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CLASSIFICATION TREE ANALYSIS FOR MOBILE NUMBER PORTABILITY- A STUDY WITH RESPECT TO MOBILE CUSTOMERS IN TAMIL NADU

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ABSTRACT

PURPOSE: The purpose of this article is to build a basic classification and regression tree for the mobile number portability. The mobile number portability is a noteworthy feature introduced by Telephone Regulatory Authority of India. The mobile service providers will be benefited from this research by understanding the mobile number portability decision made by the end users.

METHODOLOGY: Predictive research was carried out in this research study. The primary data required for analysis was obtained from questionnaire interview method. A structured questionnaire was developed using established scales. The sample respondents were selected based on snow ball sampling method. A sample of 2481 respondents was obtained and the responses were divided in to test and train data set and the classification and regression tree analysis was carried out in R.

FINDINGS: The results of Classification and Regression Tree suggested clear boundaries to classify the Mobile Number portability decision of the sample respondents. The results of the classification tree from the train data was then analysed in test data, which showed a greater accuracy level of 96.3 percentages. The random forest procedure was also carried out and the results revealed that switching barrier is the most important variable in predicting the mobile number portability of the end users.

Practical Implication: The results of the study have a direct impact on the business community, policy makers as well as the society. The policy makers can have an eye on the mobile service providers to restrict the monopolization in the industry. If the mobile service providers are imposing greater threshold as switching barrier, the mobile number portability cannot be used by the common people. On the other hand the mobile service providers can make use of this CART (Classification and Regression Tree model) to understand the retention behavior of the customers.

KEYWORDS: CART, Retention Behavior, Mobile Number Portability.

INTRODUCTION

Mobile Number Portability was introduced in India in the year 2011, but before that itself the rest of the world has seen mobile number portability. The mobile number portability was initially introduced in Singapore during the year 1997 followed by other countries like England, Hong Kong etc., The main aim for introducing mobile number portability is to empower the end user and to improve healthy competition in the telecommunication industry.

The tradeoff between retention behavior and the switching intention has to be understood by the mobile service providers. Previous research has suggested that it costs more to acquire a new customer than to retain one. Hence in order to sustain in the business the mobile service providers has to understand what are the factors influencing the switching intentions of the customers. If the mobile service providers can predict the retention behavior and switching intentions of the customers they can easily manage their customers leading to a better relationship bond between customers and the service providers which again produce a ripple effect of better business performance and profitability.

Retention of the customers is not just holding them for a longer duration of time but to get business from the customers, but to get sustainable business from them. The ARPU is one of the measures in mobile service providing industry, which can be expanded as Average Revenue per User. The average revenue per user has to increase for the mobile service providers' year on year to ripe the benefits. But if the customers started switching from one mobile service provider to another, the revenue generated from each customer will get reduced leading to a reduction in Average Revenue per User (ARPU).

The entry of Reliance Jio has affected the mobile telecommunication industry to a noteworthy level. The major players in the industry are framing rules based on the strategies introduced by Reliance Jio. This game theory has reduced the call rates of the mobile service providers to a greater extant. The mobile data consumption of an Indian individual is increasing year on year whereas the cost per megabytes (MB) of data is reducing as time advances. All these factors has led to or rather force the mobile service providers to retain their customers and take their business in a profitable path. This research article provides an in-depth analysis on Mobile Number portability and the factors influencing mobile number portability which helps the stake holders to better understand their customers and help retaining them.

LITERATURE REVIEW

Bloomer *et al.,* (1998) in the article titled "On the relationship between perceived service quality, service loyalty and switching cost" have highlighted the relationship between the three varied dimensions namely service quality, service loyalty and switching cost. The authors has a strong

intention that the service quality and service loyalty has a direct positive relationship with each other and the switching cost and service loyalty has a significant positive impact on one another. The service quality and the switching intentions have no association with each other and can be considered as the predictor variables for the dependent variable service loyalty.

Jones *et al*., (2002) in the research article titled "Switching Barriers and Repurchase intentions in services" has identified the relationship between the repurchase intentions of the customers and the switching barriers imposed by the organizations. The authors proposed a model that depticts the direct positive relationship between switching barriers and the repurchase intentions of the customers. The authors finally concluded that there is a direct positive relationship between switching barriers and the repurchase intentions of the customers, which means that higher the switching barrier, greater the repurchase intention of the customers.

Anton et al., (2007) in the article titled "Analyzing firms failures as determinants of consumer switching intentions" has highlighted the reasons for customer switching behavior and related it to the perceived reputation of the firm. The authors finally concluded that there is a significant positive relationship between the perceived reputation of the firm and the switching intentions of the customers. The research study has made a significant contribution to understand the switching behavior and the retention behavior of the customers. The authors also found that continuing dissatisfaction with the firm has a direct negative effect on the perceived reputation on the firm and the effect is as influential as change in pricing policy of the firm.

Amin *et al.,*(2012) in the article titled "Factors contributing to customer loyalty towards telecommunication service provider" studied the importance of factors contributing to customer loyalty in telecommunication industry. The data required for the study was collected from 185 telecommunication users. The research tool used in the study was self-administered questionnaire. The authors found that the perceived service quality of the sample respondents was highly influential in customer loyalty and it was negatively related to the switching intentions of the customers. The authors also identified other important factors that determine customer loyalty, namely trust, switching cost and corporate image.

RESEARCH METHODOLOGY

Predictive analysis was carried out in this research. The sample respondents were selected based on snowball sampling method. A sample of 2481 respondents was used for the research study. Telephonic interview method was adopted to get the responses from the samples and was recorded in a separate data sheet. The collected data was then entered in a spread sheet and saved as comma separated value file. The comma separated value (csv) file was then retrieved

with the help of R 3.4.3 statistical data analysis tool pack to create predictive model of classification and regression tree.

The primary data set was then divided into training and test data. The division of training and test data was made using CaTools package in R 3.4.3 and the data was divided using the command sample. Split. A sample spilt ratio of 0.7 was adopted, which makes sure that 70 percent of the data is retained in the training data set and the remaining 30 percentage is maintained in the test data set. The split was made in a completely random manner and there is no bias in the formulation and evaluation of the model. The classification and regression tree was built using the train data and the results of the classification tree were then tested with the help of test data.

To analyze the relative importance of the variables in the model, random forest method was adopted. Just like classification and regression tree, the random forest procedure will built several such trees with random split and the number of trees to be built was controlled to be hundred. Which means the random forest will build hundred such classification trees and the relative importance of the variable affecting mobile number portability was analyzed.

To construct questionnaire for the research study established scale from previous literature was used. The literature review suggested that the major determinants of mobile number portability are service quality, perceived usefulness and perceived ease of use, switching barriers, awareness about mobile number portability and reputation of the mobile service provider. The variables are rated with the help of established scales in Likert's 5 point scale.

DATA ANALYSIS AND INTERPRETATION

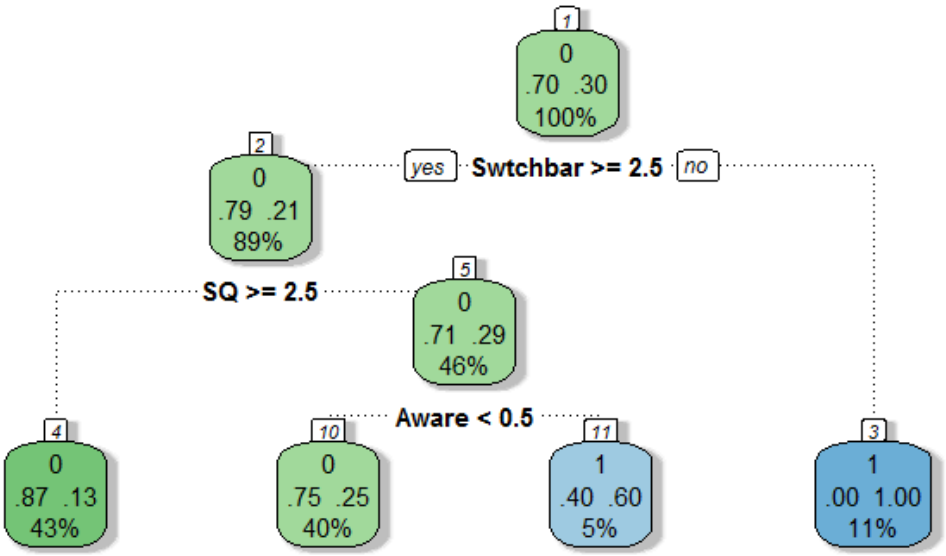
The data analysis was conducted in several steps. Initially the data collected from the sample respondents was divided in to train and test data. To do the splitting of data, a package named caTools was used. To maintain the robustness in the model and to have a consistent output, seventy percent of the collected sample was retained in the train data and the remaining thirty percent was retained in the test data. Upon splitting the original data set of 2481 samples, 1655 observations are retained in the training dataset and the remaining 826 observations are allocated to the test data set. The splitting of the data set was completely made on a random manner.

The train and test data was then subjected to the ratio testing. A check of whether there is consistency in maintaining similar count of 0's and 1's in the train and test data set, when compared to the original dataset. The sample respondents who have opted for the mobile number portability was coded as 1's and the sample respondents who have not opted for mobile number portability are codes as 0's. The number of sample respondents who have opted for mobile number portability was found to be 693 in the original data set and the number of sample

respondents who have not opted for mobile number portability was found to be 1788 leading to 27.9 percent of the sample respondents who have opted for mobile number portability. After splitting the dataset, the ratio was tested in train and test dataset. The ratio of sample respondents in the train and test dataset was found to be 27.6 and 28.4 percent respectively. Hence it can be confirmed that consistency is maintained in the dataset even after splitting.

After splitting the dataset, the train data was subjected to analysis. A nonlinear classification of the dataset was conducted using classification and regression tree. The results of the nonlinear classification were depicted in Figure 1. The figure suggests that the first and foremost variable that determines the mobile number portability is the switching barrier. The tree model suggest that if the switching barrier is greater than 2.5 in an average Likert's scale of 5, there is seventy percent chance of retaining the customers, rather if there is a switching barrier of less than 2.5 in an average Likert's scale of 5 there is high chance of the customer to use the option of mobile number portability and switch the mobile service provider. The second important variable in the usage of mobile number portability was found to be service quality. If the service quality of the mobile service provider as perceived by the customers is greater than 2.5 in an average Likert 5 point scale then there is a chance of retaining 71 percent of the customers.

Figure 1: Figure Showing classification and Regression Tree Model of Mobile Number Portability



The third most important variable in choosing mobile number portability was found to be awareness about mobile number portability. If the awareness about the mobile number portability was greater than 0.5 in an average Likert's 5 point scale, there is 29 percent of chance to use mobile number portability option by the customer.

Thus the three variables switching barrier, service quality and awareness play a vital role in determining the choice criteria of using mobile number portability option in case of mobile service providers industry. The accuracy of the model was then subjected for validation using the test dataset. The classification tree model was tested for each and every sample in the test data set and the prediction results was shown in the below table.

Table 1: Table showing Classification table for Test Data

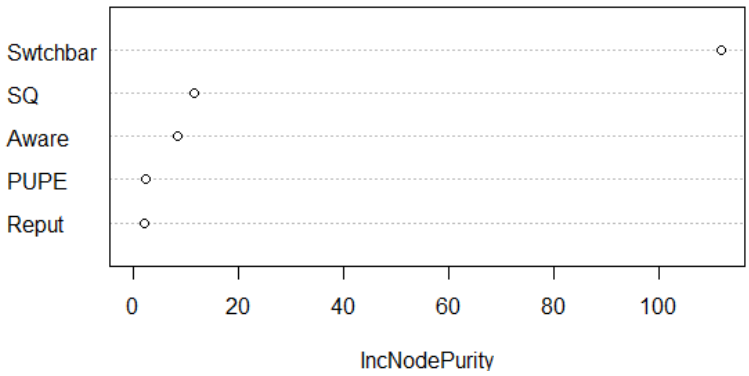
Observed		**Predicted**		
		MNP		Percentage Correct
		0	1	
MNP	0	1788	0	100
	1	70	623	89.9
Overall Percentage				97.2

The classification table was divided into observed and predicted mobile number portability. The sample respondents who used mobile number portability were coded as 1's and the sample respondents who did not use mobile number portability was coded as 0's. The overall accuracy of the model was found to be 97.2 percent and the prediction accuracy for the mobile number portability was found to be 89.9 percent. Which means that the model can precisely predict the end users who are opting for mobile number portability 89.9 percent of times? The error term can be further reduced by introducing some more variables in the model.

DISCUSSION

The linear modelling of Logit regression has started losing its momentum slowly. There are several business problems in the real business world that requires more than linear models to get accurate solutions. Classification and Regression Tree (CART) is one among the nonlinear classification. The challenges about mobile number portability can be resolved using classification and regression tree problems. Predicting the behavior of the end user is a tedious task and if a predictive model can operate with 89.9 percent accuracy level then it can be tested in several situations and geographic locations. To test the consistency of the model a Random Forest Test was conducted. The results of variable importance plot was shown in the below figure which shows that the switching barrier has a node purity level of more than 100 followed by service quality and awareness.

Figure 2: Figure Showing Variable Importance Plot of Random Forest



LIMITATIONS AND SCOPE FOR FURTHER RESEARCH

The research study was carried out in Tamil Nadu and hence the results cannot be generalized to other parts of the country. The research is having geographical limitations. In future similar research study can be carried out in other parts of the country and the results can be compared and contrasted to get new insights.

The research tool used in the study was classification and regression tree and hence the results of the study have the limitations of the statistical tool used. The research is carried out in telecommunication industry and with mobile service providers and hence the results cannot be generalized to other industries.

CONCLUSION

The results of the study have a direct impact on the business community, policy makers as well as the society. The policy makers can have an eye on the mobile service providers to restrict the monopolization in the industry. If the mobile service providers are imposing greater threshold as switching barrier, the mobile number portability cannot be used by the common people. On the other hand the mobile service providers can make use of this CART (Classification and Regression Tree model) to understand the retention behavior of the customers.

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