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Customer Segmentation Using Data Analytics Techniques for Business Decision Support

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ABSTRACT: In the current digital business environment, organizations collect a large amount of customer data through online and offline transactions. However, without proper analysis, this data cannot support effective decision-making. Customer segmentation is a useful analytical approach that helps businesses understand different customer groups based on their purchasing behavior.

It applies basic data mining and database management concepts for effective data processing and pattern identification. An online retail dataset is analyzed to study customer purchasing patterns. Tools such as Microsoft Excel and Power BI are used for data cleaning, analysis, and visualization. Customers are classified into different segments based on purchase frequency and total spending.

The findings of this research support businesses in identifying valuable customers and improving marketing and retention strategies. The study also supports the use of information systems and business intelligence techniques in modern business analytics..

KEY WORDS: Customer Segmentation, Data Analytics, Business Intelligence, Decision Support System, Customer Behavior.

I. INTRODUCTION

In today's competitive market, customer data has become one of the most valuable assets for businesses. With the rapid growth of e-commerce platforms, companies generate large volumes of transactional data every day. Proper analysis of this data allows organizations to gain insights into customer preferences and purchasing behavior.

Customer segmentation refers to the process of dividing customers into groups based on common characteristics such as buying frequency, spending patterns, and transaction history. Instead of applying the same strategy to all customers, businesses can focus on specific segments to improve efficiency.

Data analytics techniques help transform raw customer data into meaningful information. By applying analytical tools, businesses can identify high-value customers, understand buying trends, and make better strategic decisions.

This research is carried out as part of an academic study to understand the practical application of data analytics in business environments. The main objective of this paper is to perform customer segmentation using data analytics techniques and support effective business decision-making.

II. RELATED WORK

Several studies have focused on customer segmentation using data analytics and data mining techniques. Researchers have applied clustering methods, RFM analysis, and statistical tools to analyze customer purchasing behavior and spending patterns. These techniques help in understanding customer preferences and improving marketing strategies.

Previous research has also highlighted the use of business intelligence tools, data preprocessing methods, and visualization techniques for effective data analysis. Simple analytical tools such as Excel have been widely used for analyzing retail data and supporting business decision-making.

These studies show the importance of data-driven approaches in customer management. However, there is limited work focusing on the practical use of basic analytics tools with real-world datasets. This study contributes by applying simple data analytics techniques for customer behavior analysis.

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III. SIGNIFICANCE OF THE SYSTEM

Customer segmentation plays an important role in modern business analytics. It helps organizations understand the diversity of customers and their different needs. Proper segmentation enables businesses to design personalized marketing strategies and improve customer satisfaction.
Segmenting customers also helps in identifying loyal and high-value customers who contribute significantly to business revenue. Additionally, businesses can optimize their resources by focusing on relevant customer groups rather than targeting all customers equally.
Therefore, customer segmentation using data analytics techniques is essential for improving decision-making and maintaining long-term customer relationships.

IV. METHODOLOGY

This research follows a structured methodology to perform customer segmentation using data analytics techniques.

A. Dataset Collection
The dataset used in this study is the Online Retail Dataset obtained from Kaggle. It contains customer transaction records, including invoice details, quantity purchased, unit price, and country.
B. Data Cleaning
Data cleaning is performed using Microsoft Excel. Missing values, duplicate records, and incorrect entries are removed to improve the accuracy of the analysis.
C. Data Analysis
Customer behaviour is analyzed based on purchase frequency and total spending. Pivot tables are used to summarize and organize customer data for further analysis.
D. Visualization
Power BI is used as the primary visualization tool. Charts and dashboards are created to represent customer segments and purchasing patterns in a clear and understandable manner.

V. EXPERIMENTAL RESULTS AND DISCUSSION

The analysis results indicate that customers can be divided into multiple segments based on their purchasing behavior. A small group of customers contributes a major portion of the total revenue, while other customers make occasional purchases.High-value customers are identified by frequent transactions and higher spending levels. Medium-value customers show moderate purchasing behavior, while low-value customers have infrequent purchases.
These analytical results are generated using data processing, database management, and business intelligence techniques, which support efficient decision-making in modern information systems.

Figure 1: Total Sales Distribution Across Different Countries

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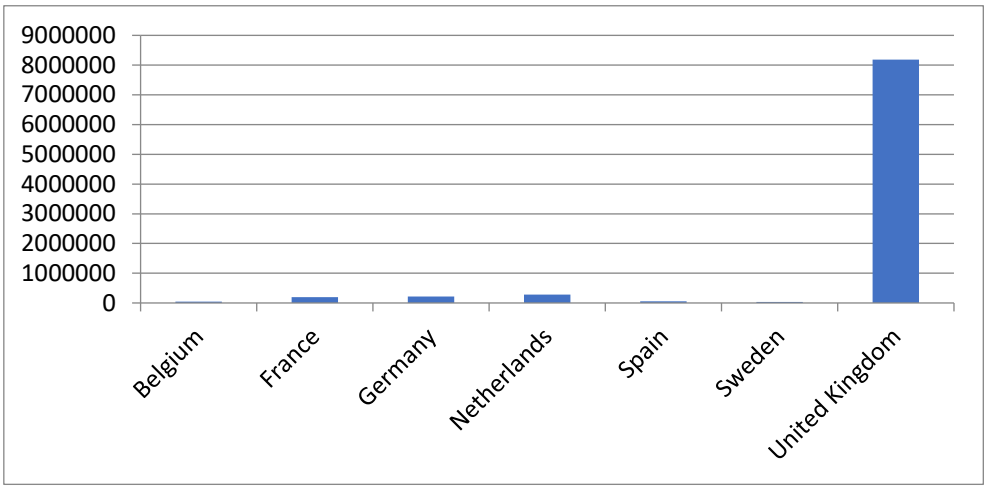
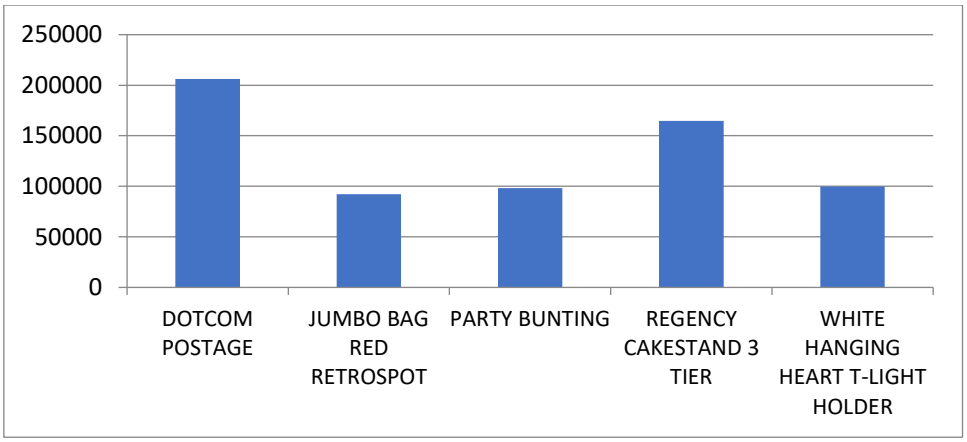


This graph represents the distribution of total sales across different countries based on the online retail dataset. It is observed that the United Kingdom contributes the highest share of total sales compared to other countries such as Germany, France, Netherlands, Spain, and Sweden. This indicates that the majority of customers and transactions are concentrated in the UK market. Other countries show relatively lower sales volumes, suggesting limited market penetration.
The analysis highlights the importance of focusing business strategies on high-performing regions while exploring growth opportunities in emerging markets. Such insights help organizations in improving international marketing and expansion plans.

Figure 2: Top 5 Products Based on Total Sales



This graph illustrates the top five products based on their total sales value. Among the selected products, "DOTCOM POSTAGE" shows the highest sales performance, followed by "REGENCY CAKESTAND 3 TIER" and "PARTY BUNTING." Other products such as "JUMBO BAG RED RETROSPOT" and "WHITE HANGING HEART T-LIGHT HOLDER" also contribute significantly to overall revenue. The results indicate that these products are highly preferred by customers and play a major role in generating profits. Identifying top-performing products helps businesses in managing inventory efficiently, planning promotional activities, and maximizing revenue generation.

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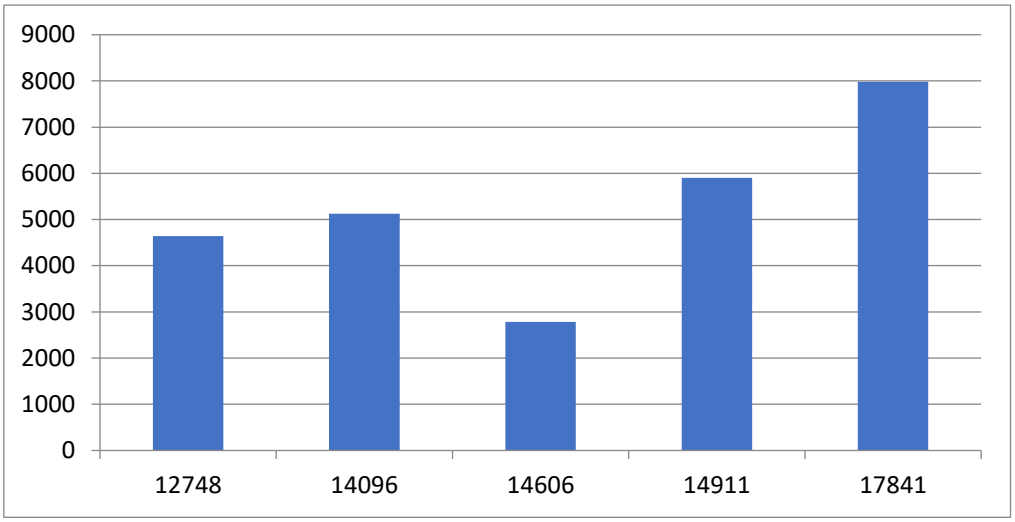
Figure 3: Purchase Frequency Analysis of Customers



This graph presents the purchase frequency analysis of selected customers based on the number of transactions made. It is observed that Customer ID 17841 shows the highest purchase frequency, followed by Customer IDs 14911 and 14096. This indicates that these customers are highly loyal and regularly engage in purchasing activities. On the other hand, some customers show relatively lower purchase frequency, reflecting occasional buying behavior. The analysis helps in identifying loyal customers and understanding their purchasing patterns. Such information is valuable for designing personalized marketing strategies, customer retention programs, and improving long-term business relationships.

V. CONCLUSION AND FUTURE WORK

This research demonstrates that customer segmentation using data analytics techniques is effective for business decision support. By analyzing customer transaction data, businesses can identify different customer segments and take informed strategic actions.

The study also demonstrates the effective use of database systems, data processing techniques, and information systems in business analytics applications.

In the future, advanced machine learning algorithms can be applied to achieve more accurate customer segmentation and predictive analysis.

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