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Data Analysis of Customer Segmentation and Personalized Strategy in the Era of Big Data

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Abstract: This article provides an overview of the use of data analytics for customer segmentation and personalization in marketing strategies. The article reviews the various approaches, advantages and challenges of using data analytics to gain insights into customer behavior and preferences. The paper also discusses the role of emerging technologies in improving data analytics capabilities for effective segmentation and personalization by examining a large body of literature. In this work, I have compiled this review by understanding and delving into the changing evolution of the traditional retail industry in the digital marketing era, the application of data analytics in modern marketing, and the impact of novel technologies such as artificial intelligence in informing strategic marketing decisions such as market segmentation and customer segmentation, and improving the efficiency of operations management. The results of the review highlight the importance of using data-driven approaches to shape modern marketing practices and provide practical insights for companies aiming to optimize customer engagement and maximize profits.

Keywords: data analysis, customer segmentation, personalization, marketing strategies

1. Introduction

In the realm of digital marketing, the traditional retail industry is facing an unparalleled influence, and the competitive advantages of conventional marketing are diminishing [1]. The concept of perfect competition presupposes homogeneity among the elements of both the market demand and supply sides are encompassed, but variability has become norm instead of being the exception [2]. It is clear that exhibit data analysis are important in the development of modern marketing. The trend of online shopping is steadily growing, with 1.61 billion individuals globally engaging in online purchases, resulting in a total of USD 1.9 trillion in 2016 [3]. The scale of global retail e-commerce will maintain rapid growth, and the number and value of online sales are on the rise. In fact, by 2024, the value of global e-commerce sales could exceed $7 trillion. The rapid development of e-commerce in recent years will continue to bring huge benefits, in the face of explosive growth of consumer demand and consumer customers, the importance of market segmentation and personalized marketing strategy for marketing is becoming more and more obvious. However, the question of how to divide the market began to be discussed in 1998. Morgan argued while not achieving perfection yet, market segmentation has objectively contributed value to industrial companies and has been an integral part of modern marketing for over 40 years [3].

The key theory of market segmentation is the existence of customer heterogeneity, through which we can identify market segments and companies and provide them with suitable products It is essential to gather data that enables the algorithmic characterization of user behavior [4]. This paper

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makes a comprehensive exploration and analysis of precision marketing strategy based on digital marketing model. In today's highly competitive business environment, companies are increasingly recognizing the significance of comprehending their customers at a deeper level to effectively tailor their marketing strategies. Customer segmentation and personalization have emerged as powerful tools in this endeavor, allowing businesses to deliver targeted and relevant messages to their consumers [5]. Even though personalized images have become widely used in various fields, personalization-oriented marketing remains a major challenge for many researchers in their job. Alves Gomes and Meisen distinguish between explicit collection of customer behavior data and implicit collection. Explicit collection refers to the explicit collection of information, such as demographic data survey, which is more difficult because of privacy or time reasons. The main purpose of implicit collection is to collect content related to the survey object, and it is easier to track interactive information [4]. Customer segmentation is an unsupervised learning procedure that employs various clustering techniques aiming to segregate the aforementioned customer data according to their similarity. In this case, similarity is quantified using an objective measure like the Euclidean distance. It is important to acknowledge that guests behavior is an ongoing process, with evolving needs, desires, and degree of satisfaction for a long time [4]. Therefore, the Processes and fundamental protocols put into effect by the company must possess adaptability to accommodate this significant level of dynamism [6,7]. The final step is to leverage the analyzed customer data. Subject matter experts such as marketers can customize suitable marketing strategies for specific customer segments based on market segments. Data analysis plays a pivotal role in enabling organizations to uncover valuable insights about their customer base, enabling them to implement more effective marketing strategies. In paper of Huang and Rust: The proposed three-stage framework for strategic marketing planning incorporates the benefits of artificial intelligence (AI) [8]. Artificial intelligence has the potential to assist in market research and strategy development, particularly in areas such as segmentation, target audience identification, and positioning (STP)and the way of action, so that in marketing strategy and implementation, mechanical Artificial intelligence has the capability for segmentation identification (customers, markets), segmentation and improvement of criteria, thinking AI for positioning and segmentation recommendation, precision marketing for different targets, sensory AI for positioning, and so on. Segment resonance, handle and maintain customer relationship. This framework is then applied to all areas of marketing, reflecting the flexible and full application of artificial intelligence in data analysis [8].

2. Principle of Data Analysis

This review aims to explore the utilization of data analysis techniques for customer segmentation and personalization in marketing strategies. It examines how businesses leverage data analysis to gain a comprehensive understanding of their clienteles' preferences, behaviors, and requirements, and subsequently devise strategies to engage and retain them. Simple estimation, Simple hypothesis testing: the lattice approach, Compositional regression, residual analysis and regression diagnostics, and Related types of data and other data analysis methods were mentioned in Aitchison 's research [9]. We can use these data methods to make assumptions and regression analysis on a larger number of mobile phone information, screen out data with high relevance and significance, and find out the best combination of data to achieve the purpose of maximum reported profit [8].

The research shows how customers' role in the social network of a cashback site determines customer behavior and business activity on the site. Guests derive advantages and value from transactions on relevant websites., attracting more users to the site, thereby facilitating the acquisition of new customers and strengthening the loyalty of existing customers. From one of the largest cash return websites in continental Europe, all transaction data of customers in a period of time and experimental samples of their roles in social networks were extracted. By collecting observation data,

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data mining of the age, gender and roles of the samples was carried out in MySQL and SAS to obtain customer characteristics, social roles, etc. The breakdown of customer seniority and customer profitability and the proportion and amount of each transaction component. Ballestar pointed the approach employed is that they utilized SPSS 24 to conduct a two-step cluster analysis, which allowed us to group customers based on their commercial activity and social network position. This analysis helped us identify distinct clusters of customers based on their behaviors and relationships within the network [10].

Contemporary machine learning algorithms, like support vector machines and latent class models, can address challenges in matching customers' interests with product information. Support vector machines and latent class models analyze customer preferences for effective matching. Collaborative systems utilize ratings and preferences from other customers to enhance the matching process. These approaches alleviate challenges by improving the accuracy and personalization of matching customers' interests with product information [11].

3. Data Analysis Techniques for Customer Segmentation

The review will delve into the various data analysis approaches employed in customer segmentation.

Marcus et al. noted that the creation of the customer value matrix originated from the intention to implement RFM (Recency, Frequency, and Monetary Value) analysis in a retail setting for small businesses. However, the challenge lies in the fact that while RFM is relatively straightforward in theory, Segmentation outcomes can be complex to comprehend and effectively implement. However, matrices, like the BCG Growth-share matrix, offer a useful tool for decision-making. This matrix evaluates market segments, products, and countries by categorizing business opportunities into cash cows, stars, dogs, and question marks. Cash cows are high-market-share businesses in low-growth markets that fund other ventures, while dogs are low-market-share businesses trapped in low-growth markets. The BCG matrix provides a clear framework to assess and prioritize opportunities based on market share and growth potential. This adds value to management strategies and tactics [5]. In another research, Migros utilizes various segmentation methods, such as value, behavioral, lifestyle, lifecycle, and activity-based segmentation, to effectively divide its customer base [12]. CRM (Customer Relationship Management) is both a tool and a strategy that leverages technology to automate business processes and effectively manage customer interactions [13]. Businesses use CRM to both meet customer expectations and demonstrate the organization's mission goals to discover, attract, and ultimately retain new customers, drive future business, and build sustainable customer relationships [13]. The soft clustering method demonstrates more promising results compared to hard clustering and the proposed soft clustering method achieves superior within-segment clustering quality compared to the finite mixture model [14]. Classify online customers' cross-category purchase data, establish good customer relationship, use data analysis and classification to improve the quality of products and services, and improve customer satisfaction in order to meet customer needs.

4. Data Analysis Techniques for Personalization

Retail profitability fell during this period. Zhu believes that retail business should adopt the following four ways to correctly understand the purpose of marketing is to discover and realize the needs of customers in order to achieve true precision marketing: information resources, market positioning, personalized and professional service level, and in-depth data mining. Information is an essential resource for enterprises survival and development, is the information basis for understanding and analyzing guests demands, and still is the strategic basis on which personalized marketing relies. Big data technology enables enterprises to capture, store, analyze, and utilize various aspects of customers' consumption patterns, such as their purchasing time, frequency, and expenditure. This data

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helps create a comprehensive customer profile. Then, after establishing a valuable target group database, businesses have the ability to perform comprehensive analyses of consumer groups based on different customer situations, meet the needs of consumer groups to the greatest extent, and determine the sales target of products. Select specific target markets to achieve detailed and accurate positioning. However, in practice, retail is a complex industry, which needs to ensure low costs, but also to achieve high returns, and fully consider the individual needs of customers. Therefore, while meeting the individual needs of customers, enterprises can appropriately give up some rights and reduce the cost of goods. Finally, big data technology is used to dig deep into the data and push the information of related products to potential users to improve marketing effect and customer satisfaction [1]. Nowadays, many fields are using these methods to obtain user portraits. Personalized service is one of the most advantageous features of differentiated competition, including demographic analysis, behavioral analysis, psychographic analysis, and predictive modeling. Online marketing markets, such as TikTok and Taobao, quickly track the browsing footprints of registered users, calculate the details of interested content and use time, and accurately push the content that users may need. Of course, regardless of online or offline markets, the application of big data technology will also lead to increased operating costs. In order to reduce costs on the premise of ensuring profits, enterprises need to make adjustments and give up some rights.

5. Case

Figure 1: Migros in Turkey [12]

5.1. History

Migros, founded in 1954, is the biggest grocery chain in Turkey. Figure 1 shows the logo of this Migros. After transferring its shares to the Koc Group in 1975, Migros experienced rapid expansion, opening numerous stores in Istanbul and other regions. They introduced different store brands to cater to diverse market segments. In 1997, Migros launched virtual stores and became a pioneer in online shopping. With an international expansion strategy, Migros combined with tansaku in 2005, implementing a management strategy to offer better value to customers while reducing costs. Migros aims to be customer-centric and operates under the vision of being "closest to the customer" with various service forms and strategies. They have a loyalty program called the "Migros Club Card" to gather customer data and maintain a strong presence in Turkey and neighboring countries [12].

5.2. Segmentation Approaches

The company utilizes various approaches to successfully divide its customer base. These methods encompass segmentation strategies based on value, behavior, lifestyle, lifecycle, and activity, all aimed at effectively categorizing their customers [12].

To be included in the customer pool for segmentation analysis, it is a prerequisite that any customer must have utilized the membership card within the 3 months preceding the survey.

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5.3. Approach 1: On merit

Based on this market division, Migros focuses its efforts to reconnect with its top-tier customers. This classification is based on the family unit. "Loyalty" is based on the family's purchase of basic life products (fruits, vegetables, meat, eggs and milk, etc.) in the store in the past six months. The experiment first divided these households into nine groups based on purchase frequency, combined the two measures to obtain a "productivity index", and then used productivity index and loyalty to segment the six markets (Figure 2). In Figure 2, a value pyramid is depicted, consisting of three levels and six segments, which are determined based on measures of productivity and loyalty.

Divisions 1, 3, and 5 are identified as the loyal user based on the mentioned standard. The most profitable group of customers representing levels 1 and 2 of the pyramid, typically consist of approximately 140,000 families. Some of the prominent use cases of this method contain providing additional services to the most valuable customers, such as irregularly giving away movie ticket tickets or inviting users to themed banquets. This is more conducive to maintaining customer relations, improving customer satisfaction, and laying a good marketing foundation and customer loyalty for the company's profit.

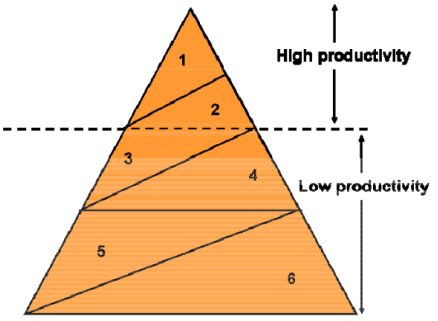

Figure 2: The Value Pyramid [12]

5.4. Approach 2: Behavior

Divide customers by behavior as the basis for survey. Customers must meet specific criteria in terms of purchase history and frequency to be included. Cluster analysis is performed using various variables such as purchase amount, location, payment method, promotion sensitivity, seasonality, and more. This analysis consistently reveals seven distinct clusters these clusters are distinguished based on various factors, including the amount spent, communication level, type of purchases, and basket size. Divisions 3 and 6, for instant, consist of high consumption group with different levels of communication.

5.5. Approach 3: Lifestyle

Customers are analyzed based on their lifestyles and expected product preferences. Fourteen experimental groups were preselected. Each customer aligns with one of these groups and compared to the average member based on purchase amounts, frequency, and specific item purchases. Customers meeting the criteria are included in one of the resulting 28 segments. However, the company strategically targets four segments, including “gourmets” ,“diet lovers”. After identifying 14 unique lifestyle segments in their customer database, the company has gained valuable insights.

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5.6. Approach 4: Activity

Activity Segmentation is an individual analysis that uses data more than a year to categorize customers as “active,” “normal,” or “passive” based on their purchase amount and frequency. The analysis calculates the average spending and standard deviations, giving more weight to recent purchases. Customers who fall significantly below the average are categorized as "passive", those who are close to the average are classified as "normal," and those who significantly surpass the average are labeled as "active". The same process is repeated for purchase frequency. The results are used to create a 3 x 3 matrix grouping customers into different segments. This segmentation helps in migration analysis and enables targeted offers to increase activity for guests who have moved from the normal segment to the passive segment.

6. Conclusion

On the one hand, segmentation provides businesses with a competitive advantage by understanding customers and tailoring strategies, leading to increased market share, loyalty, and brand differentiation. It helps improve customer retention and acquisition by focusing on profitable segments. Additionally, segmentation enhances product development by meeting specific customer needs, resulting in higher satisfaction and increased sales.

On the other hand, effective segmentation relies on accurate and relevant customer data, which can be challenging to obtain and maintain. Overgeneralization is a risk when grouping customers based on common characteristics. Implementing a comprehensive segmentation strategy requires significant investment and expertise. Accuracy in categorizing individuals into segments is crucial, considering the complex nature of customer behavior.

Ultimately, this review on the utilization of data analysis for guest segmentation and personalization in marketing strategies strives to offer a thorough comprehension of the role data analysis plays in shaping modern marketing practices. There are a few problems with this research: Data quality, Privacy and ethical issues, Model accuracy. There has also been progress: Multi-source data integration, Predictive and personalized marketing, Real-time analysis and decision-making. Among them, there are few researches in the field of cross-channel data analysis. Researchers can focus on current challenges and untapped potential in the field to advance the field. How to integrate the data of different channels, and carry out segmentation and precision marketing according to these data deserves more attention.

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