BoPCOVIPIP: Capturing the Dynamics of Marketing Mix Among Bottom of Pyramid Consumers during COVID-19

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Abstract: The behaviour of consumers mostly follows the guidelines derived from marketing theories and models. But under some unavoidable circumstances, the consumers show a complete deviation compared to their existing consumption pattern, purchase behaviour, decision-making and so on. Under similar circumstances, this study aims to capture both urban and rural Bottom of the Pyramid (BoP) consumers' perceptions of various marketing mixes during the COVID-19 pandemic situation. With a sample size of 378 and 282, the perception towards different marketing mixes has been captured for Pre-COVID and During-COVID periods, respectively. The adopted quantitative analysis indicates a difference in perception towards marketing mix During COVID compared to Pre-COVID. Moreover, the selection of West Bengal, India, as an area of research fulfills the BoP literature's existing prominent research gap. This study also comes with the potential to assist marketers and the Fast-Moving Consumer Goods (FMCG) industry in framing strategies to target BoP consumers.

Index Terms: Marketing mix, BoP, COVID-19, Apriori algorithm, West Bengal.

1. Introduction

Poverty is one of the most prominent complications of humanity. Although the fig- ure of "extreme poor" has declined but based on the condition of "decent" living i.e. US$10/ day, 71% of the world population still is considered as "vulnerable" [1]). Most of the multinationals (MNCs) and small to medium size enterprises (SMEs) from devel- oped as well as developing nations are trying to recognize and serve consumers with a capacity to consume, having an ability to pay a sustainable price for the products. Searching for "value-conscious" customers has driven the attention of the marketers to a huge pool of consumers whose annual income on a purchasing power parity ba- sis is less than US$1,500 per year and numbers 4 billion [2, 3]. Moreover, due to heterogeneous nature, less education and income related issues, marketers face more challenges to utilize the existing business models on these consumer segments [4].

Hence, understanding the nature (in terms of age, gender, income, residential types, na- ture of job and so on) and the need of BoP consumers are becoming uttermost important for marketers [5]. Countries with huge BoP segments are posing the most challenges in fronts of marketers conduct business in through the arising problems of economic, po- litical [6], governance, cultural, social [7], nature based and financial constraints [8, 9]. This is a strong logic behind the marketing theory, the analytic bases and the practical implications of poverty-centered discourses sometimes remain ambiguous.

It is widely accepted that in variety of contexts the traditional 4Ps of marketing mix plays a leading role for making marketing strategies meaningful and success- ful [10, 11]. Marketing mix serves the purpose of a conceptual framework that de- fines the decision makers' effort in configuring their offering as per the need of the consumers [12]. It has a strong potential to change an organization's competitive po- sition by activating its various components [13]. It is a trusted marketing framework deals with the tactical and operational marketing issues [14]. Despite the significant impact, the 4Ps of marketing mix requires further revision especially in the emerging markets [15]. While revising the existing marketing mix, packaging has acquired its position as 5th 'P' of marketing mix [16]. Numerous researches [17, 18] stressed the importance of packaging in the marketing. The Point of Purchase and Advertisement Institute (POPAI), indicates that 70% purchase decisions made by the consumers in the point-of-sale [19]. Needless to say, all the marketing mix elements are interconnected with each other strongly and contribute together to raise customers' satisfaction and quality of marketing accountability [20].

The outbreak of COVID-19 pandemic is one of the rarely occurring calamities that has left none of the single country unaffected [21]. This has caused a substan- tial change in how businesses act and consumers behavior. During or end of any pandemic situation often associated with a huge confusion to predict the long term economic, behavioral, or societal consequences. Some of consequences like low return on assets [22], huge purchase demand on products related to personal protection [23] and so on are generic in nature and highlighted by more than one study. Although sig- nificant progress can be observed in consumer behavioral domain in terms of mapping this field with neuromarketing [24, 25] and so on, still studies related to BoP domain is strictly limited. This has created a motivation for carrying out this research.

In the context of the BOP a limited number of studies has covered some aspects of how the marketing mix [5, 2] or a revised form of marketing mix [26, 27] can engage BOP consumers. Following this research gap as well as with an aim to enrich the existing literature and further adding a new dimension of the COVID-19 pandemic, The novelty of the paper lies below:

- Quantitative research design-based approach to explore the change in attitude of BoP consumers towards marketing mix during the COVID-19 situation.
- Application of data mining to gain insight about the change in attitude of both urban and rural BoP consumers towards marketing mix during the ongoing pan- demic situation compared to pre pandemic situation.
- Selection of West Bengal, a state of India, as an area of research during the COVID-19 situation. This state is one of the worst affected states of India.
- Here, authors have proposed an acronym: BoPCOVIPIP for capturing the dy- namics of marketing mix among Bottom of Pyramid consumers during COVID- 19.

The objective of this paper is to capture the change in perception towards marketing mix among urban and rural Bottom of the Pyramid consumers during COVID-19 compared to Pre-COVID period.

The paper is structured as follows: Relevant studies have been presented in the Section 2. Section 3 highlights the methodological approaches in a detailed manner. Section 4 highlights the findings of this study. Section 6 concludes the paper preceded by the implications for the marketers.

2. Literature Review

In order to satisfy the objective of this study, three broad areas have been selected for literature review. In the first subsection the BoP consumer segments have been studied. The next subsection captures the concepts and related work of marketing mix. Finally, the last subsection tries to observe the consumer behaviour during this COVID- 19 crisis.

2.1. BoP markets and its consumption pattern

BoP identifies people with the lowest income category living mostly in rural areas and urban slums with earning less than 3, 00,000 Indian rupees (INR) per year (urban pop- ulations) and an income of less than 1,60,000 INR per year (rural populations) [28]. Organizations have faced huge challenges to reach this segment because of its less education, low income and infrastructural challenges [29]. Two dominant streams of literature exist to discuss the effect of marketing on this low-income group market. Ad- vocates in favour of marketing stressed the benefit of products with affordable prices. This not only fulfills the needs of the consumers but also improves the overall quality of the life [30]. They also exhibit aspirations for consumption experiences and goods ownership quite similar with the middle of the pyramid population [31].

In contrast to this, the second part argued about the negative aspects of marketing on BoPs. As per this school of thought, this is ultimately affecting BoP to spend on buying nonessential commodities by sacrificing the essential needs. According to [32], poor people are being tempted easily and overspend money for buying tobacco, alcohol instead of investing the money for food and nutrition. Talking about the psychology of Poor, [33] discussed that poor feel satisfied due to their adequate consumption and a consumption "better than their peers". [34] also talked about the idea that "roman- ticizing poor" will not help the poor instead will "harm" them. As per his opinions, companies forced the poor

to buy things that were not needed for them, finally against their self-interest. Even the author is against the idea of single-serving packaging as it does not correlate with affordability. The reason he gave is that affordability is a function of the per-unit price. He argued that smaller packaging indulges impulse buy- ing, which is again a trick to trap Poor. [35] also discussed the nonessential marketing policy of companies that forced the poor people to buy discretionary (i.e.nonessential luxury) products. This attempt ends in the misallocation of their limited resources.

2.2. About marketing mix

The marketing mix is a popular way to capture market development and trends that helps to attain the business objective of a firm [36]. It helps to capture the perception of the consumers towards products and services [37]. The business-to-consumer market in developed countries starts the practical use of marketing mix as a toolkit to influence or manipulate consumers [38] as well as to alter and customize their offerings [39].

The concept of the marketing mix was suggested by [40]. The concept became more popularized by [41]. Finally, [42] summarized it into the four Ps model of prod- uct, price, promotion and place. Due to some of the challenges in the existing model, the 4Ps concept of marketing has been further revised [43, 44]. The marketing mix helps to shift the paradigm from acquisition-oriented to retention-oriented marketing by the expansion of business and focusing on customers [45]. Product, Price, Place and Promotion are the 4Ps of the marketing mix. Product refers to both goods and services. It refers to the "pack of advantages" presented to the consumers for a price. Hence, price is the value charged for a product or service. Pricing related decisions are very crucial for an organization as it directly impacts the profitability of an organization. Many factors like the need for the product, consumer's ability to pay, government re- strictions, price charged by the competitors, and so on determine the pricing decisions. To sell the product at a price, it is of utmost importance to make it available widely. The place may include a chain or persons like distributors, wholesalers, retailers. The 4th element is a promotion that deals with publicity, public relations, demonstration and so on that directly encourages the customers along with increasing the awareness level. It comes with different approaches like an advertisement, personal selling, sales promo- tion, public relation, direct marketing (promotional mix) to optimize the promotional efforts.

This study has also included the packaging as 5P of the marketing mix. Although the packaging is not a part of a physical product or an essential part of a product to function, but as an associated element, it is now being treated as a crucial element of a product [46]. Acting as a "silent salesman" [47] that strongly influences the purchase decision [48]. It acts as a "face for the product" that protects product in transit [49] by supporting self-service, consumer affluence, company and brand recognition, and op- portunity for innovation [50]. The gravity of the characteristics of a packaging element has made it self-claimed to be the 5th P [51] in the marketing mix.

For BoP consumers, based on "degree of essentiality" and "potential for value ad- dition", the decision for purchasing products varies. Price is the most crucial factor for BoP consumers. As most of these consumers are extremely price-sensitive, the deci- sion on price control matters a lot [52]. Availability is a key factor for BoP consumers. Both formal and informal channels [5] works for this consumer segment. Due to the improvement in infrastructural facilities, most of the deprived [53] BoP consumers are coming out of the "media dark" zones. However, the direct marketing approach works well for BoP consumers [26]. Here, one additional issue i.e. the issue of ethical concern rises [54]. As per [34], marketers should focus on selling appropriate prod-ucts that can serve the actual need of the poor rather than "not so important" products like cosmetics, beverages, tobacco, alcohol and so on. Regarding price, creating and maintaining a "win-win situation" for both marketers and BoP consumers has been suggested. It will help to eradicate poverty by making companies profitable. How- ever, some popular decisions related to this have received huge criticism. For example, making sachets or single-serve packets may look price effective but costs twice on a per-ounce basis [55]. For 3rd marketing mix (i.e. promotion), honesty in advertis- ing, honesty in sales promotion, creation of restricted stimulated demand by attractive marketing or promotional strategies are very crucial. For distribution (i.e.place) many companies aggrandize their efforts and create dedicated channels of distribution for the BoPs. One of the popular examples is Project Shakti. Without any doubt for this effectiveness and usefulness, this type of approach may pose a risk for previously ex- isting small retail outlets, street vendors in most of the developing countries [55]. It is a common fact that most of the BoPs purchase on a daily basis based on need rather than storing the inventory. This creates ethical concerns for the 5th marketing mix i.e. packaging. Taking reference from the issue of sachets or single-serving packets, the packaging creates an additional cost for products that makes BoPs inconvenient to purchase products. Due to price issues, BoPs prefer to buy loose compared to entire packets [34]. Consideration of environmental issues also causes threats to the sachets or single-serving packets. Attitude towards marketing mix is also getting influenced by peer pressure, extended family members, children of the family [56, 57].

2.3. Consumer behavior during the COVID-19 pandemic

Due to a lengthy lockdown, it has become a habit of consumers to avoid public places, stores, and social gatherings even when they are open. This has created a motiva- tion for the consumers to change their purchase behaviour and make it more sustain- able [58, 59]. Consumers tend to purchase most of the products that are cleaner and healthier via online platforms. According to [60] grocery shopping has increased up to a great extent. Panic buying has developed healthy food habits and is in demand for building and boosting immunity [61]. Consumers prefer extra protection during

the packaging of products and all kinds of safety measurements taken at different purchase points. As per a report generated by [62]) stated that the COVID-19 crisis had cre- ated more demand towards organic, affordable and local goods. However, variability in disposable income has created restrictions. People with low income may not always afford to buy healthy foods. But the tendency to buy more local and national products is almost common for every consumer. Consumers also showed a conservative man- tality to cut down expenses and buy only essential items. This may have increased the purchase of groceries and decreased the purchase of snacks, beverages, alcohol, etc. In a word, consumer behaviour has taken the shape of sustainable consumer behavior during this time [63].

3. Methodological Approach

This section highlights the entire methodology used for this study in a detailed manner. The research context has been highlighted in the first subsection along with the reasons for selecting the two particular districts of West Bengal. This subsection also commu- nicates the data collection procedure, tool and so on. The flow of the study has been presented in the Figure 1.
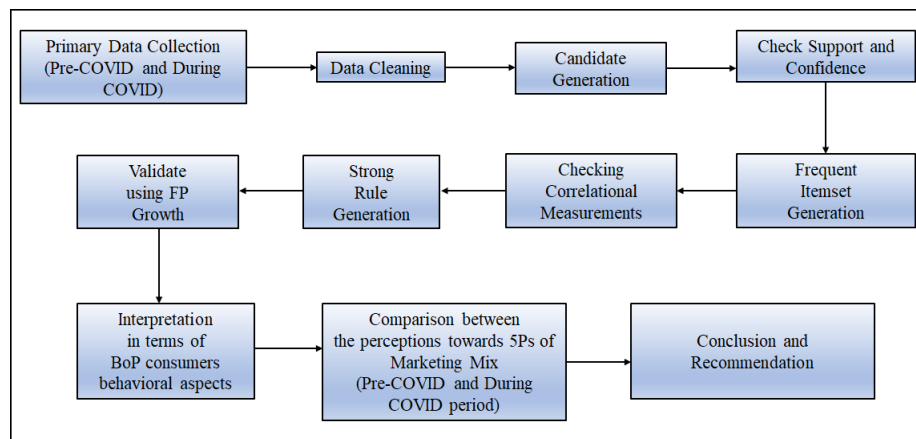

Fig.1. Flowchart of this study

3.1. Research context

Two districts i.e., Paschim Medinipur and North 24 Pgs of West Bengal, have been selected for this study. Both of these districts show a high Human Poverty Index (HPI). Even Paschim Medinipur comes in the top ten (8th place) in terms of showing high HPI. Although both of these districts show high literacy rates (Paschim Medinipur achieves 6th position and North-24-Pgs achieves 2nd position), it lacks in the per capita income and does not even qualify in the top ten ranks for creating employment opportunities. Apart from the above-mentioned facts, the Human Development Report also indicates that these two districts are getting improved access to basic amenities, i.e. provisions of electricity, latrine and safe drinking water, etc. At present, for both of the districts, most of the places are interconnected through massive cable networks, television, local newspapers, street hoardings. This supports the motivation for the selection of these two districts. A total of 378 and 282 samples have been selected for the Pre-COVID period and During COVID period, respectively.

West Bengal has reported more than 1.5 million COVID cases. Both of the above- mentioned districts (North 24 Pgs: more than 3 lakhs, Paschim Medinipur: more than 46 thousand) are in the list of top ten most affected districts [64].

This study has collected the responses through a structured questionnaire. The questionnaire has been translated to Bengali from English for collecting data. To check the validity and reliability of the translated questionnaire, the back-translation tech- nique has been used [65].

The immense and increasing popularity of the FMCG sector [66] for both urban and rural BoP consumers [67] has motivated us to select this area for this current study. Moreover, most of the products of the FMCG sector are being purchased as essential goods. As per a report provided by WRI-IFC 58% of total expenditure was spent on food. Hence the attitude of BoPs towards the marketing mix is expected to be genuine, consistent and stable. The ethical concerns (refer to subsection 2.2) towards the marketing mix can be more justified by selecting the FMCG sector.

As for both the districts, Self-Help Groups (SHGs), Health and Wellness Centre (HWC) are active, the register has been selected as the sampling frame. Mainly, the convenience sampling [68] method has been applied. During COVID-19, spotting out respondents was a big challenge. For this we have applied the snowball sampling [69] technique. For collecting the data During COVID period, it has been ensured that none of the respondents had shown any symptoms. Safety measures had been followed carefully. The questionnaire had been designed short to minimize the data collection time.

3.2. Selection of techniques

As all the elements of the marketing mix are highly associated with each other, we have selected association rule mining as a technique. This study is mainly exploratory in nature. The technique is also exploratory data mining technique.

A. Association Rule

Association rule in data mining is an approach to establish a relationship between the various items in an item set. The concept of Association rule is well used or derived from the Market Basket Analysis. The aim is to find the relationship between the several products in a purchase transaction. This technique looks for possible frequent combinations of an item set [70]. Market basket analysis scrutinizes the products that are consumed by the customers together on a daily basis and thereby cross-selling those products with the rarely sold ones so that the sales increase.

An example of association rule is based on consumer purchase data at retail stores, let us consider that there are three transactions that are made- consumer A {tea, coffee, biscuits}, consumer B {tea, coffee, milk} and consumer C {tea, coffee, sugar}. Now association rules will produce a relationship between one product and another, that is, in this case we can see if a customer buys tea, they will buy coffee. The relationship is denoted as X *Y*.

This means if X then Y, where X and Y are two disjoint item sets [71]. Association rule generates three major outputs: support, confidence and lift [72]. Support is the percentage of transactions containing a particular combination of items relative to the total number of transactions in the database [73]. The support for the combination A and B would be (equation 1):

$$Support\ (A \Rightarrow \$B) = P\ (A\ \cup B) \tag{1}$$

Confidence measures how much the consequent (item) is dependent on the an- tecedent (item) [73]. In other words, confidence is the conditional probability of the consequent given the antecedent, The equation (equation 2) is mentioned below.

$$Confidence(A \Rightarrow B) = P(B \mid A) = \frac{support(A \cup B)}{support(A)} \tag{2}$$

Lift is a measure to overcome the problems with support and confidence. It mea- sures the difference (in ratio) between the confidence of a rule and the expected confi- dence. Consider an association rule "if A then B" [73]. The lift for the rule is defined as (equation 3):

$$lift(A \Rightarrow B) = \frac{support(A \cup B)}{support(A) * support(B)} \tag{3}$$

The Apriori algorithm is a classical algorithm used to generate association rules. The basic idea of this algorithm is to develop frequent itemsets. By using one item and recursively developing a frequent item set with two items, three items and so on. There are some more measurements that help to evaluate the patterns. Here we will have used four such measures: all_confidence, max_confidence, Kulczynski and co- sine. All_confidence and max_confidence measures the minimum and maximum con- fidence of two association rules related to A and B. All_confidence can be calculated by (equation 4):

$$all\_conf(A, B) = \frac{support(A \cup B)}{\max(support(A) * support(B))} \tag{4}$$

The max_confidence can be calculated by (equation 5):

$$max\_conf(A, B) = \frac{support(A \cup B)}{min(support(A) * support(B))} \tag{5}$$

Given two itemsets A and B, the Kulczynski measure can be defined as (equation 6):

$$Kulc(A, B) = 1/2 * (\Pr(A \mid B) + \Pr(B \mid A)) \tag{6}$$

It provides the average of two conditional probabilities: the probability of itemset B given itemset A, and the probability of itemset A given itemset B.

Finally, cosine represents the harmonized lift measure of two rules A and B. It can be denoted by (equation 7):

$$Cosine(A,B) = \sqrt{(\Pr(A \mid B) * \Pr(B \mid A))} \tag{7}$$

The advantage of these four measurements is that these are not getting affected by the total number of transactions. All the values lie between 0 to 1. The more it is close to 1 the stronger the relationship is.

Finally, the IR represents the degree of imbalance between the two rules. The increased value of IR indicates the larger imbalance between the two rules. Ideal value of IR can be treated as zero.

B. Apriori Algorithm

The concept of Apriori algorithm was first given by R. Agrawal and R. Srikant in 1994 for finding frequent item sets in a dataset [74]. The algorithm is called Apriori because it uses prior knowledge of frequent itemset properties. The aim of the algorithm is that it uses an iterative approach where at every k-th iteration k number of frequent items are found and are used to generate k+1 itemsets [75]. Each k-itemset must be greater than or equal to minimum support threshold to be frequency. The principles of Apriori algorithm are:

- Collect a number of single items, get large items
- Get a candidate pair, count large pairs of items
- Get candidate triplets, count large triplets from items and so on
- For instructions: each subset of a frequent item set must be frequent

As discussed earlier, the Apriori algorithm is one of the most commonly used al- gorithms to generate association rules and calculate the support, confidence and lift. However, there is a major drawback of this algorithm. The Apriori algorithm has a higher time complexity as compared to other algorithms. The algorithm scans the en- tire database repeatedly to generate the frequent or candidate itemsets, hence the time required is more [76]. For example, if there are 104 from frequent 1-itemsets, it needs to generate more than 107 candidates into 2-length which in turn they will be tested and accumulate [77].

C. FP Growth

The Association Rule generation method gave way to an improved rule generation technique known as the FP-Growth Algorithm, which was proposed by Han [78]. It is an efficient method wherein the mining is done by an extended prefix-tree structure on a complete set of frequent patterns by patterns fragment growth [79]. The tree structure stores the compressed information about frequent patterns. In his study, it is proven that since FP growth algorithm uses a divide and conquer approach, the efficiency of this algorithm is better as compared to the previous rule mining approach that is the Apriori Algorithm [80].

The reasons for the FP Growth algorithm being more efficient than other algorithms are [80]: 1. Divide and Conquer:The mining data is decomposed into sub-datasets according to the frequent patterns identified. It leads to more focused search of smaller databases. 2. There is no candidate generation. As a result, no candidate test is required. 3. No repeated scans of the whole database

The advantage of FP growth over Apriori is that it takes less time as it does not generate any candidate itemset and iterates over the dataset twice. The disadvantages of the FP growth algorithm are that it may not fit in memory and is very expensive to build. FP growth represents frequent items in frequent pattern trees or FP-tree.

A FP Tree is a frequent pattern tree consisting of a root [81] labelled as null, a set of item-prefix subtrees as the children of the root, and a frequent item header table. Each node in the item-prefix subtree [81] consists of three fields: item-name, count and node-link, where item-name registers which item the node represents, count registers the number of transactions represented by the portion of the path reaching that node and node-link links to the next node in the FP Tree, that carries the same item-name or null if there is none. Each entry in the frequent–item- header table consists of two fields: an item-name and a head of the node-link [82].

3.3. Dataset Description

As most studies [83, 84, 24] have highlighted that the BoP market is heterogeneous and can be divided into two broad domains i.e. urban and rural BoP consumers. This is the motivation why we also have collected data from these two segments separately. It also helps to draw the comparison between both the fields. The data has been collected through a structured questionnaire. Respondents have been requested to provide indi- vidual or set of Ps from 5Ps of marketing mix which they consider while purchasing items or making purchase-related decisions. The profile of the respondents has been presented in table 1. It has been ensured that respondents have a conceptual under- standing of the 5Ps of the marketing mix and can distinguish among them. They do purchase for themselves as well as for their family. They watch the promotion of prod- ucts through televisions, even some of them influenced by celebrity endorsements [85].

The count for various attributes as well as various combinations of attributes for Pre- COVID and During COVID have been presented through figure 2 and figure 3 respec- tively.

Table 1. Profile of the BoP respondents

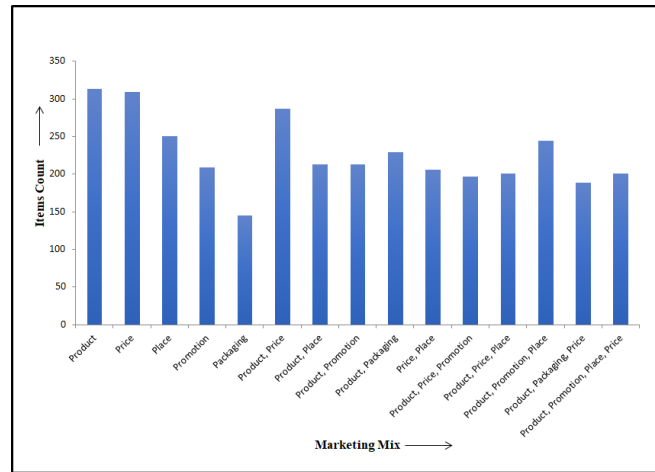| Factor	Pre-Covid	During- Covid
Age gorups		
20-25	114	95
25-40	169	107
above 4l	95	80
Qualification		
Completed_school education	127	110
Graduation (pursuing or completed)	146	90
Post-graduation (pursuing or completed)	105	82
Gender		
Male	187	156
Female	191	126

Source: Compiled by the authors.

Fig.2. Count of various attributes or combinations of various attributes for Pre-COVID period
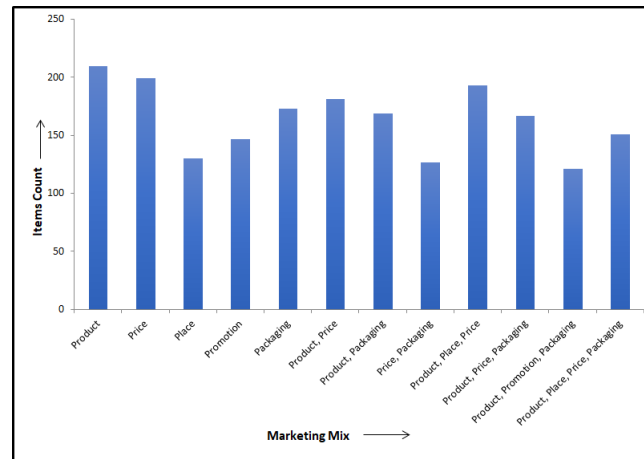

Fig.3. Count of various attributes or combinations of various attributes During COVID period

4. Result and Discussion

This section presents the findings obtained by Apriori and FP growth as well. Before applying the techniques, the data pre-processing [86] part has been highlighted in the first subsection.

4.1. Data cleaning

The work is being carried out using the Python programming language. The dataset is read in excel format and is converted into a pandas dataframe in python. On viewing the dataset, it is found that it contains multiple null values. The

null values are removed from the dataframe using the dropna() function in python and a clean dataframe is ob- tained. It is then observed that the multi-valued rows in the dataframe are not separated by any punctuation like comma (,). A function is then defined which reads one row of the dataframe and checks whether there are multiple values present in that row. If there are multiple values a comma (,) is inserted after every word and thus we get a more cleaned dataframe (refers to figure 4).

Fig.4. Representational dataset before and after cleaning

It is known that the Apriori algorithm expects the data in the dataset to be in one-hot encoded format. One hot encoding means splitting the column which contains numer- ical categorical data to many columns depending on the number of categories present in that column. Each column contains "0" or "1" corresponding to which column it has been placed [87]. The one-hot encoding is implemented and the columns of the dataframe are- product, price, place, promotion and packaging. Each row then has a value that combines '0's and '1's corresponding to the column (refers to figure 5).

Therefore, the dataset is cleaned and can be given as input to the Apriori algorithm to generate the association rules.

4.2. Implementation of Apriori and FP Growth algorithms

While generating the association rules using the Apriori algorithm, it is necessary to have the count for each item set in the data. So, using the count function in Python, we have calculated the count for itemset. Thereafter the 'apriori' and 'association rule' functions are imported from 'mlxtend.frequent patterns' package in Python. Using the 'apriori' function the support for each itemset is calculated and viewed in a dataframe.

	Price	Place	Promotion	Packaging	Product
0	0	0	0	1	0
1	0	0	0	1	0
2	1	1	1	0	1
3	0	0	1	0	0
4	0	1	1	0	1
5	1	0	1	0	0
6	1	1	1	0	0
7	1	1	0	0	0
8	0	1	1	0	1
9	1	1	0	0	1

Fig.5. One Hot Encoding

The 'FP growth' function is then imported from the 'mlxtend.frequent patterns'. Using the 'FP growth' function and a minimum support of 0.5, the rules have been generated. It is seen that both the Apriori and FP growth gave the same rules. The minimum threshold values for support and confidence have been fixed at 30% and 70% [78].

Here, we have generated two sets of association rules i.e. for 'Pre-COVID' pe- riod and 'During COVID' period. These rules have qualified the threshold cut-off for support and confidence (refers to 2 and 4). Apart from support, confidence and lift cal- culation, we have also calculated five other measurements (refers to table 3 and table 5) for checking the correlations for the two sets of rules.

Table 2. Calculation of support, confidence and lift for Pre-COVID situation

Rule No	Rules	Support (%)	Confidence (%)	Lift
Rule 1	Product $\Rightarrow$ Price	75.00	91.00	1.12
Rule 2	Product, Promotion $\Rightarrow$ Price	62.11	92.40	1.16
Rule 3	Price, Product $\Rightarrow$ Place	69.10	70.00	1.07
Rule 4	Product, Promotion, Place $\Rightarrow$ Price	53.10	82.30	1.03
Rule 5	Product, Packaging $\Rightarrow$ Price	35.00	72.90	1.02

Table 3. Calculation of some other correlations for Pre-COVID situation

Rule No	All Confidence	Max Confidence	Kulc	Cosine	IR
Rule 1	0.91	0.92	0.92	0.91	0.01
Rule 2	0.64	0.92	0.78	0.76	0.20
Rule 3	0.70	0.86	0.78	0.77	0.10
Rule 4	0.65	0.82	0.73	0.73	0.18
Rule 5	0.61	0.83	0.72	0.71	0.23

4.3. Comparison of performances

The time complexity of Apriori-based algorithm is exponential [88]. An improved version of the Apriori algorithm, as discussed before, is the FP Growth algorithm which uses a tree, so the time complexity for FP growth is that of a search tree and is quadratic [89]. As the time complexity for Apriori is exponential, hence with the increase in the number of attributes the complexity of the algorithm increases at a much higher rate as compared to FP growth which increases in a quadratic form [90].

Here, we have applied both techniques to promote these two techniques in the con- sumer behavior domain.

4.4. Interpretation

All the rules generated for the Pre-COVID period have one common attribute/one P among the 5Ps of marketing mix i.e. price in the consequences (apart from rule 3). In the antecedent part, all other 4Ps are present either individually or in a combined man- ner. Product has shown the most occurrence and packaging has shown the least occur- rence for all the rules for Pre-COVID period. For rule 1, the combination of {product and price} is present in 75% responses and 91% cases price appears in responses that contain only the product. It can be easily interpreted that for the 'Pre-COVID' period, a significant number of BoP consumers have shown concern about price and product. Their income status, less access to food, education and healthcare [4, 91] have made the situation quite obvious. The combination of {price and product} also indicates one of the propositions of C K Prahalad targeted to BoPs, where he had highlighted the BoP consumers as value-conscious consumers. Right products at the right price satisfy them the most. The lift value of greater than 1 increases the confidence that BoP consumers who are concerned about the price also select the product wisely. This finding can be associated with the incident of purchasing sachets. Due to single-use and 'low-price' it is affordable by BoPs compared to the big packet, which may be beyond the pur- chasing capacity of these consumers. Another interesting finding can be noticed from rule 3 is that place occurs in 70% responses where only {price and product} is present. A lift value greater than 1 strengthens the fact that if products are available easily or nearby, it easily captures the attention of BoP consumers provided the price is satis- factory. Place, can be perceived as one of the A i.e. Availability of 4A [66]. It is also in line with literature where the popularity of 'Kirana' stores among BoP consumers has been discussed [92]. Place or local availability of products creates a strong sense of belongingness among the BoP consumers. Moreover, some 'kirana' stores provide installment facilities. This helps BoP consumers with their restricted income. This behavioural outcome can be mapped with the concept of social capital [93]. Moreover, changing a particular 'Kirana' store seems like a deceitful act. This indirectly promotes a form of loyalty that indirectly leads to brand loyalty.

Table 4. Calculation of support, confidence and lift for During-COVID situation

Rule No	Rules	Support (%)	Confidence (%)	Lift
Rule 1	Product $\Rightarrow$ Price, Packaging	43.71	92.20	1.23
Rule 2	Product, Packaging $\Rightarrow$ Promotion	41.67	71.59	1.14
Rule 3	Product, Price $\Rightarrow$ Place, Packaging	39.52	78.20	1.11
Rule 4	Product, Price $\Rightarrow$ Packging	43.71	79.50	1.03

Rule 2 and rule 4 introduce another P i.e. promotion. For both of these cases, price increases confidence. It can be understood that if the price is satisfactory, promotion can become an effective tool to promote a product in front of BoP consumers. Mostly for rural BoP consumers, lack of electricity or internet connection in most places causes a problem to watch promotional activities through televisions, YouTube and so on. It creates an extra cost for companies to enter the BoP markets [94]. For rule 5, the combination of {product, packaging and price} is present only in 35% of the total responses. In 72% cases price occurs where only {product and packaging} is present. It can be interpreted that if the price becomes satisfactory, then only BoP consumers care about a product's packaging. Another way it can be justified is that most of the BoP consumers prefer 'loose', 'locally grown' products compared to 'packaged' products as they perceive it costly, full of preservatives, and 'not so fresh'. Most of them are time sensitive [95] and depend on very short-term planning (1-2 days) [91] which also have made them less dependent on packaged food that guarantees long storage. Selecting agriculture as a profession also promotes the use of locally grown products. All other measures showing a high value close to 1 also indicate the strong association between the rules. The value of IR close to zero also supports this claim.

In a nutshell, it can be seen that in the 'Pre-COVID' period, price and packaging create the highest and lowest impact, respectively. Product is also an important attribute that almost every BoP consumer considers.

On the other hand, most of the rules extracted During COVID period have packag- ing as the consequences (apart from rule 2). In the antecedent part, all other 4Ps are present either individually or in a combined manner. Product and packaging, individu- ally, has shown the most occurrence and promotion has shown the least occurrence for all the rules. None of the rules has shown a huge difference in terms of support com- pared to others. All itemsets corresponding to each rule have shown support in a range from 39.35% to 43.71%. This implies a diversified set of preferences towards 5Ps of marketing mix among consumers During COVID period. But, the measurements of confidence have shown huge deviations. As per rule 1, the combination of {price and packaging} has occurred 92.20% of responses where only the product is present. This combination has also increased the confidence by 1.23 times that those consumers who are concerned about products are also sensitive towards {price and packaging}. It can be interpreted that to maintain the hygiene some BoP consumers are preferring pack- aged products.The presence of packaging in most of the rules again validates this claim. This accounts for a remarkable change in the perception towards marketing mix During the COVID period compared to the Pre-COVID period. Comparing rule 2 and rule 4 it can be easily understood that price is a key factor for BoP consumers. Price clubbed with packaging, rather than only packaging, improves the co-occurrence of {product, price and packaging}. From rule 4, it can be observed that the attribute packaging has co-occurred 79.50% with only {product and price} combination. {place and packag- ing} together has been preferred by 78.20% respondents who have also preferred the combination of only {product and price}. This has been indicated by rule 4. The value of lift more than 1 has further increased the confidence. Packaged products available at the 'kirana' shops definitely increase familiarity with the brand and product, the chance of purchase, installment facility, etc. All the four measures apart from support, con- fidence and lift, showing a high value close to 1, also indicate the strong association between the rules. The value of IR close to zero also supports this claim.

Table 5. Calculation of some other correlations for During-COVID situation

Rule No	All Confidence	Max Confidence	Kulc	Cosine	IR
Rule 1	0.92	0.96	0.94	0.94	0.04
Rule 2	0.71	0.82	0.77	0.76	0.11
Rule 3	0.78	0.87	0.83	0.82	0.09
Rule 4	0.92	0.96	0.94	0.94	0.04

5. Implications for Marketers

Marketers can get a guideline about how marketing mixes impact BoP consumers for Pre and During COVID period. This empirical and scientific understanding of BoP consumers' behaviour can be translated as a practice of marketers to improve the so- cial conditions of this consumer segment. This can be a part of an initiative under Transformative Consumer Research (TCR) through which the well-being of this con- sumer segment can be improved [96]. This study also suggests that creating appropri- ate pricing-related strategies is very important for BoP consumers irrespective of the situation. As the product is another important element, proper guidelines and commu- nication need to be adopted by the marketers to communicate information related to the size and benefits of the products. This study also creates awareness among marketers that they need to facilitate the distribution channel while targeting BoP consumers as most of them prefer locally available products. The certain emphasis on Packaging During COVID crisis may pose a challenge for the marketers. As packaging generally adds some more cost. Marketers need to be more cautious while selling packaged prod- ucts to BoP consumers due to their excessive sensitiveness towards pricing. Tendency to use packaged products also comes with an opportunity for marketers. If the usage of packaged products becomes a habit among BoP consumers, marketers can promote many brands to consumers as most branded products come with packaging. Moreover, the scope for compulsive buying [97] and addictive buying [98] also may improve. As for both of these components of compensatory consumption, packaging can play a sig- nificant role. For both situations, a

place has occurred. Therefore, if packaged products can be made available in the local 'kirana' shop through proper distribution strategy, packaged products, as well as branded products, will get a chance to be purchased by these consumer segments. This can be treated as an innovative exercise taken by the marketers. This again supports the TCR literature as innovativeness is an active component of it [99, 100].

6. Conclusion

Comparing both the scenarios it is clear that the perception towards marketing mix has changed During COVID compared to Pre-COVID period. Among 5Ps of marketing mixes, two marketing mixes product and price have always played a significant role. It is quite obvious that BoP consumers are sensitive towards product and price. Both of these attributes complement each other. Like if the price is not justified, products cannot be purchased. Similarly, if a product is a non-necessary product but the price is low, BoP consumers hardly buy the products.

Literature also supports that BoPs have aspirations for consumption experiences and goods ownership quite similar to the middle of the pyramid population [101]. Like most other consumer segments, BoP consumers are showing a different behaviour Dur- ing COVID period. Their sensitivity towards price [102] has retained or become more prominent as many of them have lose jobs or income become significantly less. Still, their preference towards packaging indicates a self-protective activity to minimize the perceived risk. This finding is in line with [103] where characteristics of consumer buying behaviour during the crisis has been highlighted. The strong emphasis on the product may be caused due to panic buying to some extent. Fear of unknown uncer- tainty may increase the chance of panic buying among BoP consumers like most of the other consumers. The place has not been able to cause a significant impact as BoP consumers mostly prefer locally available products. Many constraints like meager in- come [104-106], lack of infrastructural facility [107] have refrained them from online purchase or purchase from a shopping mall and so on. As a whole, this study's findings can assist marketers in segmenting, targeting, and positioning BoP consumers more efficiently during other crises like COVID. This quantitative study can be backed with qualitative study for gaining more insight. A similar type of quantitative study can be also conducted for non-durable products. Apart from urban and rural BoP con- sumers, 'urban based rural' and 'diluted urban' BoP consumers can also be requested to participate in this type of study. Similar types of study can be conducted with a re- vised marketing mix. Not only marketing mix but other aspects like purchase intention, frequency of purchase, process of purchase related decision making During COVID-19 period can also be covered.

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