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Study on Customer Segmentation Intelligent Model of Air Cargo

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Abstract. It is a valid guarantee for airlines to segment the air cargo customers for maximum benefit. Scientific and reasonable customer segmentation can help companies reduce costs and gain market access. This paper puts forward the idea of air cargo customer segmentation model from objective hierarchy, rule hierarchy, result hierarchy and scheme hierarchy under hierarchical thinking. It aims at building an air cargo customer segmentation intelligent model which includes three dimensions. Intelligent models such as cargo association rules, neuronal networks and decision trees are used to analyse values, risks and marketing. The goal of this model is to maintain customers and increase profit margins. This paper launches a further discussion on main points of implementation during every links of stages of data preparation, customer segmentation and application of the segmentation results.

1. Introduction

Customer segmentation is one of the fundamental principles of customer relationship economics. Effective customer segmentation is one of the prerequisites for an enterprise to achieve CRM. Overall, the segmentation methods can be divided into two categories: pre-segmentation and post-segmentation. The theoretical basis for pre-segmentation is the consumer behaviour model, and RFM analysis is the representative method. In fact, there are multiple collinearity issues in RFM analysis and there is no comprehensive consideration of the five differences between customers. Considering these five differences fully, it will inevitably create data analysis burden, which requires a more powerful method of data analysis and processing. Applications based on data mining techniques can achieve better segmentation results. When consumer behaviour is more complex, pre-segmentation method cannot ensure the difference between different market segments. Another important segmentation method that is relative to pre-segmentation is the post-segmentation method, which includes predictive and descriptive segmentation. The key step in predictive segmentation is to identify dependent variable, which depends on the researcher's understanding of consumer behaviour. When the consumer behaviour is more complex, it will shrink the effect of the predictive segmentation. Therefore, it is necessary to analyse and calculate the lifetime value of air cargo customers and to segment customers. This will distinguish customers' high-value and customers' low-value, so as to selectively allocate limited resources to the real high-value air cargo customers, which will earn higher returns for air cargo enterprises. This paper combines data mining technology and customer segmentation theory, pointing out the process of air cargo customer segmentation, aiming to further improve the application level of

customer relationship management of air cargo enterprise. Some domestic literatures have given the prototype of the air cargo data warehouse, and made OLAP analysis with this prototype, and obtained some practical results about the behaviour of air cargo customers. Based on this, this paper will further discuss the study on the segmentation framework of air cargo customer and segmentation intelligent model.

2. Air cargo Customer Segmentation Framework based on Hierarchical Thinking

Air cargo Customer Segmentation Framework can be expanded from objective hierarchy, rule hierarchy, result hierarchy and scheme hierarchy.

(1) Objective hierarchy is the target of air cargo customers segmentation. Through analysis of value, risk and strategy of air cargo customers, Selecting different subdivision index system and specific subdivision method. The target is to divide customers into different groups and adopt different marketing strategies for these groups based on customer value to the airline, so as to improve customer satisfaction and loyalty, and ultimately increase air cargo company profits.

(2) Rule hierarchy is the basis of air cargo customers segmentation. Taking the customers value of air cargo as the basis of the segmentation, considering current value of air cargo customers in different cargo rates, fixed cost savings of increasing carrier rate and service cost savings of regular customers, potential value in the duration of the transaction between enterprises and customers, as well as annual profits customers may provide to enterprises in the future. To determine the comprehensive scores of customers, the rules of hierarchy are adopted to classify the values of each index in grades. If a customer index falls on a certain grade, the customer will get a corresponding level score in this index, making the scores of various indexes additive.

(3) Result hierarchy is the result of air cargo customer segmentation (divide the target customers into several customer groups). To be specific, segmentation results are achieved by clustering and cross analysis of target customers according to their current value and added value. Clustering is to divide data objects into multiple classes or clusters. Objects in the same cluster have a high degree of similarity, while in different clusters differ greatly. Because of the low dimension of air cargo data, the customer data is two dimensions and the data type is numerical type, the K-Means method can be considered for cluster analysis.

(4) Scheme hierarchy is the marketing program after air cargo customer segmentation. Adopting different marketing plans for different customer groups to improve customer value. Generally speaking, if the customer's current value and added value are relatively low, revenue can be increased by reducing customer cost or raising poundage. For customers with low current value and high added value, the company should invest more resources to improve customer service cost and sales cost and promote further development of customer relationship. For customers with low added value and high current value, company should attachés great importance to them and properly increase investment to retain such customers. For customers with high current value and high added value, the company should invest its main resources in maintaining and developing relationships with these customers.
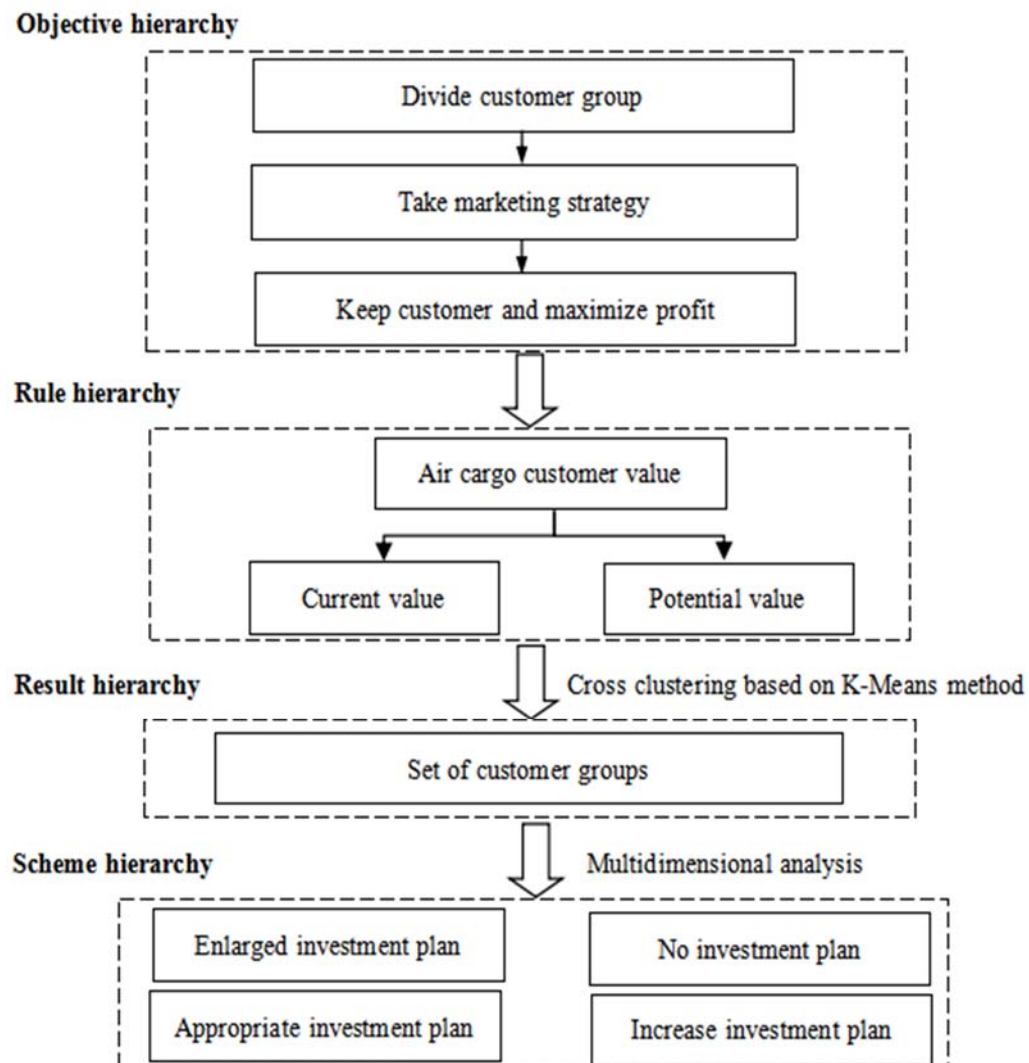
Figure 1. Segmentation framework

3. Intelligent Model Research of Air Cargo Customers Segmentation

The intelligent model of air cargo customers segmentation is mainly built through three dimensions: concept dimension, customers dimension and goods dimension. It analyzies value, risk and marketing strategies of air cargo customers by applying the intelligent models such as association rules, neural network and decision tree to maintain customers and improve profit margin. The implementation process includes three steps: data preparation stage, customers segmentation stage and segmentation results application stage, as shown in figure 2.
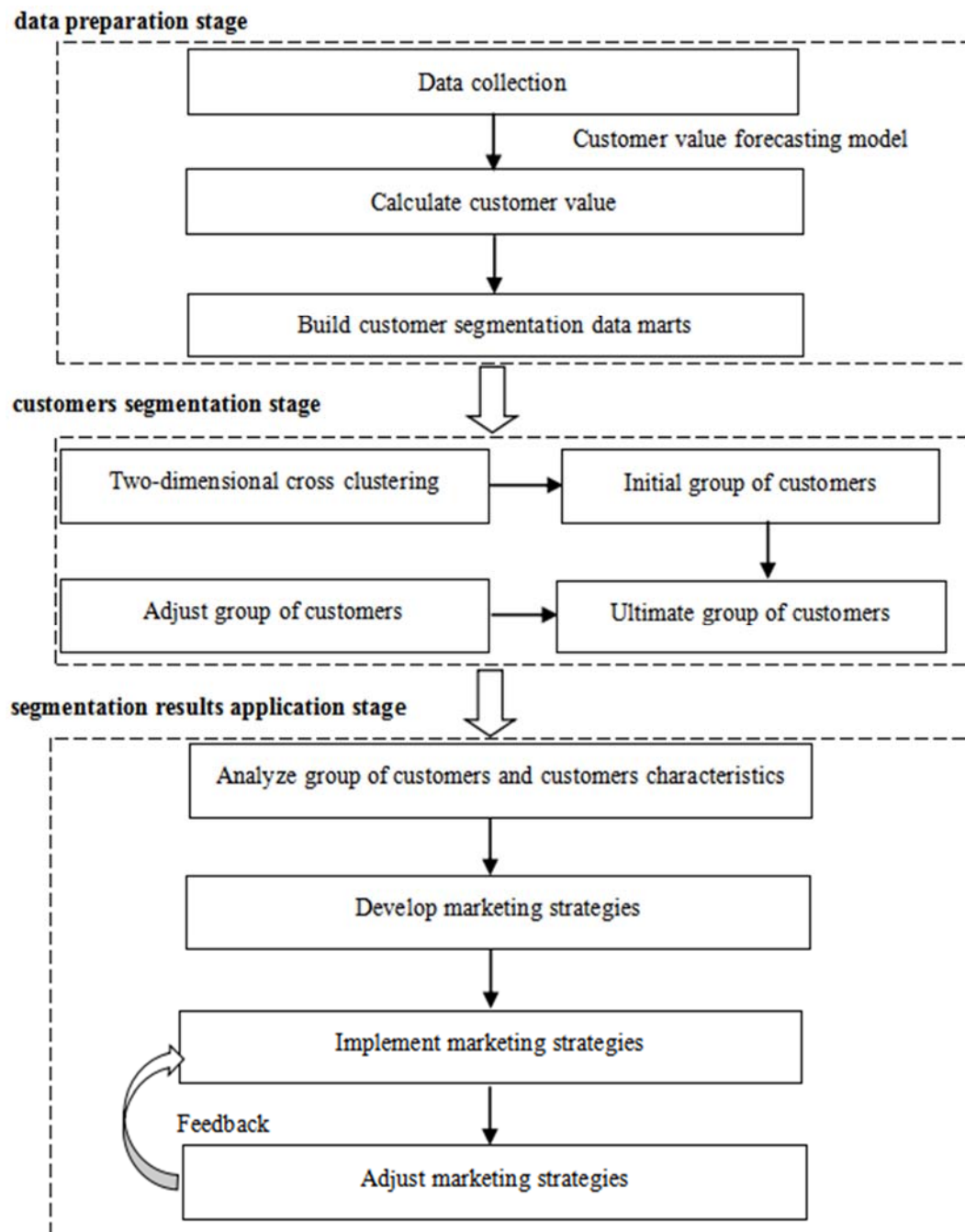
data preparation stage

Data collection

Customer value forecasting model

Calculate customer value

Build customer segmentation data marts

customers segmentation stage

Two-dimensional cross clustering → Initial group of customers

Adjust group of customers → Ultimate group of customers

segmentation results application stage

Analyze group of customers and customers characteristics

Develop marketing strategies

Implement marketing strategies

Feedback

Adjust marketing strategies
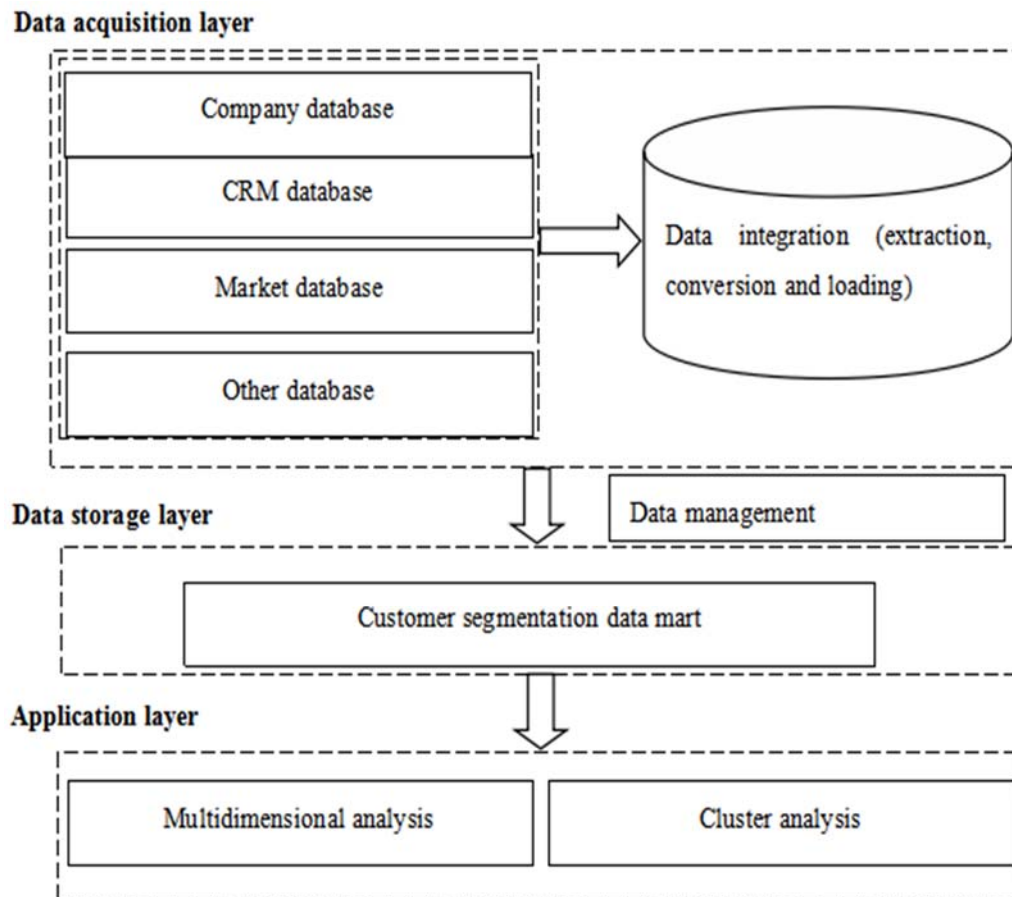
Figure 2. Segmentation framework

Figure 3. Data marts for customer segmentation.

3.1. Data Preparation

3.1.1. Date Collection. Data is the basis of customer segmentation, if the data cannot be collected accurately, the subsequent steps will be meaningless. The cargo data includes number of trades, cargo weight, number of packages and the air freight, as well as the five dimension tables of the schedule, area, sales representative, customers and flight. Customer data include the fact sheets describing customer behavior in eight measures of customer booking space, urgent items, cargo packaging, on-site delivery, door-to-door delivery, air freight, other freight, and service costs, two dimension tables of "customer basic information -- customer development strategy", father-son dimension and "date" dimension. In order to describe the customer service demand and actual contribution to the company's profit, this model also add the following 7 calculation members: total freight, net profit, and the percentage of the customer's five service demands of the customer's transaction times.

3.1.2. Calculate Customer Value according to the Prediction Model of Air Cargo Customer Value. On the basis of basic data collection, enterprises need to calculate the potential value and added value of each customer, and calculate the value of each intermediate level index of the model. After calculation, the values of the intermediate results are obtained, customer potential value and added value are the attributes of the customer, providing the basis for the multi-dimensional analysis of the customer.

3.1.3. Build Customer Segmentation Data Marts. A common view is: due to the huge investment of enterprise data warehouse, long project cycle, lower success rate, and invalid in the short term, it should start from application level and build data warehouse aiming at some applications, namely data mart.

On the one hand, the integration of data can be realized in the short term with less investment to meet the needs of decision support for some applications. On the other hand, it can be further expanded into an enterprise level through reintegration. The data marts architecture is shown in figure 3.

3.2. Customer Segmentation Stage

3.2.1. Two-dimensional Cross Clustering to Generate a Preliminary Customer Base. According to the above description, the air cargo customer segmentation method based on business intelligence adopts k-means clustering method. In this method, the determination of the number of groups K (the final number of customer groups) depends on the granularity of customer segmentation.

After the initial customer base is generated, it is necessary to store the customer base as the customer attribute into the customer segmentation data marts.

3.2.2. Adjust the Customer Base to Generate the Final Customer Base. To make the results more reasonable, the enterprise needs to make adjustments based on the initial customer. After selecting a certain K value for cluster analysis, enterprise should make a judgment on the result and determine the rationality of the customer group classification and the granularity expected. If not, the corresponding K value will be adjusted, and then clustering will be re-conducted. Repeated several times until satisfactory segmentation results are obtained.

3.2.3. Application Stage of Segmentation Results. Based on the customers segment, the company needs to conduct a multi-dimensional analysis of each customer group to understand the characteristics of it. Then, combining the enterprise's resource plan and marketing plan and putting forward corresponding marketing strategies.

4. Application basis of intelligent model of air cargo customer segmentation

The implementation process of the intelligent model of air cargo customer segmentation is an organic system integrating various elements such as technology, management ideas and business processes. In practice, to make this approach work, companies must be prepared in the following ways:

(1) Transformation of management philosophy. There is still a big gap in customer management ideas in companies comparing with foreign countries. Most of the company's management has only stayed at the level of "knowing the name instead of inherence" on CRM and customer segmentation, and few people have making in-depth thinking and practice. In terms of customer management, the common method is to focus on a few big customers insead of small and medium customers. Some advanced companies are gradually moving to more effective practices.

(2) Staffing. In order to truly improve the service level, managers shall select a group of outstanding talents with high business level, rich service experience and willingness to accept new affairs to form a professional customer service team. The customers of the enterprise are gradually being pulled away from the Cargo forwarders, a few "trumps" and other employees, and gathered into the company's dedicated customer service team to get specialized and efficient customer service. This customer service team plays an important role in the implementation of customer segmentation methods. They are responsible for communicating, collecting customer information, and being the executor of personalized marketing strategies of customer segmentation.

(3) Complete information collection mechanism. The first and most critical step of air cargo customer segmentation is collection of data. These data components are complex, including market data, customer basic data, customer behavior data, customer service data, and cargo information. Making data collection effective and complete will play a decisive role in the segmentation. However, companies have not yet formed a good mechanism. Customer basic data, behavioral data, and service data which play a key role are often incomplete. In addition, the existing data is scattered in the branches and departments of the company, and has not reached an effective concentration. This has brought great

difficulties to the development of customer segmentation. Based on this, companies should establish a comprehensive information collection mechanism to promote concentration and sharing of information.

5. Conclusion

The air cargo customer segmentation is effective for airlines to obtain maximum revenue under limited resources. Based on hierarchical thinking, this paper proposes the idea of air cargo customer segmentation framework from objective hierarchy, rule hierarchy, result hierarchy and scheme hierarchy, and analyzes the key points of each hierarchy. Also, it propose to build three dimensions about concept, customer and cargo. Intelligent models such as cargo association rules, neuronal networks and decision trees are used to analyze values, risks and marketing strategy of air cargo customers. The goal of this model is to maintain customers and increase profit margins. The research on implementation process of the air cargo customer segmentation intelligent model is carried out, and in the three stages of the data preparation phase, the customer segmentation phase and the application phase, the segmentation results such as data warehouse and implementation points are studied.

Acknowledgments

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