CONSUMER BEHAVIOUR ANALYSIS

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Abstract. Research on consumer behavior has become essential in recent years as it plays an important role in business marketing and growth. Consumers are the king of the market. For-profit organizations cannot function without customers. All the activities of the company end with the consumer and their satisfaction. Consumer behavior is the study of consumers and how they choose or eliminate products. This theory extends not only to products but also to services consumed. To develop a framework for studying consumer behavior, first look at the factors that influence consumer buying behavior, as well as the various thinking paradigms that have influenced the progress and discipline of consumer research. Modeling customer behavior is nothing more than creating a mathematical structure to map the general behavior of a particular customer group. This is done to predict how consumers will react in a particular situation. The purpose of the survey is to better understand consumer behavior by examining the factors that influence the consumer's purchasing process. The main purpose of studying consumer behavior is to understand how consumers feel and think. Building a recommendation engine is another application for studying consumer behavior. The recommendation engine basically recommends several products based on a variety of factors, including previous purchases by consumers, age, etc. It's a kind of data filtering tool that uses machine learning algorithms to recommend the most relevant items to a particular customer. The purpose of this paper is to analyze consumer segmentation and sentiment regarding product reviews and build a product recommendation system.

Keywords: Consumer Behavior, Sentiment, Consumer Segmentation, Product Recommendation

1. Introduction

The fast-paced digital environment has redefined how most businesses interact with their customers. Customer behavioral analytics is a thorough study of how customers interact with a company. Using a qualitative and quantitative approach, customer behavior analysis examines all stages of a customer's journey and provides an overview of what drives consumer behavior. By modeling customer behavior, you identify customer group behavior to predict

how similar customers will behave in similar situations. Understanding consumer behavior is important for companies to succeed with their current products and introduce new ones. All consumers have different thinking processes and attitudes towards purchasing a particular product. If a company doesn't understand how consumers react to a product, the product is more likely to fail. Consumer behavior is changing as factors such as trends, technology, fashion, and lifestyle evolve. Marketers need to understand what is changing so that they can adjust their marketing activities accordingly. In marketing, differentiating consumers is a way to differentiate one consumer from many others. This helps to create a target group of consumers with similar behavior. Understanding consumer behavior can help you create effective marketing campaigns. Each campaign can target a specific consumer group based on behavior. Consumer behavioral analytics has become an important tool for understanding customers. By studying the forces behind consumer sentiment and customer buying behavior, companies can develop new products, run marketing campaigns, and increase profitability. Companies need to talk to consumers, be aware of frustration, and most importantly, and be aware of their needs and expectations. Gordon R. Foxall et al [5] to better understand consumer behavior. This paper proposes a system that examines the epistemological state of total purchase and consumption models derived from important behavioral analysis. In addition, this article describes a behavioral outlook model for purchases and consumption, explains the origin of the model's research program, and identifies the complexity of the consumer behavior analysis model. That is verbal behavior and marketing intervention in a wealthy consumer-oriented economy.

2. Related Works

Gordon R. Foxall [2] developed a consumer behavior model based on radical behaviorism called the Behavioral Perspective Model (BPM), which is a development of the "three-tier contingency". According to this model, consumer behavior takes place at the intersection of a consumer behavior framework and the learning history of an individual's consumption and is a function of informational and utilitarian consequences. The model was useful for analyzing consumer brand selection and reactions to different parameters.

Gordon R. Foxall et. al. [3] applied the BPM model from the paper to the interpretation of environmentally harmful behaviors (the use of private transport, household energy consumption, waste disposal, and household water consumption). This application highlighted specific marketing strategies that should be adopted for modifying each of these operating classes.

Warren J. Bilkey [1] came up with the vector hypothesis which is an application of Lewinian vector psychology to consumer analysis to obtain a scientifically verifiable theory of consumer behavior. The vector hypothesis provides a valuable conceptual framework for consumer analysis to determine whether there seems to be a significant relationship between the mental tensions of individuals with respect to particular items and purchases thereof. This also determines if these mental stresses postulated in tum are influenced by economically significant considerations.

Analysis of consumer behavior combines theories and findings from marketing science, consumer research, behavioral economics, and behavioral analysis. One issue is the interpretation of real-world consumer behavior in terms of experimental research and survey. Gordon R.Foxall et al [4] proposed a solution that reviews consumer choice across a range of

laboratories and naturalistic environments, demonstrating progress in this new sub-discipline and illustrating the wide range of interpretations of consumer choice it provides.

R.V.Kulkarni et. al. [8] proposed a system that is used to analyze consumer behavior, their psychological state at the time of purchase, and how appropriate data mining methods are used to improve the conventional method. In addition, an association rule is used to mine rules for trusted clients by using sales data in a supermarket industry.

Gordon R. Foxall et. al. [6] proposed a solution that includes bilateral contingency and seeks to link them to issues stemming from meta-contingency theory and macro behavior. It is difficult to understand the relationship between a complex contextual system such as a firm, whose behavior is predictable and controllable through consideration of its emerging business consequences, and the collective behavior of consumers, each of which is a contextual system responding solely to the specific scheme of contingencies.

In the olden days, consumer behavior analysis was done just by using feedback from the customers. This does not give us a clear way about the opinion and behavior of the consumers. Ilene S. Schwartz et. al. [9] proposed a solution in order to improve the quality of this analysis. This solution involves assessing the products purchased by the consumers, how often they purchased a product, and so on.

Harold H. Kassarjian et. al. [7] theory says that Consumer behavior has evolved from a large formal approach to a midrange theory that leads to over-fragmentation. Perhaps it's time to return to master theory, which helps to incorporate the deviations.

3. Proposed Methodology

Figure 1 encapsulates the analysis of customer behavior and product recommendation system which recommends the set of products based on the input customers provide. Firstly, the market and its customer in geological approach is explored by grouping each zip code and defining its latitude and longitude based on each zip code center. As a result, the market that is highly distributed over a particular region is analyzed. Similarly, the market and customer interest are explored based on the timing approach. The analysis showed the best promotion time and Accuracy of Delivery Estimation. Next, customer behavior is explored using the RFM method. RFM (Recency Frequency Monetary) is a method used to analyze the value of the customer. RFM stands for Recency, Frequency, and Monetary. Coming to product exploration, it is divided into two categories. Popularity analysis and sentiment analysis. Sentiment analysis is achieved with the help of natural language processing. The main focus is on product recommendation. The function built for the product recommendation system will fit the data into the model. This function builds using the truncated SVD matrix reducing the components to 10. This function output will be a correlation matrix for the product pair wisely. By using the function, this recommendation has a high correlation with the product. Therefore, that suggests the company should promote this recommendation product when the product input is purchased or viewed. The company can use this recommendation system to promote the recommended product after the user purchases or is interested in the currently viewed product. By conducting this kind of promotion, a company does not randomly promote products. On the other hand, the product promoted has a high correlation. Therefore, the customer may purchase more since interesting products appear frequently.
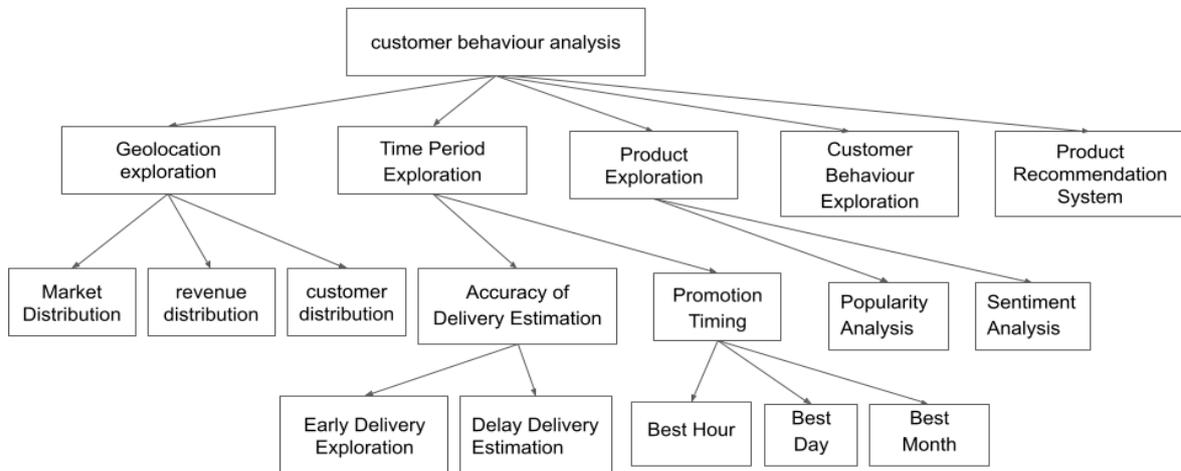
Figure 1. Model Diagram of Consumer behavior Analysis

4. Algorithm

4.1 Geo location exploration

1. Explore the geo dataset using head ()
2. Before going any further, it seems that the geo dataset contains several duplicates. Therefore, that will be dropped first.
3. Using a scatter plot, it is identified that the market is distributed highly at a particular place.

4.2 Time Period Exploration

1. This section will analyze the accuracy that the company estimates for delivery time. Moreover, this divides the case when the delivery is late and early. Change the variable type of delivery date and estimated date to date time type.
2. Since the order can be canceled after the purchase, there are empty elements on the delivery date column. Therefore, the empty column will be dropped.
3. Next, range time from the estimated delivery date and the delivery date, which is measured on day is found.
4. Furthermore, which customer got the product early and the ones who got the product late is elaborated. Since it is defined as a time interval, absolute is applied for the negative time on early variables.

4.3 Product exploration

4.3.1 Popularity analysis

1. This section will focus on exploring the popularity of products.
2. Using the bar chart in figure 5, the most popular product is found.

4.3.2 Sentiment analysis

1. Besides the popularity, the comment of the product is also considered. Since the comment is in Portuguese, it would be hard to analyze. Therefore, translate the comment to English in excel and load the dataset as data.
2. Next, to analyze the sentiment of the comment of each product. However, the data is still a mess; so, clean it by removing punctuation and symbols by defining its function as clean text.
3. After defining the function to clean the data, define a function to decide the sentiment of each comment.
4. Next, to categorize each sentiment, to decide which sentiment is positive, neutral, or negative.
5. To see which word or topic is connected with negative sentiment, visualize it with word clouds and see which word describes the negative comment the most.
6. From the word cloud, most of the negative comments are about the product, delivery, store, etc. can be analyzed. This could be the company feedback to improve the company, especially in products, delivery, and store.

4.4 Customer behavior exploration

1. To reduce error, it would be a better option to drop the duplicates.
2. Firstly, customers are categorized based on recency, frequency, monetary, and tenure. It seems that an order dataset is needed, so customer and order dataset based on customer id are joined.
3. Next, to find recency, find the range of time from latest purchase to each purchase time on the dataset. Moreover, recent is defined as the latest time each customer purchases in this market.
4. After that, frequent is defined by summing up ordered items of each customer.
5. To define monetary ordered items, values of each customer is summed.
6. Next, tenure is defined by finding the earliest purchase time from each customer

5. Results and Analysis

This paper presents an experimental implementation of consumer behavior analysis in this project. In this paper, the promotion timing was analyzed or the best time to recommend a product and the various possibilities of issues while delivering a product. Figure 2 shows most of the customers purchase products around 10 am until 22 pm. Figure 3 represents the highest number of purchases is on Tuesday (1), then Monday (0). Figure 4 shows the highest number of purchases in August (8). However, even in other days the number of purchases not significantly low, so it is recommended to avoid promote products in December (12), since it is the lowest. The consumer behavior was analyzed based on location of the consumer, timing during which a product can be promoted, how frequently they buy a product, and their views or comments on a particular product. Based on all these factors, the consumers were also

classified as loyal customers, best customers, new customers etc. Figure 5 shows it is actually excellent to have 57% of the products is rated 5. However, the rate 1: 12% percentage is quite high compared to rate 2 and 3. The sentiment analysis was also carried out on the reviews provided by the consumers. This was done by using Natural Language Processing techniques and a library called Text Blob. NLT was used to preprocess the reviews before analyzing them. A recommendation engine was built based on the above-mentioned factors. This engine basically looks through all previous purchases and recommends 10 products which are similar to the one customer bought. This is done with the help of correlation matrix.
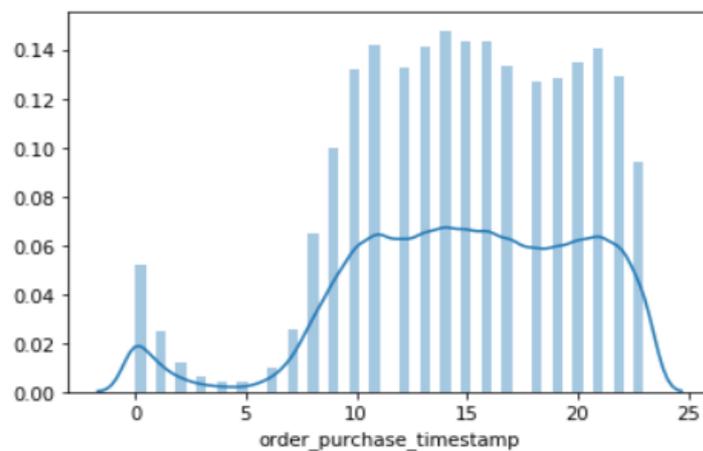
5.1 Time period exploration
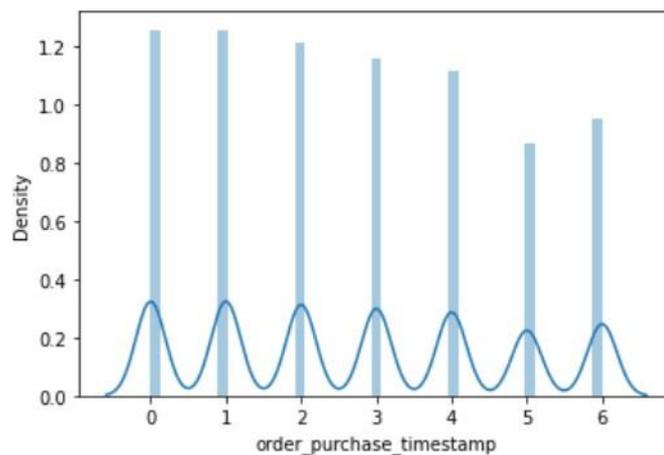

Figure 2. Best hour for purchase

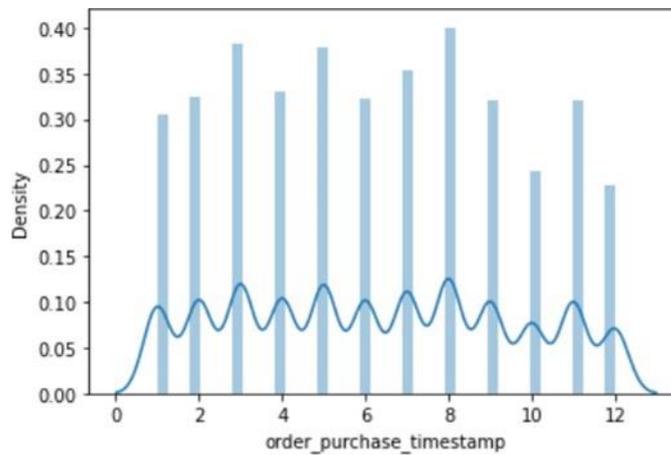**Figure 3.** Best Day for purchase

Figure 4. Best month for purchase
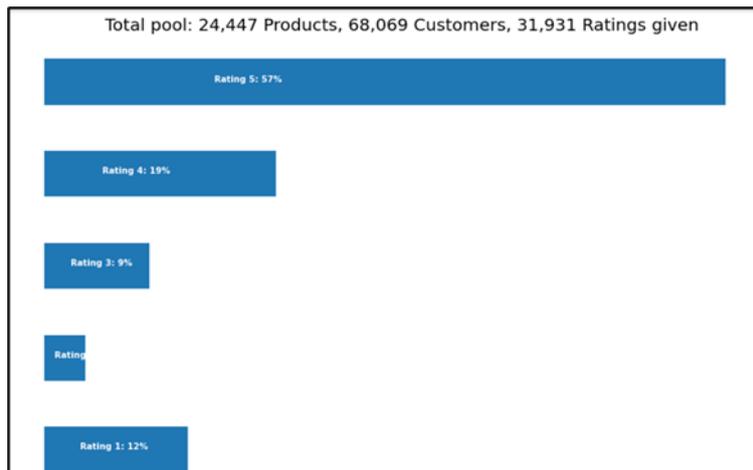
5.2 Popularity analysis

Figure 5. Popularity analysis

6. Conclusion

The main focus of this study is to increase the profit of the organizations by understanding and analyzing the behaviors of their customers. Implementation in this paper includes classifying consumers based on their location, their age, recency, frequency and monetary value of their purchases, the reviews they provide for a product, etc. By using this classification, different levels of attention to different customers can be given which is profitable. By exploring the delivery timing, it can be made sure that the product reaches the customer on time. The sentiment analysis which was performed on the customer reviews can be used to better understand the thoughts of a consumer over a product and their assumptions while buying a similar product. The Recommendation engine not only helps the consumers in making choices but also helps the organization in gaining profit. Thus, this research simplifies the works of consumers and also benefits the organization.

7. Future Works

As the business world evolves, so do consumer habits and preferences. Customer behavior is the most important factor in designing a good marketing campaign. However, customers are only humans, and customer behavior can be volatile and unpredictable. Therefore, what looks like a good marketing approach in a conference room may not be very effective. Knowing before consumer behavior trends become apparent gives businesses an unprecedented advantage over their competitors. Customer demand for transparency is increasing. Customers promote online purchases and courier services. It's already happening, but the pandemic is skeptical that it's simple and functional and makes their lives easier. Covid has taught everyone to better evaluate and prioritize what is important in life. This will change the products and services people choose the types of products and services they purchase, and the actual impact on the purchase. Ubiquitous communication is undergoing major changes. When businesses move online and remotely, it is not only desirable, but also expected to create a cohesive brand experience. Customers expect a more "human" element of interaction. Business-to-business customers will continue to benefit from technology providers, from validating actual reviews to managing sales cycles on the timeline and leveraging group buying prices. Customers will demand more anonymity. It is expected that more people tend to do it alone than let others do it.

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