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Integrating Multi-dimensional Factors Influencing Consumer Behavior in Bangladeshi E-commerce: A Data-Driven Approach

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Abstract

E-commerce in Bangladesh has experienced remarkable growth and transformation over the past few years. The rapid growth of the e-commerce sector in Bangladesh has transformed the retail landscape, making it essential for businesses to understand the factors influencing consumer purchasing behavior. Data was collected from a diverse sample of online shoppers through structured surveys, focusing on different characteristics and user experience factors. By integrating advanced statistical techniques such as crosstab analysis, factor analysis, etc. the research offers a holistic approach to identify and analyze the impact of different variables on purchasing behavior in the Bangladeshi e-commerce sector. Among the nineteen (19) variables that were analyzed differentially, ten (10) variable was found to be significant for the e-commerce sector. The results highlight critical factors such as age, education level, marital status, monthly income, and occupation as primary drivers of purchase decisions. The variables were grouped into two categories namely *'Demographic Influences'* and *'Accessibility and Affordability'*. The contribution of this study is that it integrates multiple characteristics – demographic, psychographic, behavioral, and value-based that were typically analyzed separately in previous researches. Additionally, this study systematically groups these variables into distinct and meaningful categories, an aspect not thoroughly addressed in the existing literature. Finally, this study provides Bangladeshi marketers and e-commerce businesses useful information that helps them to optimize their marketing strategies, tailor customer engagement efforts, and enhance overall customer experience in the rapidly growing digital market of Bangladesh.

Keywords

E-commerce, Purchasing behavior, Data-driven Analysis, Crosstab analysis, Factor analysis.

1. Introduction

The rapid expansion of the e-commerce sector in Bangladesh has transformed the retail landscape, offering unprecedented convenience and variety to consumers. With increasing internet penetration and widespread adoption of smartphones, the digital marketplace has seen exponential growth, becoming a critical platform for businesses to reach a diverse customer base. E-commerce platforms in Bangladesh offer a wide array of products, ranging from electronics and fashion to groceries and daily essentials. This diverse product range caters to the preferences and needs of various segments of the population. Platforms like Daraz, AjkerDeal, and Evaly serve as hubs for various sellers and brands, providing a convenient shopping experience for consumers. Despite this expansion, understanding the

factors influencing purchasing behavior remains a challenge for e-commerce companies aiming to optimize their marketing strategies and enhance customer engagement.

Online shopping behavior in Bangladesh reveals that most online shoppers are young, under 40, drawn by the convenience of time-saving, home delivery, and diverse product options. Social media, particularly Facebook, plays a key role in influencing purchasing decisions, with recommendations from friends and family being significant. Consumers are highly price-sensitive, assessing product quality based on price and past experiences, and overwhelmingly prefer cash on delivery due to trust and security concerns with online payments. Major challenges include privacy issues and the inability to inspect products physically Rahman et al. (2018). Another study in Dhaka, Bangladesh found significant gender differences in online shopping behaviors, noting that females are more likely to shop online than males and are also more likely to reduce their physical shopping frequency. Additionally, car owners are found to engage more in online shopping, which correlates with a decrease in their physical shopping frequency. Enam et al. (2024). In China, various factors affecting consumer behavior were analyzed. It was seen that the complexity of consumer behavior is shaped by a combination of diverse consumer needs, technological advancements, environmental influences, security concerns, logistics, and psychological factors. Each of these elements interacts to create a multifaceted landscape of consumer actions in the e-commerce domain Lv (2023). He et al. (2024) examined channel-switching behaviors of online customers and found that consumers are penetrating online marketing (webrooming) rather than physical shopping (showrooming). Another study analyzed customer behavior regarding loyalty under the B2B concept in Iran based on recency, frequency, and monetary variables but didn't consider any demographic or behavioral variables (Hosseini et al. 2010).

Existing studies on consumer behavior in e-commerce have primarily focused on isolated characteristics such as demographic or psychographic factors, often neglecting the interplay between these diverse attributes. Furthermore, many traditional approaches have not accounted for the unique context of emerging markets like Bangladesh, where cultural, economic, and technological factors may differ significantly from more developed e-commerce landscapes. Given the distinct consumer behavior patterns in Bangladesh, there is a need for a comprehensive, data-driven analysis to uncover the key determinants of online purchasing decisions in this context.

1.1 Objectives

With an emphasis on various attributes and user experience variables, the main goal of this study is to identify and examine the various elements influencing purchase behavior in the Bangladeshi e-commerce industry. The specific objectives of the research are –

1. To identify and analyze the key factors influencing the purchasing behavior of customers in the e-commerce sector of Bangladesh.
2. To systematically categorize the influencing variables by grouping them into distinct and meaningful categories.

2. Literature Review

The E-commerce sector in Bangladesh operates in a complex ecosystem characterized by diverse customer segments, rapid market changes, and evolving technological landscapes. Traditional approaches to customer analysis struggle to adapt to this complexity. There exists a critical need for effective customer analysis**,** without proper analysis, businesses may invest resources in unintended customers that yield suboptimal results. This inefficiency not only leads to wastage of resources but also hampers the ability to reach target customers effectively. An e-commerce customer analysis was conducted based on recency, frequency, and monetary values, along with some demographic variables Shen (2021), Wu et al. (2022). However, the study lacks only a few variables consideration. Abdi and Abolmakarem (2019) proposed a Customer Behavior Mining Framework in a telecom company for portfolio analysis and customer segmentation based on some socio-demographic features. Ma and Gu (2024) investigated the impact of the digital economy on e-commerce enterprises and built a social media marketing strategy based on information sharing however the study omitted other influencing factors.

Trust in online platforms has emerged as a significant determinant of purchasing decisions. With the increasing penetration of e-commerce in Bangladesh, studies highlight that concerns over product authenticity, payment security, and data privacy play a crucial role in shaping consumer trust and, consequently, their purchase intentions Hasan et al. (2022). Another crucial factor is perceived value, which encompasses aspects such as price competitiveness, the quality of the products, and overall shopping convenience. Given the price sensitivity of Bangladeshi consumers, competitive pricing, promotional offers, and value-added services such as cash-on-delivery options have been found

to significantly enhance purchase likelihood. Consumers often weigh these factors heavily against their past online shopping experiences Rana and Abir (2022).

Miah et al. (2022) examined how social media affected their online purchasing habits during the COVID-19 pandemic within the framework of Bangladeshi consumers. The results showed that online reviews, promotional offers, and celebrity endorsements have a positive and considerable influence on Bangladeshi consumers' online purchasing habits. Rana and Abir (2022) studied the impact of five variables—perceived behavioral control, perceived ease of use, attitude, perceived usefulness, and subjective norms—on the online buying decisions of Bangladeshi consumers and found a significant relationship among them. Hasan et al. (2022) analyzed key factors influencing online shopping behavior in Bangladesh, including service quality and responsiveness, price, consumer resources, perceived risk, website features, trialability, generation gap, payment process, and demographics, concluding that the model demonstrated a moderately strong overall impact.

In the previous research, it is seen that some authors use demographic variables - Abdi and Abolmakarem (2019), Gunandi et al. (2023), Reza et al. (2018), some use behavioral characteristics – Tabianan et al. (2022), Reza et al. (2018), Kudyba and Lawrence (2008) and some other use value-based (Recency, Frequency, Monetary) variables – Hosseini et al. (2010), Mahfuza et al. (2022), Shen (2021) for e-commerce customer segmentation. This study aims to address this gap by integrating multiple dimensions of customer characteristics—demographic, psychographic, behavioral, and value-based—to provide a holistic view of the factors influencing purchasing behavior in the Bangladeshi e-commerce sector. Utilizing a robust methodological framework that includes factor analysis, and crosstab (chi-square test) analysis we identify critical variables and categorize them into meaningful groups. This approach not only provides insights into the key drivers of consumer behavior but also allows for the segmentation of customers based on their purchasing patterns, enabling businesses to implement more targeted and effective marketing strategies.

3. Methodology

3.1 Research Design

This study adopts a mixed-method approach, combining qualitative and quantitative methods to comprehensively investigate the factors influencing consumer behavior in the Bangladeshi e-commerce sector. The research design involves identifying and validating key variables through expert insights and empirical data analysis. It follows a sequential process starting with exploratory interviews and literature review, followed by structured surveys and advanced statistical techniques.

3.2 Variable Extraction

The variables considered in this study were derived from a combination of expert opinions, previous research, and behavioral theories. Semi-structured interviews were conducted with industry professionals, including e-commerce strategists, marketing managers, and consumer behavior analysts, to identify key factors shaping online shopping behavior in Bangladesh. Table 1 shows different variables extracted from different literature and based on expert opinions. The selected variables represent a multi-dimensional framework to capture the complexity of consumer behavior.

Table 1. Variables extracted for e-commerce consumer behavior in Bangladesh

Characteristics	Variables	
Demographic	Age	Akar (2021), Aljukhadar and Senecal (2011) Arslan et al. (2019), Femina and Sudheep (2015), Hosseini and Bideh, (2013), Sandy et al. (2013), Yadav et al. (2012), Zare et al. (2020)
	Gender	
	Education level	
	Marital status	
	Current region	
	Current occupation	
Psychographic	Overall lifestyle	Roos and Kazemi (2022), Sandy et al. (2013), Sjöberg and Engelberg (2005)
	Hobby or activity	
	General outlook on life	
	Attitude toward change and innovation	
Behavioral	Hours spent online	Aljukhadar and Senecal (2011), Farid Huseynov (2017), Hong and Kim (2012), Yadav et al. (2012)
	Internet access place	
	Company offers and promotions	
	Preferred payment method	
	Device used for online purchases	
Value-based	Monthly income	Akar (2021), Aljukhadar and Senecal (2011), Hong and Kim (2012), Pramono et al. (2019), Farid Huseynov (2017)
	Monthly expense	
	Product quality in online	
	Product diversity in online	

3.3 Survey Design

A structured survey was developed based on the selected variables to collect primary data from e-commerce consumers in Bangladesh. The survey incorporated Likert-scale questions, multiple-choice items, and open-ended prompts to gather quantitative and qualitative data. It was distributed online to reach a diverse sample of respondents, ensuring representation across different socio-economic and geographic segments.

3.4 Significant Variable Analysis

To evaluate the impact of individual variables on consumer behavior, statistical techniques such as chi-square test analysis and correlation tests were employed. These methods helped quantify the relationships between independent variables and dependent outcomes. The analysis aimed to identify the most significant drivers of consumer behavior.

3.5 Dimension Reduction

Exploratory Factor Analysis (EFA) was performed to identify underlying dimensions that explain the interrelationships among variables. This structured methodology enables a comprehensive exploration of the multi-dimensional factors influencing Bangladeshi e-commerce consumers, providing actionable insights for the industry.

4. Data Collection

A structured survey questionnaire targeting e-commerce customers to gather information about their experiences and preferences and demographic details (age, income, education, etc.) was collected through offline and online methods. For data collection random sampling method was used to ensure a diverse and representative sample of e-commerce customers across Bangladesh.

4.1 Descriptive statistics

A brief descriptive statistic of collected data is given in Table 2. Descriptive statistics summarize and organize data to provide an overview of its key characteristics. A total of 280 data was collected during the survey across the country among them 193 were male and 87 were female. Majority of samples ages range from (21-25) years and (31-40) years. These statistics help researchers understand patterns, identify anomalies, and establish a foundation for deeper inferential analysis.

Table 2. Descriptive statistics of collected data

		Count	Percent	Cumulative percent
Gender	Male	193	68.9%	68.9%
	Female	87	31.1%	100.0%
	Others	0	0.0%	100.0%
Age	Less than 20 years	23	8.2%	8.2%
	21-25 years	81	28.9%	37.1%
	26-30 years	60	21.4%	58.65%
	31-40 years	65	23.2%	81.8%
	More than 40 years	51	18.2%	100.0%
Current region	Dhaka Division	62	22.1%	22.1%
	Chattogram Division	23	8.2%	30.4%
	Rajshahi Division	81	28.9%	59.3%
	Khulna Division	35	12.5%	71.8%
	Barishal Division	16	5.7%	77.5%
	Sylhet Division	20	7.1%	84.6%
	Rangpur Division	26	9.3%	93.9%
	Mymensingh Division	17	6.1%	100.0%

4.2 Data preprocessing

Before analysis, the collected data were cleaned and prepared for statistical modeling. This involved handling missing values and detecting and addressing outliers. Coding and categorization of qualitative responses were also performed to ensure compatibility with analytical frameworks. Outliers are data points that deviate significantly from the rest of the dataset. They can arise due to errors or represent genuine anomalies. In our study some outliers were found after observing descriptive statistics those were detected and corrected manually. Other tests are required like co-linearity tests, reliability tests, etc. The data was found very low amount of collinearity and a moderate amount of reliability.

5. Results and Discussion

5.1 Numerical Results

5.1.1 Significant Variables

Statistically significant variables are those that have a meaningful impact on the outcome of a statistical analysis, as determined by hypothesis testing. Identifying such variables helps focus on the key factors influencing the dependent variable, enhancing the relevance and accuracy of the analysis. As all of our variables are categorical, chi-square tests were done for significance analysis. The purchase rate was taken as the independent variable and all others are dependent variables (age, gender, income, etc.). The significance level (α) was taken as 0.05 for all the chi-square tests. A variable is considered significant if its p-value is below a predetermined threshold (0.05), indicating that the observed relationship is unlikely due to chance. The following are the null and alternative hypotheses for the variables –

Null Hypothesis (H_0): There is no significant relationship between independent variables (such as age, gender, income, etc.) and the purchase rate.
Alternative Hypothesis (H_1): There is a significant relationship between demographic factors and the purchase rate.

Table 3 shows chi-square test results for the relationship between demographic variables and their significance in e-commerce. Significant associations were found for the following variables: age ($p = 0.002$), education level ($p = 0.017$), marital status ($p = 0.004$) and current region ($p = 0.028$). Other demographic variables such as gender ($p = 0.399$) did not show significant associations.

Table 3. Chi-Square Tests of demographic variables

		Value	df	Asymptotic Significance (2-sided)
Age	Pearson Chi-Square	37.786	16	0.002
	Likelihood Ratio	35.637	16	0.003
	Linear-by-Linear Association	2.784	1	0.095
Gender	Pearson Chi-Square	4.533	4	0.339
	Likelihood Ratio	4.666	4	0.323
	Linear-by-Linear Association	0.196	1	0.658
Education level	Pearson Chi-Square	30.19	16	0.017
	Likelihood Ratio	30.216	16	0.017
	Linear-by-Linear Association	11.434	1	0.001
Marital status	Pearson Chi-Square	22.293	8	0.004
	Likelihood Ratio	23.241	8	0.003
	Linear-by-Linear Association	7.835	1	0.005
Current region	Pearson Chi-Square	44.036	28	0.028
	Likelihood Ratio	42.557	28	0.038
	Linear-by-Linear Association	4.266	1	0.039
Current occupation	Pearson Chi-Square	38.338	24	0.032
	Likelihood Ratio	36.633	24	0.048
	Linear-by-Linear Association	0.783	1	0.376

Table 4 shows the chi-square test results for the psychographic variables. It shows that none of the variables, overall lifestyle ($p = 0.573$), hobby or activity ($p = 0.458$), general outlook on life ($p = 0.758$), attitude toward change and innovation ($p = 0.951$) are significant indicating that impact is very low in the e-commerce sector.

Table 4. Chi-Square Tests of psychographic variables

		Value	df	Asymptotic Significance (2-sided)
Overall lifestyle	Pearson Chi-Square	18.213	20	0.573
	Likelihood Ratio	20.324	20	0.438
	Linear-by-Linear Association	0.224	1	0.636
Hobby or activity	Pearson Chi-Square	19.997	20	0.458
	Likelihood Ratio	19.952	20	0.461
	Linear-by-Linear Association	0.037	1	0.847
General outlook on life	Pearson Chi-Square	8.344	12	0.758
	Likelihood Ratio	8.334	12	0.759
	Linear-by-Linear Association	0.019	1	0.89
Attitude toward change and innovation	Pearson Chi-Square	5.187	12	0.951
	Likelihood Ratio	4.868	12	0.962
	Linear-by-Linear Association	1.557	1	0.212

Table 5 shows the chi-square test results for the behavioral variables. Significant associations were found for the following variables: internet access place ($p = 0.037$), and device used for online purchases ($p = 0.012$). Other demographic variables such as hours spent online ($p = 0.232$), the company offers and promotions ($p = 0.439$), **and** preferred payment method ($p = 0.164$) did not show significant associations.

Table 5. Chi-Square Tests of behavioral variables

		Value	df	Asymptotic Significance (2-sided)
Hours spent online	Pearson Chi-Square	15.179	12	0.232
	Likelihood Ratio	14.697	12	0.258
	Linear-by-Linear Association	1.791	1	0.181
Internet access place	Pearson Chi-Square	16.362	8	0.037
	Likelihood Ratio	16.796	8	0.032
	Linear-by-Linear Association	3.807	1	0.051
Company offers and promotions	Pearson Chi-Square	16.198	16	0.439
	Likelihood Ratio	16.086	16	0.447
	Linear-by-Linear Association	0.096	1	0.756
Preferred payment method	Pearson Chi-Square	21.378	16	0.164
	Likelihood Ratio	21.766	16	0.151
	Linear-by-Linear Association	0.045	1	0.833
Device used for online purchases	Pearson Chi-Square	31.388	16	0.012
	Likelihood Ratio	36.068	16	0.003
	Linear-by-Linear Association	1.148	1	0.284

Table 6 shows the chi-square test results for the behavioral variables. Significant associations were found for the following variables: monthly income ($p = 0.002$), monthly expense ($p = 0.015$), and product quality in online ($p = 0.024$). Other demographic variables such as product diversity in online ($p = 0.520$) did not show significant associations.

Table 6. Chi-Square Tests of value-based variables

		Value	df	Asymptotic Significance (2-sided)
Monthly income	Pearson Chi-Square	37.667	16	0.002
	Likelihood Ratio	35.461	16	0.003
	Linear-by-Linear Association	15.893	1	0
Monthly expense	Pearson Chi-Square	30.706	16	0.015
	Likelihood Ratio	30.729	16	0.015
	Linear-by-Linear Association	13.145	1	0
Product quality in online	Pearson Chi-Square	28.92	16	0.024
	Likelihood Ratio	31.64	16	0.011
	Linear-by-Linear Association	1.606	1	0.205
Product diversity in online	Pearson Chi-Square	15.069	16	0.520
	Likelihood Ratio	15.069	16	0.520
	Linear-by-Linear Association	0.501	1	0.479

5.2.2 Dimension groups

To identify underlying dimensions that explain the interrelationships among e-commerce variables was examined using Principal Axis Factoring (PAF) with Oblimin rotation. The initial inspection of the R-matrix indicated a substantial number of the coefficients were above .30. Table 7 shows that the Kaiser-Mayer-Olkin (KMO) index was 0.725, exceeding the recommended value of 0.6 Kaiser (1970), and Bartlett's Test of Sphericity Bartlett (1954) reached statistical significance ($\chi 2=299.12$, $p<.001$), indicating that our data were suitable for factor analysis. The results of the initial analysis revealed three factors with Eigenvalues over 10, explaining 24.4%, 13.8%, and 10.7% of the variance, respectively.

Table 7. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.725
Bartlett's Test of Sphericity	Approx. Chi-Square	299.12
	df	45
	Sig.	0.000

In Figure 1, the Scree plot plots all 10 eigenvalues for all variables. This can help visualize which factors to keep. The plot shows an elbow after the second variable, suggesting a potential two-factor solution for e-commerce. However, in this case, the graph appears to tail off after 2 factors but there is also another drop after 4 that makes it difficult to interpret.

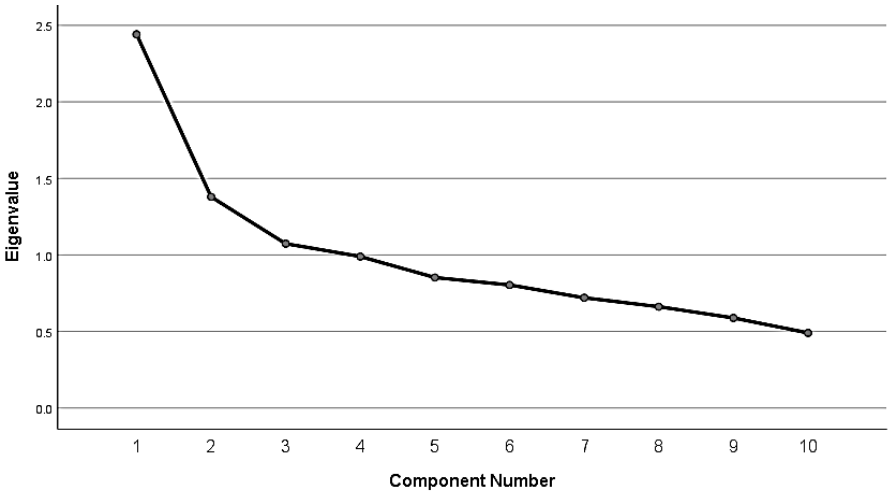

Figure 1. Scree plot

To clearly identify dimensions groups for the e-commerce factors the pattern matrix will be analyzed. Based on the factor loadings of the pattern matrix (Table 8), the following two factors can be identified:

Factor 1: This factor includes variables such as age, education level, marital status, and current occupation. These variables represent core demographic attributes that influence consumer behavior and decision-making processes in the e-commerce sector. As such, we might want to name this factor *'Demographic Influences'*. Consumers' online shopping preferences may vary significantly based on these socio-demographic attributes.

Factor 2: This factor is characterized by the current region, internet access place, monthly income, and monthly expenses. In this case the variable 'Monthly income' loads onto both Factor 2 and Factor 3. However, this variable is very similar with the variables in Factor 2, thus it was put onto with this factor. Factor 2, captures how the geographical location and access to internet facilities influence e-commerce engagement. We might want to name this factor as *'Accessibility and Affordability'*. Regional disparities and differing internet access points can shape consumers' ease of accessing online shopping platforms, thus impacting their participation in e-commerce.

Table 8. Pattern Matrix[a]

	Factor		
	1	2	3
Age	0.489		
Education level	0.649		
Marital status	0.520		
Current region		0.360	
Current occupation	-0.543		
Internet access place		-0.345	
Device used for online purchases			
Monthly income		0.606	-0.470
Monthly expense		0.480	
Product quality in online			
[a]Extraction Method: Principal Axis Factoring. Rotation Method: Oblimin with Kaiser Normalization.			

5.2 Graphical Results

The graphical results display the relationship between variables and factors. The graph shows Factor 1 on the X-axis and Factor 2 on the Y-axis. It is seen that variables closer to a factor axis strongly correlate with that factor. Variables clustering in one quadrant indicate they load similarly onto the same factor. Variables that align closer to Factor 1 or Factor 2 have higher loadings for that factor.

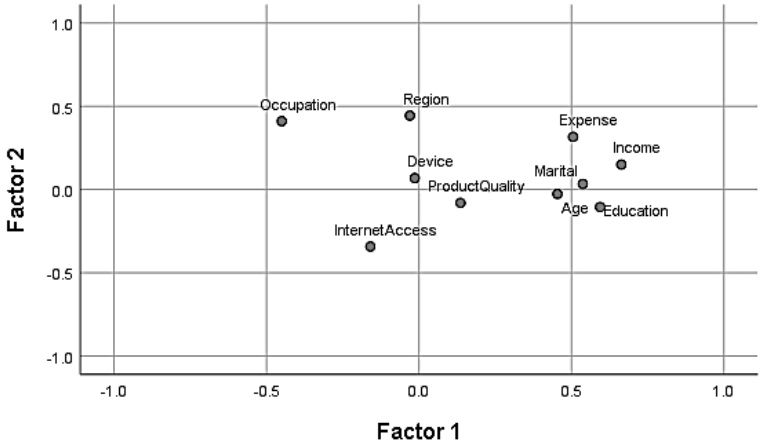

Figure 2. Graphical results of variable dimension reduction

The findings of this study highlight the significant transformation in the e-commerce landscape in Bangladesh, driven by various consumer-related factors. The identification of ten key variables, grouped into Demographic Influences and Accessibility and Affordability, provides a comprehensive framework for understanding consumer behavior in the context of a rapidly evolving digital market.

Age, education level, marital status, and occupation emerged as critical demographic factors influencing purchasing decisions. This aligns with previous research indicating that personal characteristics play a pivotal role in shaping consumer preferences. For instance, younger, more educated individuals may be more inclined to shop online due to their familiarity with technology, while marital status and occupation may influence purchasing priorities and frequency. These insights suggest that e-commerce businesses should segment their marketing strategies based on demographic profiles to effectively target diverse consumer groups. Variables such as monthly income and regional accessibility were identified as essential factors. The inclusion of these variables reflects the broader socio-economic challenges and opportunities in Bangladesh. Limited access to reliable internet or digital devices in certain regions, coupled with varying income levels, can significantly impact online shopping behavior. Addressing these disparities through localized marketing campaigns, promotions, and enhanced digital infrastructure could help businesses expand

their reach and improve customer engagement. Overall, this study offers a robust framework for understanding the factors influencing online consumer behavior in Bangladesh. By leveraging these findings, e-commerce businesses can better adapt to market demands and drive sustainable growth in the digital economy.

6. Conclusion

The rapid growth of the e-commerce sector in Bangladesh has significantly transformed the retail landscape, necessitating a deeper understanding of consumer purchasing behavior. This study, based on data from a diverse sample of online shoppers, utilized advanced statistical techniques such as crosstab analysis and factor analysis to uncover key drivers of purchase decisions. Out of nineteen analyzed variables, ten were identified as significant, with factors like age, education level, marital status, monthly income, and occupation emerging as primary influencers.

The study grouped these variables into two distinct categories: Demographic Influences and Accessibility and Affordability, offering a comprehensive view of the factors shaping consumer behavior. By integrating multiple dimensions—demographic, psychographic, behavioral, and value-based—this research bridges a critical gap in the existing literature, which often analyzes these aspects in isolation. The findings of this research are expected to offer valuable implications for e-commerce platforms, marketers, and policymakers in Bangladesh, helping them better understand consumer preferences and enhance the overall customer experience. By providing a detailed analysis of the factors shaping online shopping behavior, this study contributes to the broader understanding of e-commerce dynamics in emerging markets and sets a foundation for future research in similar contexts.

References

Abdi, F., and Abolmakarem, S., Customer Behavior Mining Framework (CBMF) using clustering and classification techniques, *Journal of Industrial Engineering International*, vol. 15, pp. 1–18, 2019. https://doi.org/10.1007/s40092-018-0285-3

Akar, E., Customers' Online Purchase Intentions and Customer Segmentation During the Period of COVID-19 Pandemic, *Journal of Internet Commerce*, vol. 20, no. 3, pp. 371–401, 2021. https://doi.org/10.1080/15332861.2021.1927435

Aljukhadar, M., and Senecal, S., Segmenting the online consumer market, *Marketing Intelligence & Planning*, vol. 29, no. 4, pp. 421–435, 2011. https://doi.org/10.1108/02634501111138572

Arslan, E. D., Seyis, M., and Birer, M., A Data Mining Approach to Predict E-Commerce Customer Behaviour, *Proceedings of the International Symposium for Production Research*, pp. 29–43, 2019. https://doi.org/10.1007/978-3-319-92267-6

Bartlett, M. S., A note on the multiplying factors for various χ 2 approximations, *Journal of the Royal Statistical Society. Series B (Methodological)*, vol. 16, no. 2, pp. 296–298, 1954.

Enam, A., Azad, I. I., and Afrin, S., Exploring online shopping behavior in Dhaka, Bangladesh, *Transportation Research Interdisciplinary Perspectives*, vol. 25, pp. 1–10, 2024. https://doi.org/10.1016/j.trip.2024.101081

Farid Huseynov, S. Ö. Y., Behavioural segmentation analysis of online consumer audience in Turkey by using real e-commerce transaction data, *International Journal of Economics and Business Research*, vol. 14, no. 1, pp. 12–28, 2017.

Femina, B. T., and Sudheep, E. M., An efficient CRM-data mining framework for the prediction of customer behaviour, *Procedia Computer Science*, vol. 46, no. 2015, pp. 725–731, 2015. https://doi.org/10.1016/j.procs.2015.02.136

Gunandi, A., Awang, H., Alhawad, E., and Shabaan, L., Customer Value and Data Mining in Segmentation Analysis, *International Journal of Information Technology and Computer Science Applications*, vol. 1, no. 1, pp. 20–34, 2023.

Hasan, I., Habib, M. M., and Tewari, V., Factors Affecting the Online Purchasing Behavior for Young Consumers: A Case Study, *Journal of Service Science and Management*, vol. 15, pp. 531–550, 2022. https://doi.org/10.4236/jssm.2022.155031

He, X., Li, M. Z. F., Li, L., Li, J., and Hu, J., Competitive pricing and advertising strategies for online retailers with "showrooming" and "webrooming," *European Journal of Operational Research*, vol. 316, no. 2, pp. 617–638, 2024. https://doi.org/https://doi.org/10.1016/j.ejor.2024.02.001

Hong, T., and Kim, E., Segmenting customers in online stores based on factors that affect the customer's intention to purchase, *Expert Systems with Applications*, vol. 39, no. 2, pp. 2127–2131, 2012. https://doi.org/10.1016/j.eswa.2011.07.114

Hosseini, S. M. S., Maleki, A., and Gholamian, M. R., Cluster analysis using data mining approach to develop CRM methodology to assess the customer loyalty, *Expert Systems with Applications*, vol. 37, no. 7, pp. 5259–5264, 2010. https://doi.org/10.1016/j.eswa.2009.12.070

Hosseini, S. Y., and Ziaei Bideh, A., A data mining approach for segmentation-based importance-performance analysis (SOM–BPNN–IPA): a new framework for developing customer retention strategies, *Service Business*, vol. 8, pp. 295–312, 2013.

Kaiser, H. F., A second generation little jiffy., *Psychometrika*, vol. 35, no. 4, pp. 401–415, 1970.

Kudyba, S., and Lawrence, K., Enhancing information management through data mining analytics to increase product sales in an e-commerce platform, *International Journal of Electronic Marketing and Retailing*, vol. 2, no. 2, pp. 97–104, 2008.

Lv, H., E-commerce consumer behavior analysis based on big data, *Journal of Computational Methods in Sciences and Engineering*, vol. 23, pp. 651–661, 2023. https://doi.org/10.3233/JCM-226628

Ma, X., and Gu, X., New marketing strategy model of E-commerce enterprises in the era of digital economy, *Heliyon*, vol. 10, no. 8, pp. 1–12, 2024. https://doi.org/10.1016/j.heliyon.2024.e29038

Mahfuza, R., Islam, N., Toyeb, M., Emon, M. A. F., Chowdhury, S. A., and Alam, M. G. R., LRFMV: An efficient customer segmentation model for superstores, *PloS One*, vol. 17, no. 12, pp. 1–29, 2022.

Miah, M. R., Hossain, A., Shikder, R., Saha, T., and Neger, M., Evaluating the impact of social media on online shopping behavior during COVID-19 pandemic: A Bangladeshi consumers' perspectives, *Heliyon*, vol. 8, pp. 1–13, 2022. https://doi.org/10.1016/j.heliyon.2022.e10600

Pramono, P. P., Surjandari, I., and Laoh, E., Estimating customer segmentation based on customer lifetime value using two-stage clustering method, *16th International Conference on Service Systems and Service Management (ICSSSM)*, pp. 1–5, 2019.

Rahman, M. A., Islam, M. A., Esha, B. H., Sultana, N., and Chakravorty, S., Consumer buying behavior towards online shopping: An empirical study on Dhaka city, Bangladesh, *Cogent Business and Management*, vol. 5, no. 1, pp. 1–22, 2018. https://doi.org/10.1080/23311975.2018.1514940

Rana, M. M., and Abir, H. R., Drivers of Consumers' Online Purchase Intention in Bangladesh., *Dhaka University Journal of Management*, vol. 14, no. 1, pp. 115–132, 2022. https://doi.org/10.57240/dujm140108

Reza, M, Nahar, S. and, and Akter, T., Segmentation of mobile customers using data mining techniques, *International Journal of Engineering Research & Technology (IJERT)*, vol. 7, no. 10, pp. 251–255, 2018.

Roos, J. M., and Kazemi, A., The five factor model of personality as predictor of online shopping: Analyzing data from a large representative sample of Swedish internet users, *Cogent Psychology*, vol. 9, no. 1, pp. 1–18, 2022. https://doi.org/10.1080/23311908.2021.2024640

Sandy, C. J., Gosling, S. D., and Durant, J., Predicting consumer behavior and media preferences: The comparative validity of personality traits and demographic variables, *Psychology & Marketing*, vol. 30, no. 11, pp. 937–949, 2013.

Shen, B., E-commerce customer segmentation via unsupervised machine learning, *The 2nd International Conference on Computing and Data Science*, pp. 1–7, 2021.

Sjöberg, L., and Engelberg, E., Lifestyles and consumer behavior, *SSE/EFI Working Paper Series in Business Administration*, pp. 1–34, 2005.

Tabianan, K., Velu, S., and Ravi, V., K-Means Clustering Approach for Intelligent Customer Segmentation Using Customer Purchase Behavior Data, *Sustainability*, vol. 14, no. 12, pp. 1–15, 2022. https://doi.org/10.3390/su14127243

Wu, Z., Jin, L., Zhao, J., Jing, L., and Chen, L., Research on Segmenting E-Commerce Customer through an Improved K-Medoids Clustering Algorithm, *Computational Intelligence and Neuroscience*, vol. 2022, no. 1, pp. 1–10, 2022.

Yadav, M. P., Feeroz, M., and Yadav, V. K., *Mining the customer behavior using web usage mInIng In e-commerce*, *July*, pp. 1–4, 2012.

Zare, M., Shakeri, H., and Mahmoudi, R., Ecommerce: An efficient digital marketing data mining framework to predict customer performance, *Journal of the International Academy for Case Studies*, vol. 26, no. 5, pp. 1–8, 2020.

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