

# **Product recommendation approaches based on customer lifetime value**

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## **ABSTRACT**

Product recommendation is a business activity that is critical in attracting customers. Accordingly, improving the quality of a recommendation to fulfill customers' needs is important in fiercely competitive environments. Although various recommender systems have been proposed, few have addressed the lifetime value of a customer to a firm. Generally, customer lifetime value is evaluated in terms of RFM (Recency, Frequency, Monetary) variables. However, the relative importance among them varies with the characteristics of the product and industry. Accordingly, this work developed a novel product recommendation methodology, named WRFM-based method that combined group decision-making and data mining techniques. The analytic hierarchy process (AHP) was applied to determine the relative weights of RFM variables in evaluating customer lifetime value or loyalty. Clustering techniques were then employed to group customers according to the weighted RFM value. Finally, an association rule mining approach was implemented to provide product recommendations to each customer group.

Although the WRFM-based method is more effective for loyal customers, it is difficult to generate recommendation rules for less loyal customers. Furthermore, preference-based collaborative filtering (CF) typically makes recommendations based on the similarities of customer preferences. Therefore, this work proposed a hybrid method to overcome the drawback of WRFM-based method by using preference-based CF method to improve the quality of recommendation for less loyal customers. This work also proposed a WRFMCP method that exploits the merits of the WRFM-based method and the preference-based CF method to improve the quality of recommendation.

However the WRFM-based CF method is based on collaborative filtering recommendation and suffers several limitations. This work uses customer demands derived from frequently purchased products in each industry to integrate CF to make recommendations. This work also combines customer demands and past purchasing, named extended-preferences to improve recommendation accuracy. Customer demands are then included as a factor in making recommendations for re-ranking candidate

products. This work ran several experiments to confirm the differences between methods. The experimental results indicate that the quality of recommendation obtained using the combined methods outperforms that of the other methods. Finally, the results of this work can also be extended to recommend product items to customers who may purchase few product items based on extended-preferences.

**Keywords:** Product recommendation, WRFM-based method, customer lifetime value, hybrid recommender system, collaborative filtering, content-based filtering.



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