onset of dark stores, particularly among older and younger age brackets. This suggests that traditional retail stores will likely see a decline in customer base, though they may not disappear entirely. Due to its convenience, the increasing use of dark stores by older generations, who are generally reluctant to embrace new technologies, is a noteworthy development.

As technology continues to advance and younger generations become even more comfortable with online shopping, the popularity of dark stores is expected to grow further.

VII. RESULT AND INTERPRETATION

7.1: Trends:

- Older Generations Leading Usage: Individuals aged 54 and above are the primary users of dark stores, showcasing a shift away from traditional retail. Their high satisfaction with delivery speed and product quality underscores the value they place on convenience and reliability.
- Tech-Savvy Teenagers: Teenagers, as digital natives, form the second-largest user group, aligning with their preference for online solutions.
- Middle-Aged Hesitation: Middle-aged individuals continue to favour traditional retail, highlighting a gap in the adoption of dark stores within this demographic.

7.2: Usage and Satisfaction:

- Frequent Usage Drives Satisfaction: Correlation data reveals that frequent use of

dark stores is strongly tied to satisfaction with delivery speed (0.45216) and product quality (0.42777). This indicates that consumers deeply appreciate the efficiency of dark store services.

- Customer Service as a Secondary Factor: Satisfaction with customer service, while positive, exhibits a weaker correlation with usage (0.18085), suggesting it is less critical in influencing frequent use.
- Negative Perception Among Traditional Store Visitors: A negative correlation between traditional store visits and satisfaction variables (e.g., -0.18124 for delivery speed) highlights resistance from users still engaged with brick-and-mortar retail.

7.3: Future Perspectives and Satisfaction:

- Frequent Users and Future Growth: Correlations show that frequent users strongly believe in increased future usage of dark stores (0.53555) and are likely to recommend them to others (0.49439), suggesting sustained loyalty.
- Scepticism About Replacement of Traditional Retail: Despite satisfaction with dark stores, customers remain sceptical about their potential to fully replace traditional retail (-0.02925 to 0.28022), indicating that dark stores are seen as a complement rather than a substitute.
- Value and Societal Concerns: Satisfaction with delivery speed and product quality also correlates with concerns about the impact of dark stores on traditional retail employment (0.54578), highlighting a recognition of trade-offs despite high service value.

7.4: Future Perspectives and Usage:

- Continued Adoption of Dark Stores: The data shows that frequent users of dark stores are very likely to keep using these services in the future. A strong correlation (0.53555) between regular usage and future intention indicates that dark stores have effectively built long-term customer loyalty.
- Convenience and Urgency as Key Drivers: Consumers who use dark stores for urgent purchases are more likely to continue using them in the long term. A correlation of 0.417 between emergency-based purchases and

future usage highlights that convenience is a significant factor in determining consumer loyalty.

o Uncertainty Around Traditional Retail Replacement: Despite an increasing reliance on dark stores, consumers remain sceptical about their complete replacement of traditional retail. Correlation results (-0.02925 to 0.28022) show that while dark stores are a valuable addition, they are not yet perceived as a full substitute.

VIII. CONCLUSION

This study investigated the impact of dark stores on consumer behaviour in Indore, examining various age groups. The findings revealed that the presence of dark stores significantly influences shopping habits, leading to an increase in online shopping and a decrease in foot traffic at traditional retail locations. Notably, older shoppers (aged 54 and above) and teenagers demonstrate a stronger inclination to utilize dark stores, while middle-aged consumers show a preference for conventional retail, highlighting a generational gap in adoption.

The research also identified a robust correlation between the regular use of dark stores and the probability of making future purchases. Consumers who frequently use dark stores are highly likely to maintain this habit, indicating a growing reliance on this retail format. However, the idea that dark stores will fully supplant traditional retail was not supported by the findings. Instead, the research indicates that dark stores are intended to enhance physical retail rather than completely replace it.

Moreover, while customer service significantly affects consumer satisfaction, it is not the primary driver for the frequent use of dark stores. Aspects such as the speed of delivery and the quality of products play a more pivotal role in encouraging repeat purchases, underscoring the importance of efficiency and reliability in consumer decision-making.

In conclusion, the study confirms that dark stores have a substantial impact on consumer behaviour in Indore, with expected growth in this sector. Nonetheless, traditional retail is projected to persist, serving those market segments that prefer in-person shopping experiences. Understanding these trends can help businesses modify their strategies to effectively address the diverse needs of consumers in an evolving retail landscape.

IX. LIMITATIONS

o This study's findings are based on self-reported data, which may lead to biased data, as consumers may overestimate or underestimate their online shopping behaviour.

o Additionally, the sample size may limit generalisation across all of Indore, as shopping preferences are widely subjective.

o Future studies may increase the sample size and focus on specific consumer segments, like middle-aged individuals, to deepen insights.

Declaration of AI and Assistance Usage
During the preparation of this work, the authors used Grammarly for grammar and language refinement, and ChatGPT for text structuring and clarity enhancement. After using these tools/services, the authors reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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