

An Algorithm to Efficiently Predict the Purchase of FMCG Products in the E-Market Place

Manish Kumar Majumdar¹, Prof. Shaji Joseph¹
^{1,2} Symbiosis Center for Information Technology, Pune

ABSTRACT: The marketing world consists of potential buyers and sellers. The sellers try to influence the buyers by various means to compete against their competitor products. But the success and failure of a product depends on the mindset of potential buyers. The perceptions perceived by the buyers about a product are because of all the marketing skills used to influence the mindset of the buyers. As a buyer enters to the world of products to purchase the desired one, the perceptions about the product and the mindset of the buyer decides which product is going to be picked from the shelf to the cart. This study aims in predicting with utmost accuracy about which product is to be picked from a given range of products by a buyer. The prediction consists of the perceptions of the potential buyers i.e. Brand, Price, Quality, Value for Money, Design, Reviews & Ratings and the major characteristics of a product i.e. Word of Mouth, Brand, Cost, Effectiveness, Advertisement, Packaging. An algorithm is being developed to map the following and to predict which product is likely to be picked up by a potential buyer in terms of preference from first to last product given.

Index Terms— Perceptions, Marketing, Prediction, Calculations, Parameters, Consumer, Product

Introduction

Need, want and desire go hand in hand. Marketing is all about connecting these dots to make that happen. It can be a product or service but meeting them is utmost important for a marketer. There are two worlds of buyers and sellers connected by some visible or invisible forces. The forces of cohesion are being created by the marketers to convert the need, want and desire to a tangible form. The buyer world has some perceptions and the seller world has some calculations. But for the marketers, they try to solve the jigsaw of perceptions and calculations to match the buyers with sellers. Customers are the king. They have their rights to purchase a product but depending on 'what'. This 'what' is called marketing. Given various products of same category, a customer chooses one out of others while another might choose the same or other from the given lot. There must be certain features in the product that made it unique out of others or these must be certain perceptions about the products in the mindset of the buyers. Both the outcomes are possible. Hence, in this study, we will analyze the major parameters of perceptions held in the deep corners of the buyers and the striking features of a product that makes it to move from the shelf to the shopping cart.

Consumer buying behavior is the entire process of selection, purchase and consumption of goods and services for the satisfaction of their needs and wants. There are different processes involved in this consumer behavior. Many thought process, factors, specificities and characteristics influence an individual in what to purchase and the consumer in their decision-making process, looking for products, shopping habits, purchasing behavior, selection of products, the brands to buy or the retailers to go. A purchase decision is the result of each and every aspect of these factors. Initially the consumer tries to find what resources to be consumed, then the consumer selects only those commodities that promise greater value of utility.

After selection of the commodities, the consumer makes an estimate of the parameters or expectations from the product and other factors influencing the purchase behavior of consumer.

2 Literature Review

A multi-trait-multi method has been proposed by Davis for determining the discriminant and convergent validity for the buyers which measures their purchase influence about the products they buy and the perceptions they hold before purchasing^[1].

In the studies of Jeffrey^[2] - Self confidence is one of the major factors in consumer purchase decision making process. It is that key variable that handles risk in making the decision of purchase or not to purchase. When a potential buyer is to purchase a product, it has been seen that buyers with low self-confidence would be defensive or indecisive about their purchase.

Again in the studies of Joseph N. Fry and Fredrick H. Siller^[3] - it compared the key factors of the purchase decision behavior of working and middle class housewives. This was done to understand the purchase behavior

and driving factors to purchase. The study was done under controlled conditions like a simulated shopping behavior. The major factors that came to limelight are the comparisons of search like brand preference, product similarity and deal sensitivity. These were noted in the simulated shopping experience.

Consumers always seek products to satisfy their needs and desires. Consumer behavior is beyond than studying what consumers buy. Consumer behavior is to understand the decision-making process of their buying behavior^[4]. (Solomon 2004, pp. 6-8.)

Marketers or Producers study the consumer buying patterns to ideate what, how, when, why they buy. Predicting why consumers buy a specific product is the utmost difficult task to predict because the answer can be multiple scenarios inside the buyer's mind^[5].

A consumer's purchasing behavior is controlled by some factors. These can be cultural, psychological factors, social and personal. Consumer purchasing behavior is the subset of human behavior and studying these behaviors can help us to predict the buying behavior of the consumers. Marketers can make an assumption on how consumers might behave while making purchasing decisions in future^[6].

There are many aspects that a consumer wants to have in their product or there are many parameters that a consumer evaluates for a required product. Sometimes, a consumer focuses on only price or sometimes on brand or sometimes in word of mouth. But never ever it has been seen that a proper foundation of the parameters have been done for any scenario. So, in this study we have come up with six set of parameters of products and consumers. These parameters are interlinked and sometime one of the parameter plays a major role, sometimes set of two or three or six all together. The major parameters that a consumer looks in a product are Brand^[2], Cost^[2,3], Effectiveness^[3], Advertisement^[3,5], Packaging^[5] and Word of mouth^[5]. And when it comes to the consumers, they have in their mind Brand^[2], Price^[2,3], Quality^[3], Value for Money^[3], Design^[5] and Reviews^[3,5]. Hence, we have condensed all aspects of a product and psychological factors affecting purchase of a product into six set of categories.

These six from consumers and products play a vital role in selection of the product. Each parameter has dependency on others based on situation^[8]. These situations decide the preference of parameters. The major parameters that play a vital role in product purchase are Brand, Price, Effectiveness, Advertisement and Reviews or Word of mouth^[7,9]. Hence, in our study we took the parameters from both the world of consumers and product and tried to find a relationship among them.

3 Rationale of study

Indian is a potential marketplace for online industry. Indians have become much more dependent on online stores to purchase their daily to daily needs from Amazon pantry or Flipkart etcetera. The demand for online products has grown very high in recent times because of the discounts which different bank offers via their credit or debit cards. This has led people to switch from brick and mortar store to the online store, with guaranteed time for the delivery for their products, sitting at their home and just placing the order with the click of a mouse or just a click in via their smart phone. But the question lies - out of thousand products which product will be shifted from the store house to the cart and get checked out at last. There are a lot of products which are listed by sellers in the market place. But the major thing to study is that which product goes to the cart very often and which product just hovers only in the list of the products. This study, relates to the shopping behavior of online consumers who find their best products in the E-Marketplace. This study will help us to understand how customers choose their product basing on the parameters that they have in their mind during their purchase. This will not only increase the sales of the sellers online but also it will help the online retailers to target the potential customers and decrease the price of the advertisement which they spend heftily to push the products. This study will predict customers' choice out of several category of products and help them to get their desired products in the E-Marketplace. Online consumers usually filter their product by rating or price or by colour and much more parameters but are there any shortest way to find the desired products without applying these filters. Of course, our study aims in studying the consumer's mindset before the purchase is made and can help in showing the appropriate products to the customer at the time of log in and shadow the products which he or she doesn't want to hover through.

4 Objectives OF The Study

The main objectives of the study are:

1. Understanding the mindset of the potential consumers.
2. Better mapping of required products to potential consumers.

3. Reducing the cost of advertisement
4. Better understanding of consumer behavior.

5 Research Methodology

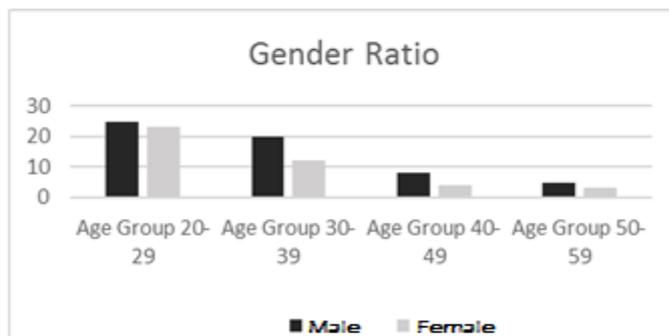
In the first phase of research, a Google Form was floated to understand the consumer's behavior while they purchase any FMCG product in the online market place. We had given them free hand to write the attributes that they see or want in their products before purchasing. The consumers were allowed to write down in words or sentences about what are the specifications or parameters that they see before purchasing any kind of product. Then these attributes were clubbed together to give us six major parameters in which all these can be justified. A total of 250 responses were analyzed in this phase. This survey helped us to know the major aspects that a consumer looks for before buying any FMCG product for their use or suggesting their dear ones online. Attributes of the products are categorized under six set of parameters namely Brand, Cost, Effectiveness, Advertisement, Packaging and Word of mouth. The scale is taken from 1 to 10 because of the better prediction of human feelings. Shorter is the scale, difficult is to mark the feelings.

Rating for Brand value of the product was decided from an online survey of 100 different consumers on a scale of 1 to 10. The rating for cost has been determined by considering all the products in the same segment via the weight or liters of product divided by MRP of the product.

Rating for Effectiveness of the product has been taken from the comment section of the Flipkart and Amazon from verified purchaser where they have given their ratings are based on the experience they had. Last 100 experiences were taken into consideration based on the descending order of their date of purchase. Ratings for Packaging were taken from the feedback section of Flipkart and Amazon where the consumers had given the rating for the packaging of the product they have received. The recent 100 feedbacks were considered from verified purchase consumers based on their date of purchase in descending order. The rating for Word of mouth has been taken from the consumers in the same Google Form where they had to give the brand value. The method to determine was in form where people were asked whether they would suggest this brand and the given set of products to their near and dear ones. For the ratings of the advertisement category we have not taken the amount invested by a company to gain consumers. In fact, a survey of 100 people was taken in which consumers were asked whether they had seen the advertisement of this product in any of the desired channels either offline or online media.

Similarly, for the consumers, the parameter that matters are Brand, Price, Quality, Value for Money, Design and Reviews. After working on the parameters, again an online Google form was sent to the consumers where they had to rate the six parameters Brand, Price, Quality, Value for Money, Design and Reviews on a scale of 1 to 10 before going to purchase the products online. After the ratings were given for the parameters, the next 5 segments constituted of different products from different domains like Detergents, Juices, Soaps, Deodorants and Sanitizers. Each domain had approximately 10 -20 listed products. The consumers were asked to give their buying preference for the given products in a scale of 1 to 3. 1 represents their first choice, 2 represent the second and 3 represent their third choice if they were to purchase the product online. Each product was shown as it is shown in Flipkart and Amazon and even the products were hyperlinked to their respective E-Commerce platform to get the same feel of purchasing online. But here, after looking through every aspect, the consumer has to choose 3 products that the consumer would purchase from the online store.

Now, the ratings given by each of the consumers to the six parameters Brand, Price, Quality, Value for Money, Design and Reviews are taken as input for the algorithm with the name of the consumers, the name of the products and the six set of parameters for each of the products i.e. Brand, Cost, Effectiveness, Advertisement, Packaging and Word of mouth. These inputs are processed to get the final result. The final result consists of the name of the consumer and 3 products arranged in their order of preference that they would buy from the given products in each segments.



6 The Algorithm - PerfectProductPrediction

function mainBlock

declare Product Matrix, Consumer Matrix, SelectionMatrix

call function getDataForProductMatrix

call function getDataForConsumerMatrix

call function getSelectionMatrix

print sorted SelectionMatrix

end of mainBlock

function getDataForProductMatrix

initialize productNames [1 to n]

initialize productRatingsforEachProduct [1-6]

end of getDataForProductMatrix

function getDataForConsumerMatrix

initialize consumerNames [1 to m]

initialize consumerRatingsforEachParameter [1-6]

end of getDataForConsumerMatrix

function getSelectionMatrix

loop for each product [1 to n] and consumer [1 to m]

selectionOfProduct = consumerRatingsforEachParameter [1 to 6] – productRatingsforEachProduct [1 to 6]

end of loop

end of getSelectionMatrix

7 Interpretation Of The Algorithm

getDataForConsumerMatrix takes the input of consumers name and their ratings for the parameters in sequence of Quality, Brand, Price, Value for Money, Reviews and Design.

getDataForProductMatrix takes the input of products and their ratings in the order of Word of Mouth, Brand, Cost, Effectiveness, Advertisement and packaging.

getSelectionMatrix performs the main operation of matching the product's parameter to Consumer's perception. The mapping is done like this:

Consumer Perception

Product Parameters

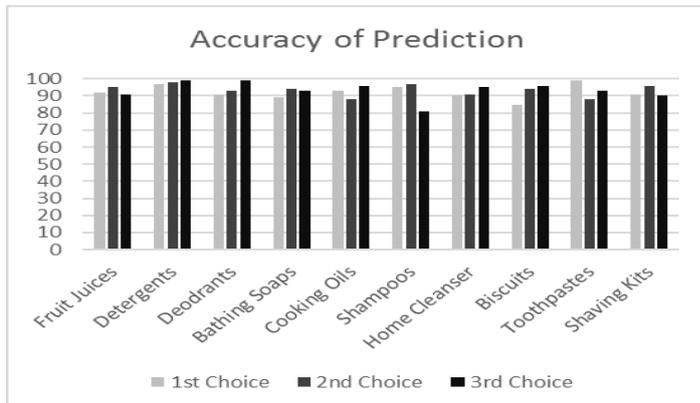
Quality	Word of Mouth
Brand	Brand
Price	Cost
Value for Money	Effectiveness
Reviews	Advertisements
Design	Packaging

We found a direct relation of these parameters that cater to the consumer’s need.

The Consumer’s perception of the product was subtracted from Product’s parameters. This helped us to know which product meets the consumer’s expectation. Like a consumer rated brand as 9. This shows that brand matters for him. And the product got a brand rating of 10. So, when we subtract Consumer’s perception with product parameter i.e. 9-10, we get -1. This shows that the product has passed beyond the consumer’s expectation. So, the more negative the result, the more likely the product is to be picked.

SelectionMatrix sorts the product weightage with consumer’s name and line 11 prints them.

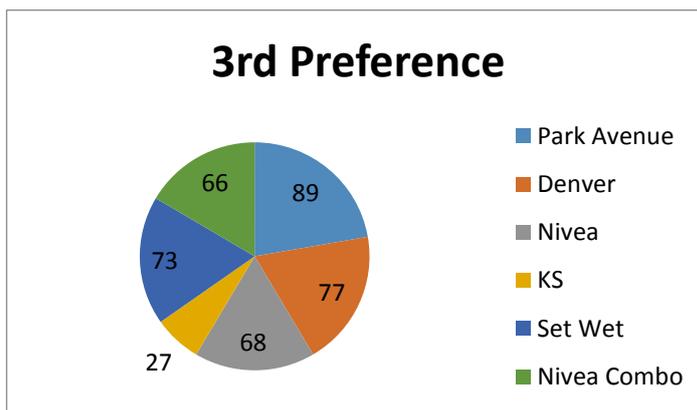
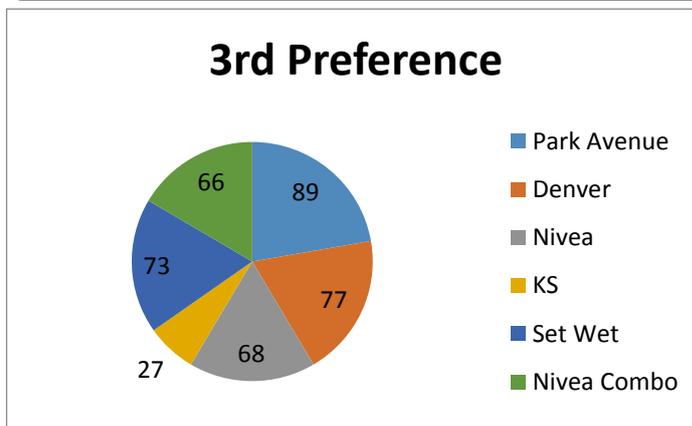
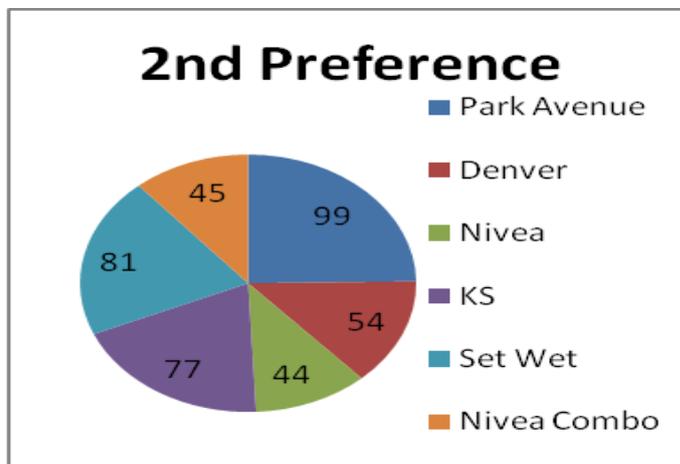
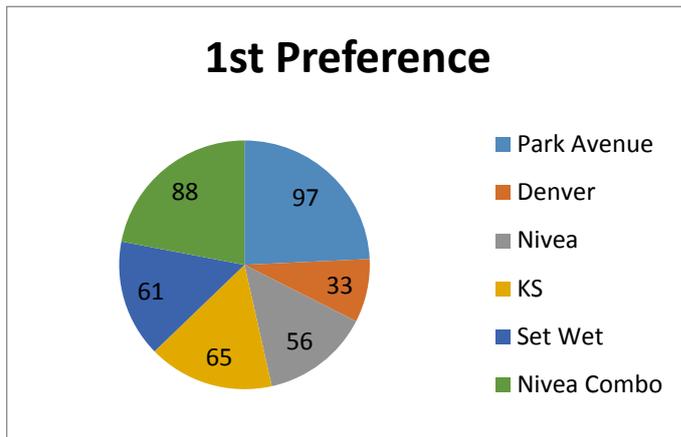
8 Findings From The Study



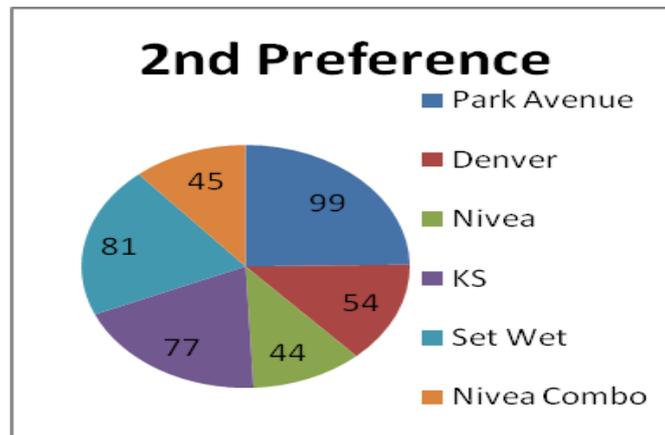
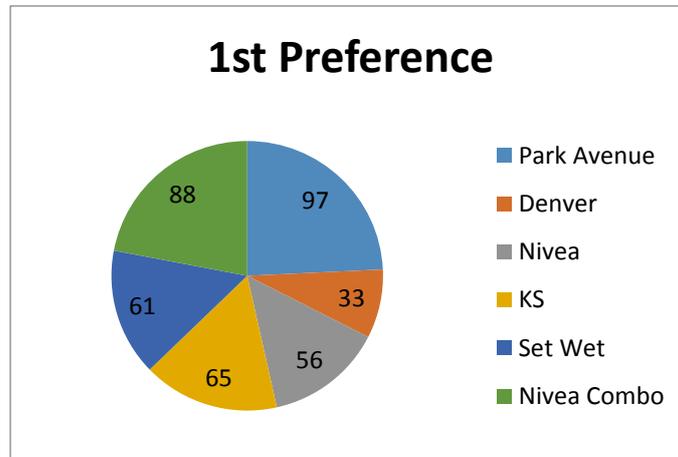
We found that there is a strong correlation between the 6 parameters of the product and consumer’s perception. This algorithm has accuracy of 95% overall. The accuracy of prediction of products in different segments has been shown in the above stated image.

With this algorithm, we could understand the consumer’s buying behavior and which products they would choose over the others. This can reduce the advertisement cost significantly and can help product makers to focus on the required parameters of the product for better reach and buy.

For the validation of our algorithm, the results of 400 respondents were taken and the analysis of Deodorants section is being shown.



The above shown pie charts are the actual preferences given by the consumers in order of their purchase. The below shown pie charts are the prediction from our algorithm for the above set of consumers.



Conclusion

With this accuracy, it can be said that consumer’s choice of products was predicted properly. The accuracy can be increased with more inputs from consumers. The study helped to know consumer’s perception, buying behavior, product parameters and the flaws in products that can be enhanced over time.

In our study, we have considered only that part of population who do online marketing either from Amazon or Flipkart. These two E-Commerce platforms are chosen because these are the most popular online E-Commerce store with the greatest number of customer base, trust and availability of required products. Even they have the pantry option. The age gap that has been considered for this study is from 20 to 59 years. We have taken equal proportion of male to female consumers so that there is no chance of getting biased results as per gender. Only FMCG goods are taken into consideration which are ordered on regular basis and have a large substitutions and people can switch to other product in case of unavailability of the required product.

References

1. Harry Davis L., (1970). “Dimensions of Marital Roles in Consumer Decision Making”, Journal of Marketing Research, Vol.VII, No.2, May 1970, pp.168-177.
2. Joseph N. Fry & Fredrick H. Siller., (1970) “A comparison of Housewife Decision making in Two Social Classes”, Vol.VII, No.3, Aug.1970, pp.333-337.

3. Jeffrey, A. Barach., "Consumer Decision making and Self-confidence", Indian Journal of Marketing, Vol.2, No.3, Sept.1971, p.18.
4. Solomon, M. 2004. Consumer Behavior. Sixth Edition. Prentice Hall.
5. Kotler, P. & Armstrong, G. 2009. Principles of Marketing. Pearson Education. Thirteenth Edition. New Jersey.
6. Kardes, F. Cline, T. Cronley, M. 2011. Consumer behavior: Science and Practice. South-Western Cengage Learning.
7. Yue Xin and Xie Jianhui, "Research on the consumer behavior in C2C market," 2011 2nd International Conference on Artificial Intelligence, Management Science and Electronic Commerce (AIMSEC), Dengleng, 2011, pp. 1428-1431, doi: 10.1109/AIMSEC.2011.6010852.
8. G. A. Calvert and M. J. Brammer, "Predicting Consumer Behavior: Using Novel Mind-Reading Approaches," in IEEE Pulse, vol. 3, no. 3, pp. 38-41, May 2012, doi: 10.1109/MPUL.2012.2189167.
9. J. George, "Growing & changing trends in consumer behavior," 2016 International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT), Chennai, 2016, pp. 4804-4809, doi: 10.1109/ICEEOT.2016.7755633.