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Analysis on the Application of Custom Segmentation

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ABSTRACT
It has been proved that customer segmentation can bring more profits to companies. However, many small companies still hesitate to use it, or they just do not know how to actually use customer segmentation. This paper analyzes the purpose and benefits of customer segmentation. The most common applications of customer segmentation are customer development and customer retention which allow businesses to sell more of their products. Moreover, this paper illustrates the general process of customer segmentation to give a brief idea about building customer segmentation. The end of the paper lists the functions of customer segmentation in the telecommunication, retail, and credit card industry as examples of using and altering customer segmentation in different industries.

Keywords: *Business Analytics, Customers, Marketing, Profit, Segmentation*

1. INTRODUCTION

Customer segmentation is a process of clustering and dividing commercial entities into separate groups based on certain standards. As the developments in Data Science, Business Analytics, and Machine Learning, customer segmentation could be completed by several convenient tools. In recent years, an increasing number of companies started to use customer segmentation to help themselves make marketing strategies. However, many inexperienced companies do not know the purples of customer segmentation and misunderstand the importance of it. For one thing, while large companies use this business skill nearly everywhere, many small companies mimic the way of large companies using customer segmentation, even if they are not clear about the purposes of customer segmentation, as well as the correct process of customer segmentation for their specific companies. For another thing, sometimes, founders of newly started companies think that their companies are too small to do customer segmentation, or they trust their previous marketing experience more than data. However, in fact, customer segmentation is worthwhile for companies no matter how big they are, and a proper segmentation conducted by the computer is more reliable than personal experience.

This paper aims to analyze the benefits and application of customer segmentation, in order to help inexperience companies better understand the applications and basic method of customer segmentation. In addition, some common applications of customer segmentation are listed, followed by a brief introduction of the example process of customer segmentation.

2. SIGNIFICANCE OF CUSTOM SEGMENTATION

Companies usually use customer segmentation to have a better understanding of customers because the segmentation visualized certain characteristics of the customers. Hence, Customer segmentation can help managers optimize marketing strategies to promote various business metrics.

2.1. Customer Development

Achieving profitability is the goal of all companies. The most obvious way to achieve this goal is to develop more customers. However, it is a hard process for many companies because they do it thoughtlessly. Companies have to find the pattern of customer development to make this process stable and effective. Customer segmentation is in favor of finding a clear pattern for customer development. A company can cluster their customers based on some features of customers, such as location, income, shopping hobbit, and so on. After a company has the information and features of existing customers, with the skill of machine learning, this company can create a model that can predict the probability of a person being a potential customer and

which customer categories this person will belong to. This predictive model can find target customers for companies so that they can focus only on a specific group of people. Having the potential customers list, a company could reduce the cost of advertising or messaging because these are sent to fewer people, but still maintain their efficiency.

Moreover, A company can use segmentation to develop new products that attract more customers. By clustering the products and customers, a company can see the relationship between the products and customers. If a business wants to expand the target customers, it should look up to minor customers, find the products bought by this group of customers, extract common features of these products, and finally apply this feature to more products. Following this procedure, the small cluster could grow to a big cluster. Price is a key feature that affects new products' performance. A high price will reduce the number of orders, and a low price will reduce the profit per order. Customer segmentation can help a company to balance these two parameters according to the behaviors of existing customers. By building a target marketing model, companies can have the probability of people buying their new products at a certain price, which helps the manager to maximize the estimated profits.

2.2. Customer Retention

Another common application of customer segmentation is to strengthen customer loyalty or increase customer retention rates. In business, customer retention is even more important than new customer development. Typically, the cost of getting a new customer is five times more to the cost for keep an existing one. A normal company would lose 10 to 30 percent of its customers per year, while a 5 percent increase in the customer retention rate could bring a 25 to 100 percent increase in the average customer values.[1] How to retain more of their customers is a question for all managers. Customer segmentation can assist managers in strengthening customer loyalty.

Once a company clusters its customers, this company would able to identify which groups of customers created most values. This is the process of Customer Value Measures (CVM) using customer segmentation. After companies identify its high-value customers, based on the background, preference, and shopping hobbit of these groups of customers, companies can make specific marketing strategies, VIP, and special coupons for example, to meet their needs.[2] The costs of these new strategies could be then same as the unmodified strategies, yet they are much more effective in improving customer experience and satisfaction which will highly increase the customer retention rate and customer loyalty.

3. BRIEF PROCESS

Before actually dividing things, analysts have to decide the detail for segmentation, such as the variables for segmentation, the number of groups, and the minimum number of customers in each group. Once all the details above are settled, analysts need to choose an algorithm to divide customers into groups depending on the purposes and properties of the segmentation. Finally, most companies would continue to build a model to predict the categories of their new customers. The following are the elaborations of each step mentioned before.[3]

3.1. Data Preparation

The raw data cannot directly be used to do the segmentation. Data preparation is an important step in customer segmentation. These data would have many features, which generates a multidimensional data frame. Analysts have to fill empty entries, transfer non-numerical values to numerical, adjust the scale, and so on. All these works can let the computer read data more easily.

3.2. Customer Categories

Three common algorithms for marketing segmentation are Decision Trees, K Means, and Hierarchical Agglomerative Clustering (HAC). All the algorithms have their advantages and disadvantages, so analysts have to choose a proper algorithm that can best fulfill the requirements.

3.3. Build Predictive

The predictive model can use current information of customers to anticipate the feature behaviors of these customers or the possible behaviors of new customers. In this process, data would be divided into a training set, testing set, and, possibly cross-validation set. Computers can use certain algorithms on a training set to generate the prediction of customer segmentation. The most basic algorithms for classifying customers are Support Vector Machine Classifier, Logistic Regression, K-Nearest Neighbors, Decision Tree, Random Forest, AdaBoost, Gradient Boosting Classifier. Different algorithms have their own advantages and drawbacks, analysts need to decide which model to be used.

3.4. Evaluate Predictive

One commonly used approach to evaluate a predictive model is computing various indexes based on the Confusion Matrix. Table 1 shows the content of the Confusion Matrix.

Table 1. Confusion Matrix

	Predicted Results: 0	**Predicted Results: 1**
Actual Results:0	True Negatives (TN)	False Positives (FP)
Actual Results:1	False Negatives (FN)	True Positives (TP)

Confusion Matrix can be expanded to have multiple dimensions if there are several features to be predicted. Three basic indexes are derived from the Confusion Matrix:

$$Accuracy = \frac{TP+TN}{TP+TN+FP+FN} \quad (1)$$

$$Precision = \frac{TP}{TP+FP} \quad (2)$$

$$Sensitivity = Recall = \frac{TP}{TP+FN} \quad (3)$$

Accuracy, precision, and recall along can reveal some traits of a model, but each of them is powerless when the data are imbalanced. For example, when a set of data contains 97% of positives and 3% of negatives, a predictive model will have 97% Accuracy if it predicts all the results as positives. In this case, the predictive model has a decent accuracy yet the model actually does not predict anything. Therefore, analysts typically introduce other scores to evaluate the models. F1-score is frequently used to balance these basic indexes.

$$F1\,Score = \frac{2*precision*recall}{precision+recall} \quad (4)$$

Analysts are allowed to modify the constant coefficient of F1-score to meet their applications of predictive models.

Moreover, analysts can draw the learning curves of a model to check the quality of this model. Specifically, analysts can draw the changes in any score they what to trace as the number of train data increase. By observing the trends and critical points of the learning curve, analysts would know whether the model is overfitting or underfitting the data.

3.5. Improve Predictive

Every models has several parameters that need to be set when people build the models in Python. After analysts have the criteria for the evaluation of models, they can improve the predictive models by adjusting the parameters of models. Besides, analysts can improve the models by combining multiple predictive models. For instance, a new model can be formed by considering the results of several other models. This new model will generate positives if and only if more than half of the results from other models are positive. The combined predictive models can have better or worse scores than every single model, depending on the qualities of models included, so analysts need to carefully choose which models to be included.

4. EXAMPLE APPLICATIONS IN SPECIFIC INDUSTRIES

Even though customer segmentation can provide the above benefits to nearly all companies, the applications of customer segmentation can be different depending on the specific company types. Experienced companies have their unique way to apply customer segmentation, which makes the segmentation more useful in their fields because they can reveal more details and solve specific problems of these fields. Companies have to continuously optimize their way of customer segmentation. To be more specific, managers should decide how to divide their patrons, and use the segmentation to improve their services and increase the revenue. for better results. Yet, this is challenging because it requires not only segmentation skills, but also a deep understanding of one specific industry. The following are some examples of applications for different business industries.

4.1. Telecommunication Industry

Telecommunication companies can group their customers in four ways: customer value segmentation, customer behavior segmentation, customer life cycle segmentation, and customer migration segmentation. [4] Among these four types of customer segmentation, customer behavior segmentation is most important for telecommunication business and commonly used by marketers. From customer behavior segmentation, marketers can know people's preferences for using phones. For instance, some clients are more willing to communicate with others via direct phone calls instead of text message, hence telecommunication company should try to communicate these clients with phone calls in order to avoid any uncomfortable of clients; In contrast, if clients prefer sending and reading text messages, managers should not bother these customers with phone calls and also aware that they could be candidates of some value-added services related to text, such as MMS.

4.2. Retail Industry

In the retail industry, the connection between shoppers and managers is tight, and managers should monitor patrons' shopping hobbits to provide special

offers for patrons. Some basic features that can be used for segmentation are purchase date of purchase, the number of items per order, spent money per order, categories of items, etc. The retail store can use this information to help sell products. For example, after a retail store detect that one customer buys one certain product very often, the manager of this store can off this customer discount for that product, which encourages the customer to bring more in a short time. Similarly, if the store finds that customers live far from the store rarely purchase at this store, the manager can try to offer free parking to people who brought a certain amount of products from the store, so that people are now encouraged to drive to the store and purchasing more.[5]

4.3. Credit Card Industry

Customer segmentation is especially crucial for banks when they lend money to clients, because it can serve the function of risk management in the credit card industry. Without segmenting customers by appropriate mathematical models and the processing of computers, result from the unreliable predictions of whether clients would pay their bills, the risk of the banks is high. For example, until the 1990s, many Japanese banks still gave their credit cards base on a simple assessment of clients. These banks evaluated their clients according to merely the universities and jobs of clients. They granted a high credit limit to people who have decent jobs, like lawyers, or attended top universities. [6] Nevertheless, this experience-based assessment cannot provide comprehensive forecasts for banks, because jobs and schools of clients do not have a strict positive correlation. As a result, many Japanese banks at that time had problems of retaining customers and obtaining profits. In contrast, customer segmentation can take into account various features, expert variables, of clients, such as the number of open accounts, maximum delinquency past 24 months, age of the oldest open account, length of residence, mortgage LTV, etc. Banks can use these variables to segmenting and assessing their clients, which would balance the risks and profits of banks.

5. CONCLUSION

In conclusion, customer segmentation is a useful tool for nearly all companies of different scales to pursue higher marketing performances. The number of customers is one of the most important factors affecting companies' profits. Segmenting customers can assist managers to make marketing strategies for customer development and retention, thus it could potentially increase the revenue of a company. The most basic processes of segmenting include data preparation, customer categories, build and evaluate predictive. Although the uses and basic procedures of customer segmentation can be common, the ways of applying it differ from industries to industries or, even, companies to companies. As shown by examples of customer segmentation in telecommunication, retail, and credit card industries, managers of different industries or companies should know very clear about what to focus on, according to the features of the industries and companies. In other words, some specialized features need to be taken into account by data analysts. In conclusion, companies should pay their attention to customer segmentation but they need to carefully and wisely for better and more reliable results.

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