Assessing Implicit Causes of Fast-Food Demand Fluctuation Through Facilitating an Exploratory Factor Analysis

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Abstract The demand for food especially in the fast-food sector has changed remarkably over the last decade among Bangladeshi consumers due to its economic growth. So, demand variation is a key issue among businessmen to satisfy the customers' demand. To understand and keep track of the challenges, this study investigates the underlying significant causes of demand variation. To perform the research, a total of 333 respondents were interviewed with a 14-item structured questionnaire. In this study, Kaiser-Meyer-Olkin's and Bartlett's test of Sphericity are used to measure of sampling adequacy and assess the factorability of the data, respectively along with calculating Cronbach's alpha and composite reliability. The outcomes of exploratory factor analysis extracted the most significant 11-item and ranked them into 4 different structured factors. Besides, the findings of this study could assist practitioners to become more competitive in the current business practices as demands for fast food products vary daily.

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1. Introduction

Bangladesh is one of the fastest-growing economies of the world with huge infrastructural development. The country has been the successful insubstantial amount of poverty reduction with sustained economic growth and development. So, it achieved the middle-income status from the lower middle income in 2021 as per the world bank report. Thus, the lifestyle of its population has improved significantly [1]. Previously, common people of this country used to have homemade food as part of their religious belief while there is a huge change in food consumption among the urban and semi-urban dwellers [2]. This gave birth to a new type of popular food called 'fast food' available in restaurants, shopping malls, airports, educational institutions, hospitals, and carts [3]. Fast food is a type of food produced in a mouthwatering way for commercial sale with strong home delivery or dining out system. The restaurants keep both options open for the convenience of their customers [4]. The most popular fast foods available in Bangladesh are burgers, fried chicken, pizzas, pasta, chicken chap, burger, chicken

roll, vegetable rolls, beef roll, and sandwiches, etc. [5]. The development of a society depends largely on economic development. Previously, dining out was considered a luxury which has now become a common occurrence with necessity. This tendency of dining out and taking away food has predominantly increased among the workers and working families. This increases the consumption of takeaway food which leads the continuous demand fluctuation [1]. The demand fluctuation of consumers of this sector depends on some reasons which are to be explored and practiced by the business stakeholders for long-term sustainability. This sector has been one of the most popular for different reasons yet very little research has been conducted to identify the influential factors of demand variation and consumers' psychology [6]. Therefore, this study aims to identify the influencing factors of demand variation (i.e., phase of the day, product and service quality, environment and decoration, price and special occasion, etc.) for some selected fast-food items. Researchers view this study will work as a guideline for the fast-food restaurant to keep track of consumers' repeated purchase intention and success of this sector in the future. As a result, the findings of this research can help practitioners design a

strategic business strategy for long-term growth in the fast-food industry.

2. Literature Review

An empirical study conducted by Duong N. T. et al. [7] Vietnam on consumer's behavior towards food and beverage services. They did their survey among 300 customers and along with 26 items and successfully identified 4 factors (i.e., social influence, service, price, and food quality) that contribute a significant impact on consumers' loyalty regarding food and beverages. According to the study of Jeong E. H. et al. [3], significant factors like product quality, healthfulness, safety, ethicality, novelty-seeking fulfillment, and special dietary fulfillment have a great impact on the kosher food choice of Jewish people. The research findings also provide practical guidelines for developing marketing strategies to target the non-Jewish population. KIM Y. S., CHRISTINE B. and RAAB C. [8] directed research among 393 people aged 50 to determine the significant factors of restaurants choices for customers' dinner purposes in Las Vegas, USA. They found that food quality and restaurants service facilities play a significant role among the respondents. Purwanto A. et al. [9] surveyed 110 Indonesian people regarding halal food purchasing intention and they concluded that brand value, product quality, perceived value, halal certification, health awareness, and halal marketing have significant influence. Jekanowski. et al. [10] showed in their study that convenience and accessibility have an appreciable role in changing consumer's fast-food demand pattern which ultimately leads to the growth of this sector.

Ricahrd T.J. and Luis P. [11] determined the correlation between promotion and fast-food demand. The findings show that promotion basically increases demand and has positive impact on the market shares of restaurants. Nezakati H., Kuan Y. L., and Asgari O. [4] showed that product quality, customer satisfaction, and brand trust are the dominant variables that drive the customers' loyalty to preferred fast-food restaurants in Malaysia. A study conducted by Serhan M. and Serhan C. [12] showed that some service attributes such as food quality, price, service quality, etc. have a significant and positive effect on the overall consumer satisfaction in a rural university campus. Gregory S.R. et al. [13] pointed out that the fast-paced, hospitality and highly competitive nature of quick-service restaurants (QSRs) have motivated the customers to purchase fast food as well as to increase customer's internal satisfaction. Kim Y. S., Patrick J. M., and Ronnie J. M. Y. [14] conducted a study at a university food court service to determine the customer satisfaction factors. The results suggested that the freshness, aesthetic, and food nutrition change the customers' satisfaction. Binkley, J., K., & Bales, J. [15] found that prices of food items are important determinants of fast-food demands variation in metropolitan areas in the USA. OAMEN T. E. [16] explored and promoted a validated summary of key work-attributes to provide information for conducting Exploratory Factor Analysis (EFA) in pharmaceutical sales and marketing operations during the current global pandemic situation. Shrestha N. [17] conducted a study on futsal game in Nepal advocated by exploratory factor analysis that social benefit, health benefit, and the reward were the major three components that positively influenced the majority of the urban people and their perception of the Futsal game was positive. In Bangladesh Rabbi M. F. et al. [6] conducted their research on identifying the causes of demand variation and assess its impact on sales volume for fast food items.

They found out eleven causes of demand variation and twelve consequences. The research also concluded that some factors like price and occasion are highly responsible for the variation of sales volume. According to the study conducted by Goyal A. and Singh N.P. [18], three dimensions i.e., service and delivery dimension, product dimension, and the quality dimension of fast food outlets 'features are identified based on factor analysis results for the attraction of fast food among the young generation. According to the study of Islam N. and Shafayet Ullah G. M. S. [19] suggested that the brand value, distance and accessibility, compatibility and cost and quality relationship should be emphasized to improve the attraction of university students towards fast food items in Bangladesh. Jahan S. et al. [20] researched to find out the impact of globalization on the UAE food sector. Their study highlighted that cost pressures, technological changes, the intensity of competition, economies of scale, and political and legal factors dominate the growth of the food industry.

3. Research Methodology

3.1. Questionnaire Design

For this research, the questionnaire survey approach was used to acquire the necessary empirical data. The literature review process and interactions with demand forecasting experts resulted in a total of 14 survey items. The questionnaire contains 14 items on a 5-point Likert scale ranging from "Very Low (1), Low (2), Moderate (3), High (4), and Very High (5).

3.2. Study Design and Data Collection

The research was conducted on an online survey form through "Google Sheets" as well as physical interviewed across the participants from Dhaka (Capital City of Bangladesh). The sample size was calculated using a 10:1 respondent-to-item ratio, which is suggested for groups of more than 100 people. This will allow research to be replicated [21,22]. In this study, 333 people responded to a 14-item questionnaire with a ratio of more than 20:1. The structured questionnaire contained 14-item Likert scale questions examining the perception of respondents about the causes of fast-food demand variation during the period of lockdown in Bangladesh which spanned from April 2021 to June 2021. Consent was obtained from respondents through the provision of unique personal identifiers.

3.3. Exploratory Factor Analysis

Exploratory factor analysis is used in this research to explore the data set to find involved internal relationship

between provided items and categorical items that are essential for integrated concepts. To find underlying variables, factor analysis groups comparable variables into the same factor and solely use the data correlation matrix. The statements were analyzed using factor analysis with the assistance of principal components extraction to see if they represented identifiable constituents related to tourist satisfaction in this study. In order to highlight the variance and identify primary components of data set, statistical procedure of principal component analysis (PCA) is incorporated [23].

For internal reliability, the Cronbach alpha value of the surveyed data was fixed at 0.6. The Kaiser-Meyer-Olkin (KMO) sample adequacy measure was set at greater than 0.5 baselines. The KMO score was calculated using the following criteria: >0.9=exceptional,>0.8=exceptional,>0.7=middle, >0.6=mediocre,>0.5=miserable, and <0.5=unacceptable. The absolute minimum value for validity is 0.5. To conduct FA, KMO guarantees that the distribution of observed values is satisfactory [24-25]. The null hypothesis, H0: The variables are orthogonal, i.e., the original correlation matrix is an identity matrix, indicating that the variables are unrelated and thus inauspicable for structure discovery, is tested using Bartlett's Test of Sphericity. H1: The variables are opposition of orthogonal, i.e., they are appreciably correlated that the correlation matrix deviated significantly from the identity matrix. Factor analysis may be worthwhile for the data set if the significant value is less than 0.05. The determinant's value is a crucial test for multicollinearity or singularity. The determinant score of the correlation matrix must be > 0.00001, indicating that multicollinearity is not present.

The process of factor extraction entails selecting the possible smallest quantity of factors that may best reflect the internal relationship among a group of variables. There are numerous methods for determining the number of underlying components. Principal component analysis and common factor analysis can both be used to find factor solutions. Because the goal of this study is to evaluate the data to acquire the smallest number of components required to reflect the existing data set, principal component analysis (PCA) was performed.

In this study, Kaiser's Criterion and the Scree Test are utilized to aid in the determination of the number of elements to keep. To identify the number of initial unrotated components to be extracted, apply the Kaiser's criterion (Eigenvalue Criterion) and the Scree test. The eigenvalue is the ratio of the common variance to the particular variance explained by a single extracted factor. The horizontal axis of a scree plot is made up of eigenvalue numbers, while the vertical axis is made up of eigenvalue magnitudes. Within the graph, the eigenvalues are represented as dots, with a line connecting the consecutive values. When the plot reaches an 'elbow' or leveling, factor extraction should be stopped. This test is used to determine the optimal number of variables to extract before the quantity of unique variance starts to dominate the common variance structure [26-27].

Due to large cross-loadings, whereas numerous factors are associated with multiple variables, factors acquired during the first extraction phase are typically difficult to understand. Factor rotation can be done in two ways: orthogonal (uncorrelated) or oblique (correlated) factor solutions. Orthogonal factor rotation is utilized in this study because it produces solutions that are easier to comprehend and report. Orthogonal rotation algorithms include varimax, quartimax, and equimax. Furthermore, Kaiser's (Varimax technique is utilized to reduce the number of variables with large loadings on each component. For the purpose of maximizing the differences between the squared pattern structure coefficients for a given factor, Varimax is used. Loads that are high after extraction grow greater following rotation, whereas loadings that are low become lower. If the rotated component matrix reveals a lot of significant cross-loading values, it's best to redo the factor analysis and delete all cross-loaded variables to obtain an item loaded in just one component [27,28]

3.4. Instrument Reliability and Validity

Cronbach's alpha is used to assess a questionnaire's reliability and gives an easy approach to determine if a score is trustworthy. Cronbach's alpha of higher than 0.6 is generally regarded as acceptable. The composite reliability coefficients and the average variance extracted are connected to the measure's quality. The AVE is a measure of how much variation a concept absorbs compared to how much variance is attributable to measurement error [29].
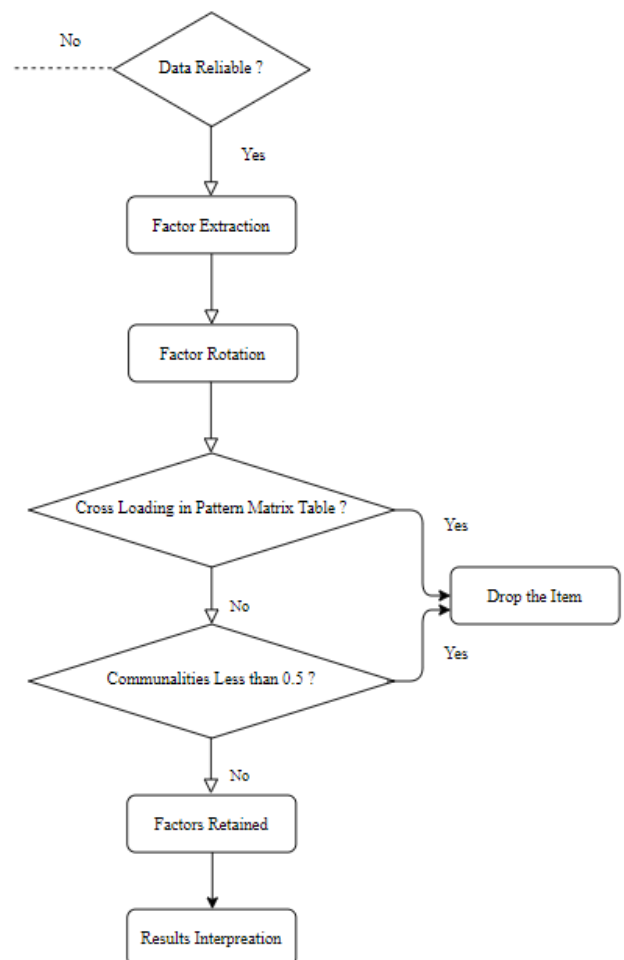

Figure 1. Flowchart of Explanatory Factor Analysis

Specifically, AVE is a criterion for determining convergent validity. Convergent validity is a measurement of the amount of agreement between different indicators of the same construct. To determine convergent validity, the item factor loading, composite reliability, and average variance extracted must be computed. The AVE and CR values range from 0 to 1, with a greater number indicating a better level of dependability. The convergent validity is confirmed when the AVE is greater than or equal to 0.5. The values of composite reliability between 0.6 to 0.7 are acceptable while in the more advanced phase the value has to be higher than 0.7. According to Fornell and Larcker, if AVE is less than 0.5, but composite reliability is higher than 0.6, the convergent validity of the construct is still adequate [29].

4. Results and Discussion

The results of the statistical software SPSS are reported in this section. The participants in this study were 333 people who normally prefer fast food in their daily lives. The majority of participants (85.28%) are between the ages of 15 and 25 with males accounting for 54.35 percent of the overall sample and females accounting for 45.65 percent. 14 items (See Appendix A) are selected as the prime reasons working behind the fast-food demand variation. The level of accountability for each cause was assessed using a Likert-scale questionnaire and the following rating guide: 1=Very Low, 2=Low, 3=Moderate, 4=High and 5= Very High. The majority of participants gave demand variation causes a moderate or high rating. On average, 17 percent of respondents rated their preference levels as Very High, 33 percent as High, 31 percent as Moderate, 14 percent as Low, and 5 percent as Very Low. This emphasizes the significance of the 14 items in influencing the variation in fast food demand across time.

4.1. Exploratory Factor Analysis (EFA)

Factor analysis should be carried out for assessing the main contributors to fast food demand fluctuation in typical restaurants. We performed EFA in stepwise so that a structural approach can be established for this research field.

In order to uncover elements that influence the demand variation, Kaiser's Meyer-Olkin (KMO) sampling adequacy measure, the determinant score and Bartlett's Sphericity Test were calculated to establish the data set's eligibility for the use of factor analysis [28,30].

Table 1. Suitability test of the data

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.792
Bartlett's Test of Sphericity	Approx. Chi-Square	918.652
	df	91
	Sig.	.000

The value of Kaiser-Meyer-Olkin statistics in Table 1 is $0.79 > 0.60$, indicating that the sampling adequacy is suitable and factor analysis is appropriate for the data. The Bartlett's test of sphericity is extremely significant, with a p value of 0.000, showing that the variables are related. The determinant score is $0.060 > 0.0001$, indicating that multicollinearity is not present. Later on, after removal of variables, the KMO value stands at 0.77 and determinant score increases as 0.095 which is greater than the critical value (0.0001).

The eigenvalues associated with each factor indicate the variance explained by those particular linear components. If the coefficient value is less than 0.5, any factor loadings with values less than 0.5 are muted [28]. The method of factor analysis extraction used in this study was principal component analysis. Initially, the data set is broken down into fourteen (14) linear items before extraction.
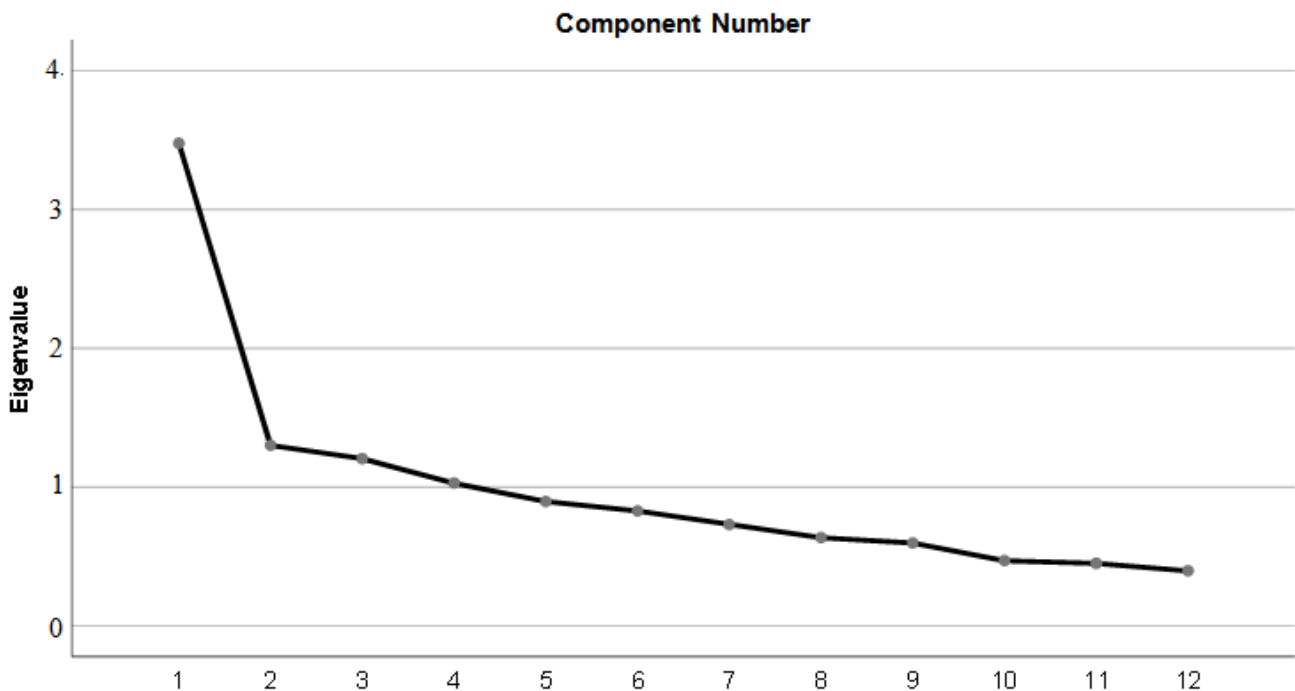

Figure 2. Scree Plot

To guarantee appropriate levels of explanation, the scale's commonality, which shows the degree of variance in each dimension, was also examined. The results showed that all commonalities except "Food Availability" and "Time Phases of the Day" were close to 0.50. So, after dropping these two items, we achieved the data set has four different linear components after extraction and rotation for the eigenvalue > 1 in our final trial. The four factors account for 58.38 percent of the total variation. It is recommended that the retained variables account for at least 50% of the total variation. With an eigenvalue of 3.475, the first component accounts for 28.95% of the total variance. With an eigenvalue of 1.3, the second component accounted for 10.83 percent of the variance. With an eigenvalue of 1.203, the third component accounted for 10.03% of the variance and with an eigenvalue of 1.03, the fourth component accounted for 8.57% of the variance. The Scree test is represented in Figure 2 by a graph with eigenvalues on the y-axis and 12 components in order of extraction on the x-axis. The eigenvalues of large factors are retrieved first, followed by smaller factors. The scree plot is used to determine how many variables should be retained. The scree plot shows that four variables have eigenvalues greater than one, accounting for the vast majority of the data's overall variability. Other variables only account for a small portion of the variability and are therefore considered insignificant.

For this step, Varimax rotation is executed to analyze whether a variable might relate to more than one factor. As there are no cross-loadings in the Rotated Component Matrix table, the commonalities were checked. As seen in the following table the Food Availability and Time Phases of the day have values very less than 0.5. So, these two items were dropped from further analysis.

The component and factor loadings are shown in Table 2. The factor loading expressed each variable's relationship to the underlying factor of variation in fast food demand. The first factor extracted has four items (Service Quality, Environment, Weekend, Special Occasion), all have loadings greater than 0.5.

Table 2. Rotated Component Matrix Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization

Items	1	2	3	4
Factor 1				
Service Quality	0.744			
Environment	0.666			
Weekend	0.598			
Special Occasion	0.685			
Factor 2				
Food Reviews in Social Media		0.568		
Shifting in Food Habits		0.722		
Proximity to consumer		0.627		
Factor 3				
Price			0.831	
Food Quality			0.688	
Factor 4				
Consumer Income				0.652
Cultural Diversity				0.782

Similarly, the 2nd factor contained 3 items (Food Reviews in Social Media, Shifting in Food Habits and Proximity to consumer), 3rd factor has two components (Price and Food Quality). Lastly, the 4th factor carries two items (Consumer Income and Cultural Diversity). Since Advertisement has no loading in the Rotated Component Matrix table, it was not shown here. Ultimately, 11 causes of demand variation have been identified which are distributed into four factors.

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Figure 3. 1st Run Commonalities of Items

4.2. Reliability and Validity Test

Calculating Cronbach's alpha to verify the instrument's accuracy and reliability confirms the instrument's internal consistency. Cronbach's alpha greater than 0.60 to be considered appropriate. Cronbach's alpha values of 0.68, 0.63, 0.64, and 0.64, respectively, were found in Table 3 for the four factors confirming the survey instrument's reliability. Cronbach's alpha coefficient for overall scale reliability factors is 0.74 > 0.6. It demonstrates that the variables are internally consistent because they correlate with their component grouping.

Table 3. Reliability, Average Variance Extracted (AVE) and Composite Reliability (CR)

Factors	Cronbach's Alpha	AVE	CR
Factor 1	0.68	0.46	0.77
Factor 2	0.63	0.41	0.68
Factor 3	0.64	0.58	0.73
Factor 4	0.64	0.52	0.68

When the Average Variance Extracted (AVE) is closer to 0.5, convergent validity is demonstrated. The four components had AVE values of 0.46, 0.41, 0.58, and 0.52 respectively. All four factors have Composite Reliability (CR) values of 0.77, 0.68, 0.73, and 0.68 respectively. It demonstrates the scale items' internal consistency [29]

4.3. Ranking of the Factors

From the Factor Analysis, the most significant reasons are grouped into four factors. Therefore, we can compute the variables by combining the reasons under each component. Descriptive statistics can be useful in investigating the summary of the responses to those factors. According to Table 4 below, the first prioritized factor is identified as Factor 1 having the largest mean value among others. Similarly, Factor 2 is ranked as 3rd, Factor 3 is ranked 2nd and Factor 4 has got the last position as having the least mean value.

Table 4. Descriptive Statistics of Factors

Factors	Minimum Statistic	Maximum Statistic	Mean Statistic	Standard Deviation Statistic	Rank
Factor 1	1.25	5.00	3.56	0.77	1
Factor 2	1.33	5.00	3.36	0.75	3
Factor 3	1.00	5.00	3.55	0.91	2
Factor 4	1.00	5.00	3.18	0.80	4

5. Conclusion and Recommendations

Factor Analysis is a very useful method for filtering enormous datasets into relevant, manageable groups with common characterizations, to increase decision quality, efficiency, and generalizability. This method is useful in content analysis research since it assures that all critical/relevant data items are taken into account. After the confirmation through Kaiser-Meyer-Olkin statistics, Bartlett's test of sphericity and determinant score, the Exploratory Factor Analysis (EFA) has been performed to identify the main factors of demand variation. Principal Component Analysis with Orthogonal Rotation (varimax) has extracted four factors under which 11 items (reasons) are identified. Factor 1 (Service Quality, Environment, Weekend and Special Occasion) and Factor 3 (Price and Food Quality) are marked as the most important features for creating variation in fast food demand. From this, it can be said that most of the people prefer to have the fast-food items during special occasions and weekend time. Also, people give importance to the surrounding atmosphere around the restaurant. They keep eye on not only food price tags but also its flavors and tastes to choose among the food items.

On a policy level, exploratory factor analysis is extremely useful in decision making at the strategic, tactical, and operational levels of management in pharmaceutical sales and marketing companies, as it allows decision-makers to identify, isolate, and contextualize the key issues/factors to be considered. It also facilitates them to focus on a small number of manageable factors rather than a vast number of characteristics. Because the findings of the study cannot be extended to a wide population, a more advanced investigation using probability sampling methods with a larger sample size can be conducted. However, further research is needed to analyze in detail the possible causes behind fast food demand variation in a typical restaurant. Moreover, the explanation of interrelationship among the factors can be studied in the future.

Acknowledgements

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APPENDIX A

SL	Item Name	Description
1	Environment & Decoration	The design and decoration of a restaurant might entice customers to sit and eat fast food.
2	Income level	Food demand can range from low-income to middle-income to upper-income netizens.
3	Price	*The customer is asked for a monetary value for their food.*
4	Promotion	To increase sales, a company may offer a "discount" or "cash-back" to their customers.
5	Availability	*The term "availability" relates to whether or not the food is available to the customer.*
6	Shifting of food habit	It refers to switching the consumer preferences from one food to another.
7	Advertisement	Advertising is a form of commercial branding in which a product, service, or concept is promoted or sold.
8	Customer Proximity	The average distance between the restaurant and the customer is known as customer proximity.
9	Special Occasion	A noteworthy day or event is referred to as a "special occasion." Birthdays, graduations, weddings, and other special occasions are just a few examples.
10	Weekend/Holiday	The the time between the end of one work or school week and the start of the next: Bangladeshi Fridays and Saturdays
11	Cultural Diversity	Religion, ethnicity, language, nationality, sexual orientation, class, gender, age, handicap, health differences, geographic location, and a variety of other factors all contribute to cultural diversity
12	Food Reviews in Social Media	It refers to sharing/ exchanging feedback on a social account like Facebook, Twitter, etc.
13	Service Quality	The quality of service offered by the waiter has a significant impact on customer satisfaction.
14	Food Quality	A good restaurant maintains a high level for food quality and ensures that every meal is of the same high standard.