

ENHANCING RETAIL STORE INCOME WITH CUSTOMIZED DIGITAL COUPONS ISSUED IN REAL TIME

¹ SIDDESH K T, ² KOTRU SWAMY S M, ³ OMKAR M REVANKAR

[1] Assistant Professor Department of MCA, BIET, Davangere

[2] Assistant Professor Department of MCA, BIET, Davangere

[3] Student, Department of MCA, BIET, Davangere

ABSTRACT

With the development of big data and deep learning technology, big data and deep learning technology have also been applied to the marketing field, which was a part of business administration. Customer churn management is one of the most important areas of marketing. In this paper, we proposed a method to prevent customer churn and increase purchase conversion rate by issuing customized discount coupons to customers with high churn rate based on big data in real time. After segmenting customer segments with two-dimensional segment analysis, a real-time churn rate estimation model based on clickstream data was generated for each segment. After that, we issued customized coupons to our customers. Finally, we tested the conversion rate and sales growth. A two-dimensional cluster analysis-based churn rate estimation combined with a recommendation system was found to be significantly more useful than the respective simple models. Using this proposed model, it is possible to increase sales by automatically estimating the customer's churn probability and shopping propensity without the burden of marketing costs in the online shopping mall.

Keywords: *real-time, field, customer.*

1. INTRODUCTION

With the development of big data and deep learning technology, big data and deep learning technology have also been applied to the marketing field, which was a part of management. Also, growth in internet adoption has made digital coupons a popular promotional tool. Customized digital coupon issuance is a very important topic in online commerce. This is because maintaining existing customers is a more important business issue than acquiring new customers. Also, retaining existing customers is much more economically advantageous than acquiring new customers. In fact, the acquisition cost of new customers is known to be five to six times higher than the maintenance cost of existing customers.

Companies that have effectively managed customer churn by improving customer retention are known to have a positive effect not only on the company's profitability but also on improving brand image by improving customer satisfaction. Customized coupon issuance research has traditionally been active in highly competitive and urgent sectors such as telecommunications, finance, distribution, and game industries, and has focused mainly on developing predictive models using machine learning and artificial intelligence technology. Also, recently, AI-based marketing using big data analysis and deep learning is emerging. Such AI-driven targeting can save huge amounts of marketing costs and raise online sales provided that the targeting model succeeds in estimating customer responsiveness accurately. In

particular, in the case of online shopping malls, the average purchase conversion rate is around 2%. Online shopping malls have the advantage of being easily accessed through the PC web or mobile web, but on the contrary, this advantage can be a disadvantage that it is easy to see and leave quickly. Therefore, even the slightest reduction of customer churn rate can lead to high conversions, which can lead to huge profits. Unlike offline shopping malls, online shopping malls are easy to collect data. All online behavioral characteristics of customers can be collected in real time in the shopping mall's own DB. Therefore, it is possible to have a wealth of customer history data and to use it to understand customer tendencies. In conclusion, if you use rich customer historical data to infer behaviors and tastes, you can increase customer conversion rates without special promotions. The easiest and most intuitive way is to issue personalized coupons to customers in real time. By selecting customers with a high risk of real-time churn and issuing real-time customized discount coupons, it is possible to increase sales by increasing the purchase conversion rate without burdening special expenses such as promotional events. And to put these strategies into action, you need an AI-powered strategy. After AI automatically learns the histories of customers, it is possible to properly issue coupons by identifying the behaviors and tastes of individual customers. Among the AI methodologies, in particular, deep learning based strategies can be implemented. Deep learning learns a large amount of data to make an optimal decision, and the more data, the better the result. By learning a large amount of real-time log data accumulated in an online shopping mall, it is possible to predict customer behavior and taste. In particular, it is possible to create a more sophisticated model every day by updating and re-learning the existing model with data that accumulates every day.

2. LITERATURE REVIEW

P. Naval and N. Pandey, "What makes a consumer redeem digital coupons? Behavioral insights from grounded theory approach," 2021.

The growth in internet adoption has made digital coupons a popular promotional tool. However, the extant literature on digital coupons is at an embryonic stage and requires theory building. This study adopts an inductive grounded theory approach to explore the new horizons for digital coupon redemption.[1]

C. Hung and C. F. Tsai, "Market segmentation based on hierarchical selforganizing map for markets of multimedia on demand," 2008.

Customer relationship management (CRM) aims at understanding and measuring the true value of customers. Market segmentation is a general method for successful CRM. This paper focuses on approaches that provide a human manager with a visualized decision making tool for market segmentation. We propose a novel market segmentation approach, namely the hierarchical self-organizing segmentation model (HSOS), for dealing with a real-world data set for market segmentation of multimedia on demand in Taiwan.[2]

G. Nie, "Finding the hidden pattern of credit card holder's churn: A case of China," 2009.

In this paper, we propose a framework of the whole process of churn prediction of credit card holder. In order to make the knowledge extracted from data mining more executable, we take the execution of the model into account during the whole process from variable designing to model understanding. Using the Logistic regression, we build a model based on the data of more than 5000 credit card holders. The tests of model perform very well.[3]

A. D. Athanassopoulos, "Customer satisfaction cues to support market segmentation and explain switching behavior," 2000.

In this paper, customer satisfaction cues in retail banking services in Greece are examined. The study proposes an instrument of customer satisfaction that contains service quality and such other attributes as price, convenience, and innovation. The proposed framework of customer satisfaction was verified empirically yielding four distinct facets for business customers and five for individual customers.[4]

C. Hung and C. F. Tsai, “Market segmentation based on hierarchical selforganizing map for markets of multimedia on demand, , Jan. 2008.

Customer relationship management (CRM) aims at understanding and measuring the true value of customers. Market segmentation is a general method for successful CRM. This paper focuses on approaches that provide a human manager with a visualized decision making tool for market segmentation.[5]

H.-S. Kim and H. Seung-Woo, “A two-dimensional customer loyalty segment-based customer churn prediction methodology,” 2020.

Enterprises have vast amounts of customer behavior data in the era of big data. How to take advantage of these data to evaluate custom forfeit risks effectively is a common issue faced by enterprises. Most of traditional customer churn predicting models ignore customer segmentation and misclassification cost, which reduces the rationality of model.[6]

R. M. Gubela, S. Lessmann, and S. Jaroszewicz, “Response transformation and profit decomposition for revenue uplift modeling,” *Eur. J. Oper. Res.*, vol. 283, no. 2, pp. 647–661, Jun. 2020.

Uplift models support decision-making in marketing campaign planning. Estimating the causal effect of a marketing treatment, an uplift model facilitates targeting communication to responsive customers and efficient allocation of marketing budgets. Research into uplift models focuses on conversion models to

maximize incremental sales. The paper introduces uplift modeling strategies for maximizing incremental revenues.[7]

M.-S. Chang, H. Kim, and Joong, “A customer segmentation scheme base on big data in a bank,” *J. Digit. Contents Soc.*, vol. 19, no. 1, pp. 85–91, 2018.

Consumer segmentation is an electronic marketing practice that involves dividing consumers into groups with similar features to discover their preferences. In the business-to-customer (B2C) retailing industry, marketers explore big data to segment consumers based on various dimensions. However, among these dimensions, the motives of location and time of shopping have received relatively less attention. In this study, we use the recency, frequency, monetary, and tenure (RFMT) method to segment consumers into 10 groups based on their time and geographical features.[8]

System Architecture

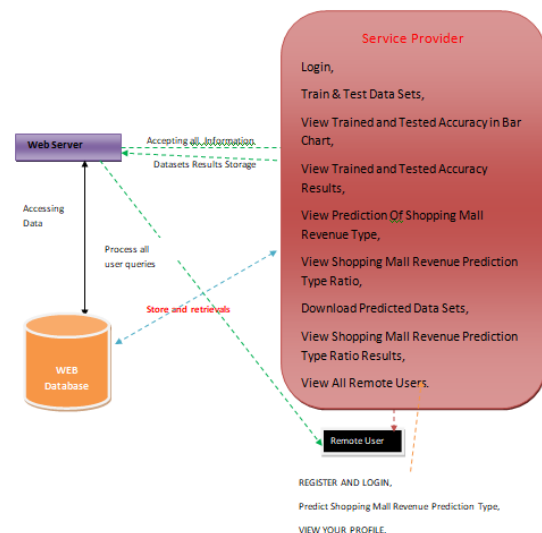


Fig 1. System Architecture

3. METHODOLOGY

3.1 DATA SET USED

3.1.1 Data Collection and Integration:

Gather data from various sources including customer transactions, clickstream data (website or app interaction data), demographic information, past purchase history, etc. Integrate and preprocess the data to ensure it's suitable for analysis.

3.1.2 Segmentation using Two-Dimensional Segment Analysis:

Utilize clustering techniques or other segmentation methods to divide customers into meaningful segments based on two-dimensional analysis, possibly considering metrics like recency of purchase and frequency of interactions.

3.1.3 Real-Time Churn Rate Estimation Model:

Develop a predictive model using machine learning techniques (such as logistic regression, decision trees, or more advanced methods like neural networks) to estimate churn probability for each segment. Incorporate clickstream data in real-time to update churn probability estimates dynamically.

3.1.4 Customized Coupon Issuance:

Based on the churn probability estimated by the model, issue customized discount coupons to customers identified as having a high churn risk. Coupons could be personalized based on individual preferences and historical behavior to maximize effectiveness.

3.1.5 Evaluation and Testing:

Implement A/B testing or control group testing to measure the impact of customized coupons on conversion rates and sales growth. Monitor and analyze results to refine the model and coupon issuance strategy iteratively.

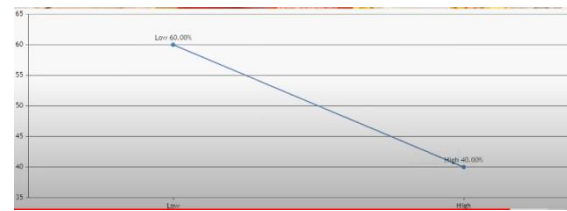


Fig 3 Line Graph

3.2 DATA PRE-PROCESSING

3.2.1 Real-Time Data Processing:

Implement streaming data processing techniques (e.g., Apache Kafka, Spark Streaming) to handle real-time clickstream data and update churn predictions promptly. Utilize scalable cloud platforms (e.g., AWS, Google Cloud) for handling large volumes of data and performing computations in real-time.

3.2.2 Service Provider

In this module, the Service Provider has to login by using valid user name and password. After login successful he can do some operations such as Train & Test Data Sets, View Trained and Tested Accuracy in Bar Chart, View Trained and Tested Accuracy Results, View Prediction Of Shopping Mall Revenue Type, View Shopping Mall Revenue Prediction Type Ratio, Download Predicted Data Sets, View Shopping Mall Revenue Prediction Type Ratio Results, View All Remote User.

3.2.3 View and Authorize Users

In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.

3.2.4 Remote User

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful,

he has to login by using authorized user name and password. Once Login is successful user will do some operations like REGISTER AND LOGIN Predict Shopping Mall Revenue Prediction Type, VIEW YOUR PROFILE.

3.3 ALGORITHM AND TECHNIQUES

3.3.1 Churn Prediction Algorithm:

Utilize supervised learning algorithms (e.g., logistic regression, random forest, support vector machines) to build churn prediction models. Incorporate features such as customer demographics, transaction history, website/app interaction patterns (derived from clickstream data), and coupon redemption history.

Train the model on historical data and continuously update it with real-time data to improve accuracy.

3.3.2 Coupon Customization Algorithm:

Develop algorithms for personalized coupon recommendation based on customer profiles and predicted churn probabilities. Use techniques like collaborative filtering, content-based filtering, or hybrid methods to tailor coupon offerings to individual customer preferences and behaviors. Implement real-time recommendation engines to ensure timely delivery of coupons during customer interactions.

4. RESULT

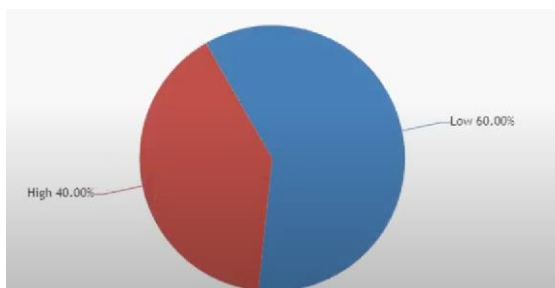


Fig 3 chart

View Shopping Mall Revenue Prediction Type Found Ratio Details	
Shopping Mall Revenue Prediction Type	Ratio
Low	60.0
High	40.0

Fig 4 Ratio

The study implemented a sophisticated approach to mitigate customer churn and boost purchase conversion rates in an online shopping context through advanced big data analytics and deep learning techniques. Initially, customers were segmented using a two-dimensional cluster analysis, integrating factors like demographics and behavioral data. Real-time churn rate models, fueled by clickstream data, were then deployed for each segment to predict churn likelihood promptly. Subsequently, personalized discount coupons were dynamically issued to high-churn-risk customers via a recommendation system aligned with their preferences and historical buying patterns. Evaluation of the approach demonstrated substantial improvements in conversion rates and sales growth. Compared to simpler models, the two-dimensional cluster analysis combined with the recommendation system proved notably effective.

5. CONCLUSION

We identified previous e-commerce marketing approaches to derive user behavior prediction. A deep learning method for real time customer churn prediction showed an appropriate result. We applied our research to online shopping mall to raise conversion rate and sales. To check whether our experiment carry out monetary value, we developed a framework to measure the sales amount when used with segment model and personalized recommended digital coupon. We found that our model (scenario1) shows the best results. We found it is suitable for e-commerce online shopping mall to raise conversion rate and sales. Our study empirically showed that marketing, which was a field of management, could

be solved more efficiently and quickly by applying big data and deep learning technology.

6. REFERENCES

- [1] P. Naval and N. Pandey, "What makes a consumer redeem digital coupons? Behavioral insights from grounded theory approach," *J. Promotion Manage.*, vol. 28, no. 3, pp. 205–238, 2021.
- [2] C. Hung and C. F. Tsai, "Market segmentation based on hierarchical selforganizing map for markets of multimedia on demand," *Expert Syst. With Appl.*, vol. 34, pp. 780–787, Jan. 2008.
- [3] G. Nie, "Finding the hidden pattern of credit card holder's churn: A case of China," in *Proc. Int. Conf. Comput. Sci.* Cham, Switzerland: Springer, 2009, pp. 561–569.
- [4] A. D. Athanassopoulos, "Customer satisfaction cues to support market segmentation and explain switching behavior," *J. Bus. Res.*, vol. 47, no. 3, pp. 191–207, Mar. 2000.
- [5] C. Hung and C. F. Tsai, "Market segmentation based on hierarchical selforganizing map for markets of multimedia on demand," *Expert Syst. With Appl.*, vol. 34, pp. 780–787, Jan. 2008.
- [6] H.-S. Kim and H. Seung-Woo, "A two-dimensional customer loyalty segment-based customer churn prediction methodology," *Intell. Inf. Res.*, vol. 26, no. 4, pp. 111–126, 2020.
- [7] R. M. Gubela, S. Lessmann, and S. Jaroszewicz, "Response transformation and profit decomposition for revenue uplift modeling," *Eur. J. Oper. Res.*, vol. 283, no. 2, pp. 647–661, Jun. 2020.
- [8] M.-S. Chang, H. Kim, and Joong, "A customer segmentation scheme base on big data in a bank," *J. Digit. Contents Soc.*, vol. 19, no. 1, pp. 85–91, 2018.