PROFILING CUSTOMERS OF MOBILE TELECOMMUNICATION SERVICES

Indranil Bose & Chen Xi
School of Business, The University of Hong Kong
bose, chenxi@business.hku.hk

ABSTRACT

Mobile phones have entered the daily lives of people around the globe. Various mobile data services are provided to customers these days and they are becoming more and more popular. In Hong Kong the penetration rate of mobile phones is more than 100% which means on an average people own more than one mobile phone. On the other hand there are six mobile telecommunication operators in Hong Kong. So the competition to acquire and retain customers among mobile service providers is fierce. The key to survival in this competitive industry lies in knowing the customers better. Different people have different preferences in using mobile telecommunication services and mobile phones. According to IDC group’s study of usage patterns of mobile data services across the Asia Pacific region, SMS is the most popular mobile service used [1]. About 65% of customers send SMS everyday. Only 35% of customers do not use SMS that frequently. Treating all customers without differentiation may lead to the situation that some customers have to choose services they do not want and this may lead to loss of customers. One of the approaches used to understand customers is customer clustering. Clustering classifies customers into different groups in order to see similarities and dissimilarities between customers. Mobile service providers can develop different mobile services for different clusters in order to match the services to the customers’ preferences. In mobile marketing, the usage information of mobile telecommunication services is the best data that can be used to reflect customers’ behaviors and preferences. However, relatively little attention has been paid in academic research on applying clustering techniques using mobile telecommunication usage data for customer profiling. In this research, we perform customer clustering using mobile telecommunication usage data to identify interesting facts about customers which may be of use to mobile marketers. Data mining techniques are employed in this research and the data mining process model of CRoss Industry Standard Process, CRISP-DM in short, is followed [2]. This process model describes a standard data mining project lifecycle [3] [4]. The CRISP-DM process has 6 phases: business understanding, data understanding, data preparation, modeling, evaluation, and deployment. Unsupervised clustering techniques are used because we are exploring the data set and do not have any target. We use K-means clustering and Kohonen Vector Quantization networks (KVQ). Kohonen Vector Quantization networks are an unsupervised clustering technique closely related to K-means cluster analysis and Self-Organizing Maps (SOM) [5]. K-means begins clustering by selecting K (specified number of clusters) seeds (centers of clusters) according to the distribution of the data set. And these seeds selected by K-means tend to be approximately uniformly distributed. In other words K-means assumes a uniform distribution of the data set. In contrast, KVQ selects code book vectors, randomly and the distribution probability density function is approximated by a set of optimally placed discrete parameter vectors. Code book vectors which are closest to each cluster are found and moved closer to the clusters by a certain portion. The portion is specified by the learning ratio. KVQ and SOM have similar learning algorithms but SOM considers both distances in input space and distances in the map while KVQ only considers the former. We collected mobile telecommunication data from a major local mobile telecommunication operator. The data set contains information on customers’ demographics, handset features, usage records of mobile services, registered services, and amount of revenue contributed by customers. There are about 52000 records and each record is characterized by 200 attributes. We divide the attributes into four groups: usage attributes, revenue attributes, service attributes, and handset attributes. By clustering customers based on these four groups of attributes we create four profiles of customers: usage profile, revenue profile, service profile, and handset profile. The analysis of the clustering results contains two steps. First the results obtained using the two clustering techniques are compared. The criteria used for comparison are cluster numbers, average distances, average CV indexes (ratio of standard deviation and mean of distances). Distance in the context of clustering refers to Euclidean distances between data points and the seeds of clusters. Lower average distance or lower CV index means higher cluster concentration and hence higher cluster quality. The second step involves examination of the clustering results obtained by KVQ to discover relationships between different profiles of customers. Several interesting facts about customers are discovered that may be of help to mobile marketers for carrying out targeted marketing campaigns. Our results show that KVQ approach is able to identify clusters with lower average distances than K-means approach. On the other hand clusters identified by the K-means approach have lower CV indexes. We chose to further analyze the
results of KVQ because the clusters it identified had smaller average distances while the CV indexes of them are acceptable compared to K-means. We identified six groups using usage data. Each of these groups showed a different usage pattern. Some customers tended to use more mobile IDD calls. Some tended to use more SMS. Others tended to use more of other services. For marketers this might indicate that there are opportunities to recommend services to customers according to the profile of customers. For researchers it might be interesting to compare these customers to find out the reason for the discrepancy in usage patterns for a certain type of mobile telecommunication service. The four profiles of customers are not closely related. By comparing service profile and revenue profile we found that most people register available services but do not use them often because most services charge customers money only when they use them. This might indicate that either the customers think the usefulness of the mobile services provided to them is low or they have not realized the usefulness of these services. Thus, researchers and marketers of mobile telecommunications could think of studying the customers’ preferences and develop more personalized mobile communication services for them. By comparing usage profile and revenue profile we found that customers’ usage of mobile communication services and revenues they generated are unbalanced. Some customers who had low usage of services contributed higher revenues. This might be good for the operators at present but might be dangerous in future. When these customers would realize the imbalance between the money they paid and the service they used, they might either switch to plans with lower revenue or even switch to other companies. Marketers should take suitable actions to either provide these customers more valuable services or advise them to use more suitable plans with lower fees. For researchers this result implies that when studying customer churn type problems the factors related to unbalance between usage and revenue should be taken into careful consideration. We also noticed that customers that had high usage contributed less money and this indicated the customers’ potential to generate more profit. Packages with higher level of services might be promoted to these customers. Finally we compared handset profile and revenue profile and found that if researchers wanted to include the factor of handset in models studying customers’ mobile telecommunication behavior patterns it might not be necessary to develop many levels of value for that factor.

REFERENCES

A pioneer in wireless communications, Mobile Telecommunications Technologies Corp. offers paging and messaging services to U.S. and international customers. Known to pager customers in the United States through its SkyTel subsidiary, Mobile Telecommunications (MTel) served customers in more than 19 countries during the mid-1990s through its SkyTel system, which transmitted messages to more than one million pagers in North America, Latin America, and the Pacific Rim. See the company profile for Mobile TeleSystems PJSC (MBT) including business summary, industry/sector information, number of employees, business summary, corporate governance, key executives and their compensation. Mobile TeleSystems Public Joint Stock Company provides telecommunication services primarily in Russia. It offers voice and data transmission, internet access, broadband, pay TV, and various value added services through wireless and fixed lines; financial services; and integration services, as well as sells equipment, accessories, and software. Telecom Customer Service App. According to a, companies with a larger array of digital offerings have higher customer satisfaction scores. Besides, such companies also manage to reduce the cost-to-serve for each customer by 20%-40%. T-Mobile NL followed a similar approach and launched a self-service portal that promotes peer-to-peer customer support. Within this growing community of 400,000 members, get answered by other customers. With the help of predictive analytics tools, telecommunication companies can transform the vast array of structured and unstructured voice of customer data into enriched customer profiles featuring: General Customer Information: customer ID, MSISDN, demographic, services used, spending pattern, usage plan, etc. Telecommunications services provide a vital thread that keeps communities connected, enabling the near-instantaneous transmission of signals and messages. It is so effortless to pick up a phone at any time and start a video conference with partners on opposite sides of the planet, that it easy to forget the scale of operations that make such a feat possible. Operating and maintaining telecommunications infrastructure and services is a mammoth task, that requires significant expenditure. In the mobile industry alone, capital expenditure (CAPEX) is expected to reach 160 billion U.S. dollars in 2