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Managing Mobile Market Users Based on the AARRR Model in the Age of Big Data

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Abstract
In this paper, our research is based on the theory of Customer Relationship Management and the data-management framework which are used by one of the Telecom Operator in China in the age of Big Data. By collecting the user behavior data of the Mobile Market and utilizing the AARRR model to do the data mining, we come to some conclusions about the characters of the lost user, the suggestions of the product improvement, how to improve the download-pay conversions, and so on. The result shows that it possesses instructional significance and referenced value for the mobile internet application operations management.

Key words: Customer relationship management; User lifecycle; AARRR model; Data mining; Mobile internet application

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INTRODUCTION

With the computer science and technology and the rapid development of Internet, information is also a way to rapid transmission of explosive. The information explosion has two meanings. One is explosive growth of data; the other is the explosion of the data value. The data contain great knowledge and value, the increasing amount of data that makes the information increasingly rich and valuable.

The advent of the era of big data and Mobile Internet has brought the infinite opportunity to telecom operators. Telecom operators offer all channels for data transfer and exchange, which is the congenital advantage of the telecom operators and they would be the most potential competitors in the era of big data. The telecom operators have the largest data resources of the users, including the user identity data, telecom communication data, and the behavior data of searching the internet and so on. These resources will become the most important competitive factors of the telecom operators. The telecom operators should use the digital management to conduct service innovation so that they can meet the change and the opportunities of the era of big data.

Mobile application stores as the "habitat" of the mobile internet applications and itself is an application also. It is the windows for the developers to promote their mobile internet applications. In order to take advantage of the users scale, The Telecom Operator launched the Mobile Market application store (hereafter referred to as MM). The user can download the mobile application from the MM in their mobile phone, the developers can management their application through the developer community and the telecom operator can categorize and sell the applications through shelf management and the analysis of user personalized information. MM as The Telecom Operator Value-Added Service Platform, it carries out build the industrial chain of the mobile phone software of responsibility, so the user management of MM is crucial important for The Telecom Operator in the competition between The Telecom Operator and the OTT (Over the top) application server provider.

According to customer management, conducting comprehensive, effective and fine management around the customer life cycle and utilizing different management

strategies to manage the customer in different life cycle phases is essential to the customer relationship management (CRM) of MM. The concept of customer life cycle was first put forward by Ives and Learmonth (1984), they proposed that introduced the time variables into the customer relationship research (Ives & Learmonth, 1984). In the research of customer life-cycle management, buyer-seller relationship in marketing channels introduced by Dwyer had important significance, and the customer life cycle was divided into five general phases: awareness, exploration, expansion, commitment, dissolution (Dwyer & Schurr, 1987). To evaluate the customer life cycle management in the companies, the research in this field was mainly aim at calculating the value of customer life cycle as the indicator and utilizing different marketing strategies in different life cycle phases without specific operation model to conduct the customer management. Social network plays an important role in the Internet age and "go viral" which is utilizing the existing customer to spread the information about the potential new customer becomes a new way of customer acquisition. So we need an operation model which conforms to the mobile internet age to conduct the mobile internet applications operations.

In our research, we introduce the data- analysis platform which is developed by The Telecom Operator in the age of big data, and we utilize the AARRR model which depends on the feature of MM to evaluate the customer management of MM.

1. ADDING THE CUSTOMER RELATIONSHIP MANAGEMENT LENS

CRM refers to a customer-focused business strategy. The concept of CRM is not new and it opens the mind and became an attitude to customers and to the company itself. To create and add value for the company and its customers, CRM dynamically integrates three elements: sales, marketing and the customer care service (Ricardo, 2006).

The definitions of CRM are various in the literature. CRM was defined as "a set of business processes and overall policies designed to capture, retain and provide service to customers." by Scott (Scott, 2001). "A coherent and complete set of processes and technologies for managing relationships with current and potential customers and associates of the company, using the marketing, sales and service departments, regardless of the channel of communication" was the definition of CRM defined by Injazz and Karen (Injazz & Karen, 2004). Generally, CRM is defined as the "management of mutually beneficial relationship(s) from the seller's perspective" (LaPlaca, 2004, p.463). However, the definition of CRM requires a more specific definition. Current definitions of CRM can be classified into one of two categories: strategic or operational, and the strategic definitions and operational definitions maybe closely related (Keith & Eli, 2008). The operational definitions of CRM are more closely related to the processes and technologies associated with enabling better customer relationships, for example, the operational explanation of CRM, "CRM allows companies to gather customer data swiftly, identify the most valuable customers over time, and increase customer loyalty by providing customized products and services" (Rigby et al., 2002, p.101). The technologies and processes associated with CRM in the operational definition also implies one of the most popular trends that CRM is a series of information technology (IT) products oriented towards automating some business processes such as marketing, sales or services (Kirby, 2001). However, CRM should be viewed more than implementation of IT (Light, 2001). As IT is one of the important roles in CRM, the role of IT tools in CRM impacts the different customer stages: initiation, maintenance, and termination (Reinartz, Krafft, & Hoyer, 2004). Moreover, a well-organized IT infrastructure and architecture can facilitate different customer processes, such as segmentation of customers based on their value or prediction of customer behaviours (Clark & Smith, 2003; Gummesson, 2002; Ryals & Knox, 2001). The objectives of CRM include acquiring new customers, enhancing the profitability of existing customers and retaining profitable customers (Tsai, Hu, & Lu, 2015). Customer retention is a strategic imperative for most firms (Anderson & Mittal, 2000). Firms want to understand how to retain customers (Bolton, Lemon, & Bramlett, 2006; Gounaris, 2005), and through better customer relationship and customer experience they can minimise the risk of customer loss (Granovetter, 1973; Haleblian, Devers, McNamara, Carpenter, & Davison, 2009; Heinonen et al., 2010). For the experience-based organizations, if they can identify who the most valuable customer will be, where they live, how they purchase, and other kinds of data, there will be a tremendous amount of readily available data and marketing models (Harvard Business Review, 2015). Life-cycle service offerings are based on long-term relationships and focused on understanding the activities that customers perform when using and/or operating a product (Cornet et al., 2000; Davies, 2004; Galbraith, 2002; Johnstone, Dainty, & Wilkinson, 2009; Prahalad & Ramaswamy, 2000; Windahl et al., 2004; Wise & Baumgartner, 1999). For mobile internet applications, their customer processes are digital processes, and automation is one of the key capabilities. Automation involves the digitization and streamlining of steps in the journey that were formerly done manually (Edelman & Singer, 2015). Proactive personalization in the mobile internet application is building on the automation capability which means companies should take information gleaned either from past interactions with a customer or from existing resources and use it to instantaneously customize the

customer's experience (Edelman & Singer, 2015). The branded mobile phone applications (branded apps) will be widely used in the coming years (Zhao & Christine, 2015). The branded apps are marketing devices because their high level of user engagement (Calder, Malthouse, & Schaedel, 2009). There are five dimensions of branded apps: tool-, game-, social-, m-commerce-, or design-centric (Zhao & Christine, 2015). For tool-centric apps, the main goals are to identify the motivations and requirements of customers in using/buying products and to develop service to assist customers in these processes (Zhao & Christine, 2015). Customer life-cycle service is important for the CRM of mobile internet applications, and CRM requires operation model to customize the customer's experience and retaining profitable customers.

2. THE AARRR OPERATION MODEL BASED ON THE FEATURES OF MM

AARRR model which is widely used to build the customer-management evaluation system, was first introduced by Dave McClure in the *Start Up Metrics for Pirates* and it is a management framework of customer life-cycle and operations objectives. In figure 1, Acquisition, Activation, Retention, Revenue and Refer are the elements of AARRR model and each of them means the five most important stages of mobile internet applications (McClure, 2007). The Telecom Operator modified the AARRR operation model based on the features of MM.

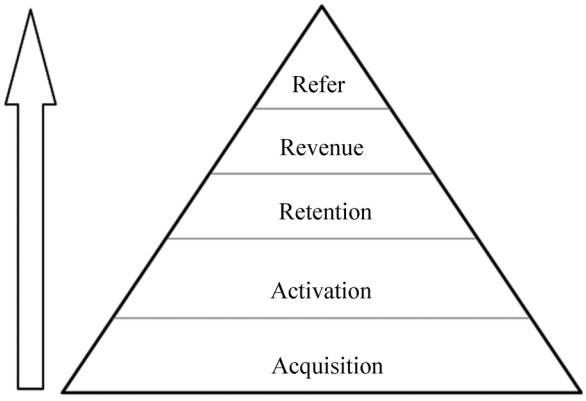

Figure 1
The AARRR Model

The first A in AARRR represents Acquisition, which means the objective of customer management at this stage is acquiring new customers. In this stage, the telecom operator needs to focus on the increasement of new customers and evaluate the performance of different distribution channels.

The second A in AARRR represents Activation, which means the objective of customer management at this stage is increasing the level of activity. In this stage, the telecom operator not only needs to focus on the current activity level of customers but also their sustained activity in given time.

The first R in AARRR represents Retention, which means the objective of customer management at this stage is increasing the rate of customer retention. Generally, the cost of retaining an existed customer is far less than acquiring a new customer.

The second R in AARRR represents Revenue, which means the objective of customer management at this stage is obtaining income. In this stage, "income" is generalized to "output" in The Telecom Operator. The Telecom Operator not only focuses on the direct revenue but also pay attention to the indirect revenue, such as downloads and customers' data traffic.

The third R in AARRR represents Refer, which means the objective of customer management at this stage is virus transmission. Thanks to the social network, virus transmission becomes the new method of acquiring new customers. Low cost and spread effectively are two advantages of this method. K index is the indicator of virus transmission performance, which means the spread of conversion (people of spreading successful divide total spread times).

The company can discover the problems in every stage of customer management performance in time through this AARRR operation model and identify unmet needs.

3. EMPIRICAL ANALYSIS

3.1 Data Acquisition and Data Processing

As shown in Figure 2, in order to meet with the era of big data, The Telecom Operator has established the digitized management system, set up the basic data platform.

The company can collect the customer information in time through the basic data platform, and the company also set up the data-label database, which as shown in Figure 3.

The data-label database consists of two parts: The data attribute unique to telecom operator and the common data labels of Internet firms. The common data labels of Internet firms includes social attribute, consumption attribute, socialization and the attribute of product using, which are the common labels in Internet firms. The social attribute contains the sex of customer, the age of customer, the education of customer, the career of customer and so on. The consumption attribute contains the shopping trips, the sum of money, the shopping channels and so on. Socialization contains the degree of social, the main social circle, channel preference, the frequency of social activities and so on. The attribute of product using contains product types, the usage scenario, the function

usage and the stickiness of product usage and so on. These five common data labels can depict the customers in real life situations, their preferences and their use of internet products.

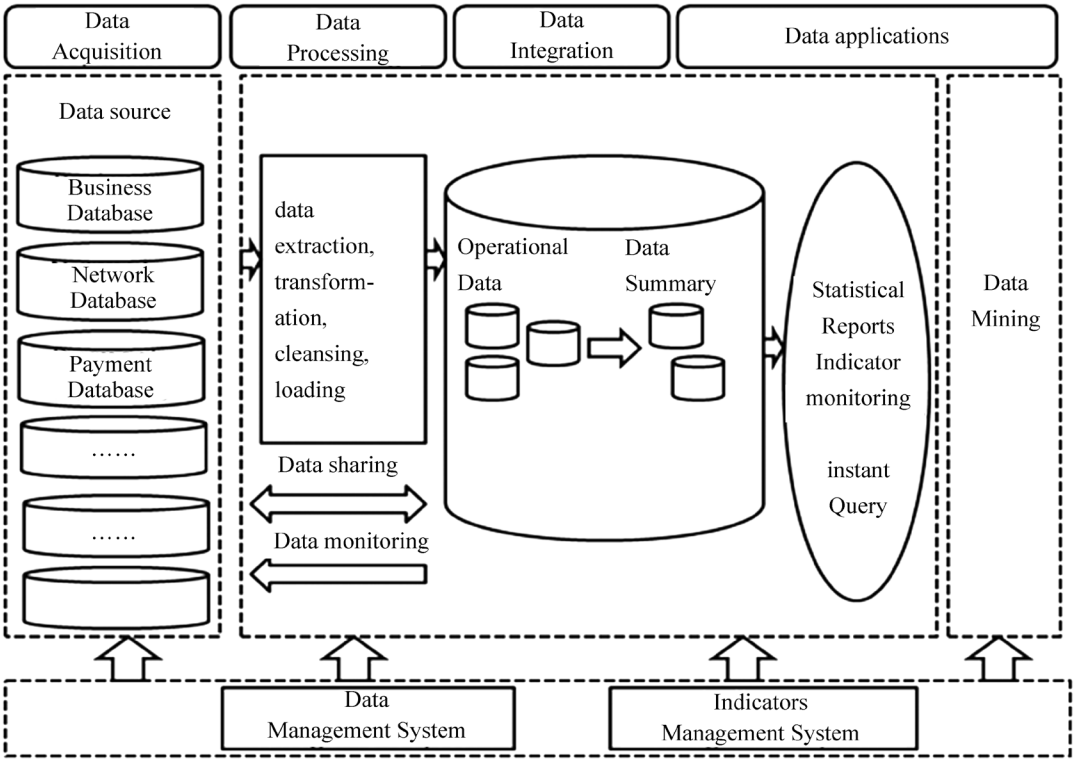

Figure 2
Basic Data Platform

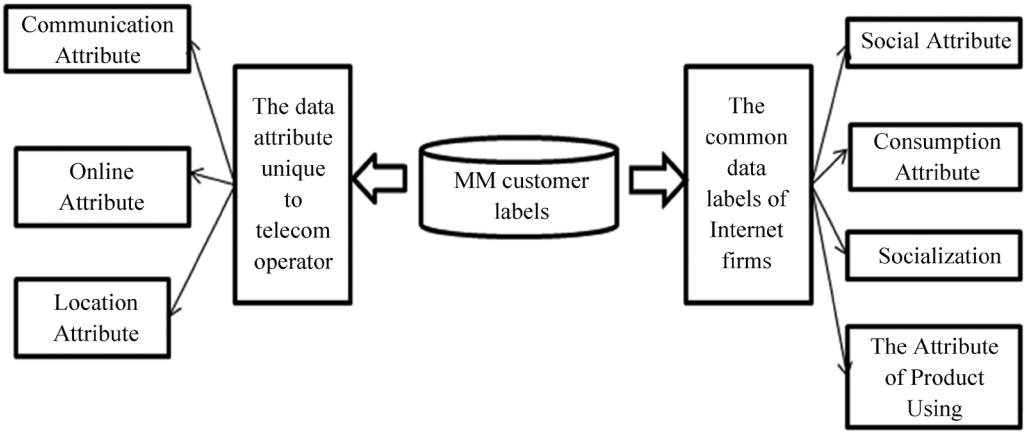

Figure 3
The Data-Label Database

3.2 Model Analysis and Evaluation

3.2.1 The Analysis of Acquisition

The marketers chose five million customers to conduct the SMS marketing in a marketing activity, and the goal of this marketing activity is acquiring ten thousand new customers. However, the effect of the marketing is not as expected and there are only five thousand new customers. In order to solve this problem, the marketer utilized persona to conduct the potential customer analysis to rediscover the target customers. Persona means depict the features of the customer through the mathematical language when the customer volume is enough.

In our research, we chose the active customer of MM to conduct the persona and find out the features of target

customer. As shown in Figure 4, with traffic flow and traffic charge, for example, comparing them with the total customers PV (PV: Page View), we find that the customer whose traffic flow is over 30M or traffic charge is more than 10 yuan will be more active than other customers. So we can make a conclusion that the customer with the feature we mentioned above will be more likely to become the active customer of MM.

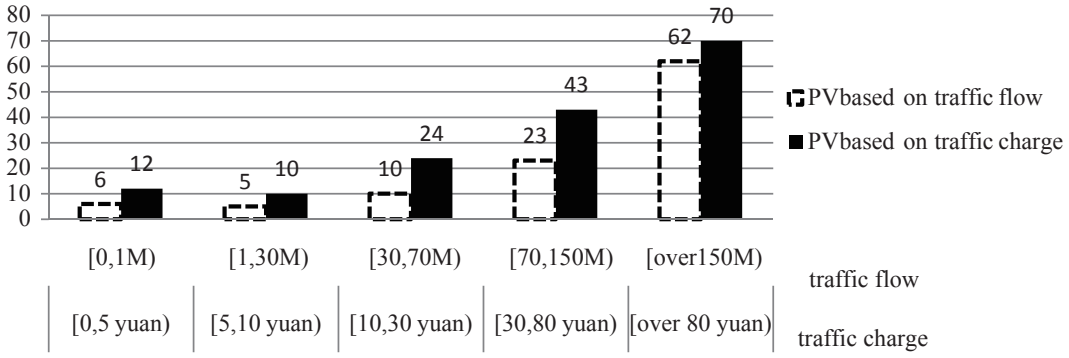

Figure 4
The Analysis of Traffic Flow and Traffic Charge Based on PV

The other attribute of MM in the database was analysed in the way described above and the analyst gave the features of the target customers. However, because of the company's secrecy work, we just showed part of the conclusion information which as shown in Table 1. According to the features of target customers, which can enhance the marketing effect, the marketer could reselect five million potential customers to conduct the SMS marketing and got fourteen thousand new customers in the end.

3.2.2 The Analysis of Activation

Although the customer down-load and installs the MM, the frequency and using time of MM use is far less than that of the competitive applications. How to improve the activation of the customer becomes the most urgent problem. Utilizing the platform of The Telecom Operator user experience centre, the company invites different kinds of customers to conduct the product use experience and survey so that the company can find out the imperfection of MM.

The analysts arranged the information collected from the user experience centre and identified that MM had three main imperfections in Table 2.

Table 1
The Features of Different Kinds of Customers

Target customers	Non-target customers	User exception
Using the mid-to-high mobile phone	The mobile phone system is Kjava or Symbian	Total charge is less than 5 yuan
Using GSM or M-Zone	Non-3 G user	
Send more than 10 messages /month	Send less than 10 messages/month	
More than 70 M traffic flow /month	Less than 30 M traffic flow/month	
Total charge is more than 10 yuan	Total charge is less than 10 yuan	
Like reading and games		

Table 2
The Imperfection of MM

Unfocused	Little information	Without introduction
Content module unfocused	No download times information	The action menu without introduction
Home-page unfocused	No document size information	Without download introduction
The content in recommendation is not related	No advertisement information	Without Search terms introduction
The search order is without rules	No effective comment information	The payment without introduction and so sudden
	No effective search matches	
	No effective ranking list information	
	No attractive iconic information	

3.2.3 The analysis of Retention

The retention in MM contains four parts: losing user structure analysis, losing user behavioural differences analysis, the reasons of user losing analysis and user losing warning and monitor system.

The main task of losing user structure analysis is depicting the structure of the losing user and find out the features of the losing users and their telecom communication information. As shown in Figure 5, we find that most of the losing users use domestic brand mobile phone such as ZTE, Lenovo and Coolpad. And the mobile phone brand used between the losing user and the retain user are quite different. We can make a preliminary conclusion that the customer who uses cheaper mobile phones may be more likely to become the losing users.

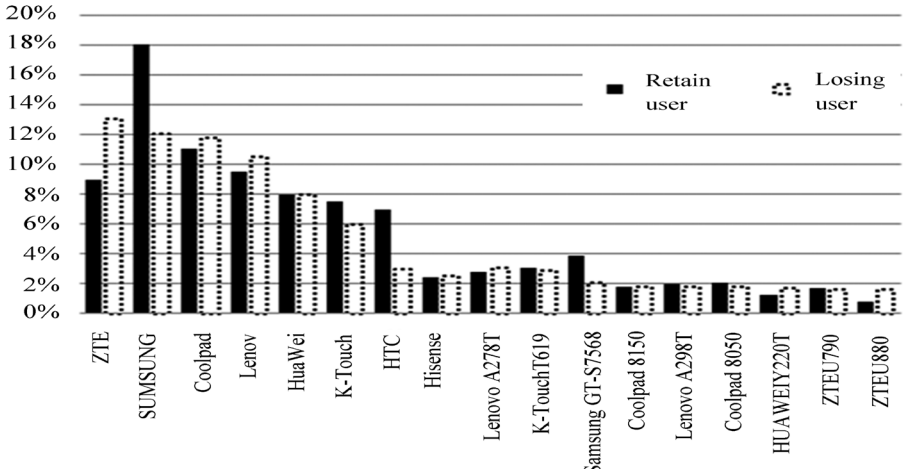

Figure 5
The Analysis About Retain User and Losing User Based on the Mobile Phone Brand

The main task of losing user behavioural differences analysis is analysing the essential differences between the losing user and loyal user in MM usage. In our research, we find that the loyal customer and the losing customer performed great different in the average MM visiting days per month and the average PV per month, which means that before the customer lose, the user agglutinant has been decreased. As shown in Figure 6 and Figure 7, we can use average MM visiting days per month and the average PV per month as the important monitoring indicators.

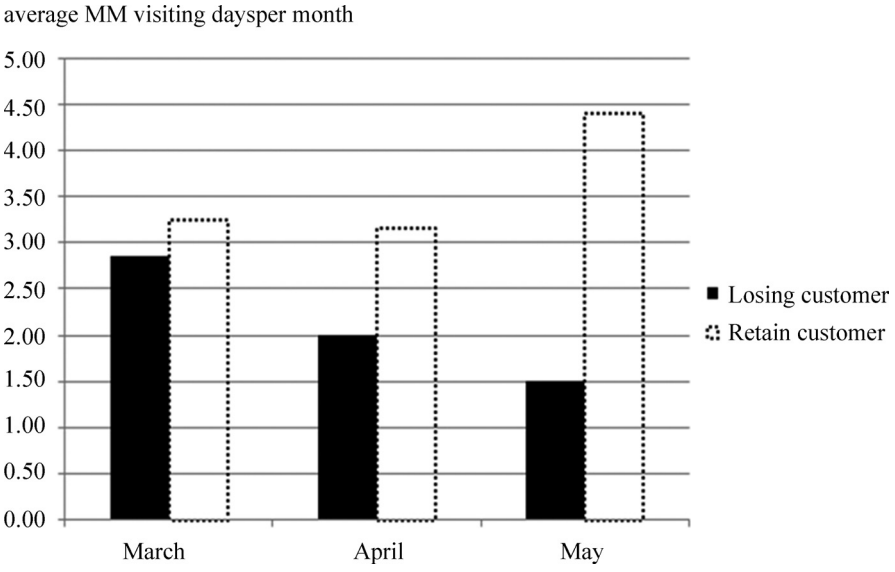

Figure 6
Average MM Visiting Days

The main task for the reasons of user losing the analysis is to find out the crucial cause of the customer lose. Combining qualitative method with quantitative method to find out the main cause of customer losing, we can get the point cut to improve the product. In the qualitative research, we chose part of the customer who just leaves MM to conduct this research and find out these two main problems cause them losing: the interface and the content. The interface of MM is not user-friendly because of aesthetics deficiency, no guidance, imperfect

display effect, mixed sections and too many functions. Content in MM can not satisfy the needs of the customer, the resource is not sufficient, the quality of the content is not unified and so on.

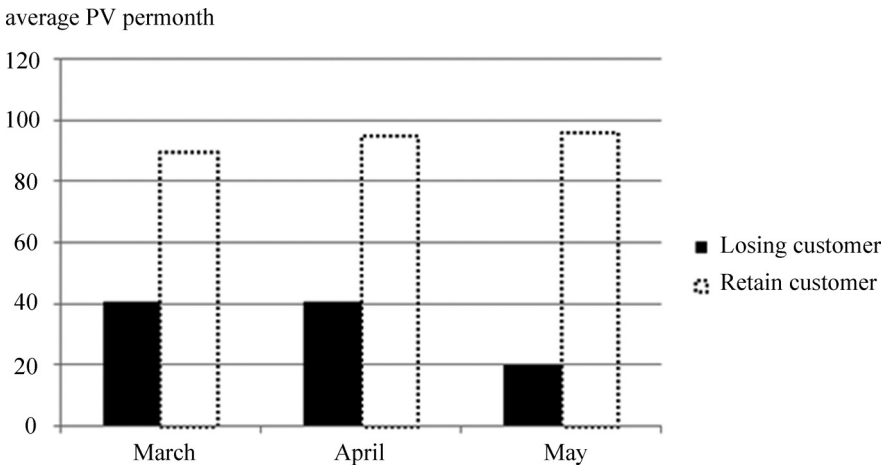

Figure 7
Average PV Per Month

Customer losing warning and monitor system can help the company to monitor the customers' behaviour any time and master the unexpected behaviours of the customers and carry out the marketing activities in time to retain the customers. Through what we mentioned above, the customers who were going to give up using MM would have some unexpected behaviours in the average MM visiting days per month and the average PV per month, we can dovetailed this two indicators into our customer losing warning and monitor system.

3.2.4 The Analysis of Revenue

As a mobile application store, the main income of MM is the share revenue of application download from MM. Although the number of users has reached a certain scale, the users who would pay for the application is low, which leads to the speed of revenue increase is not the same as the numbers of customers increase. How to improve the download-pay conversions is the main task in the revenue stage and the key is to how to prompt the customers to download the application with high download-pay conversions.

Firstly, we need to analyze the structure of revenue. The revenue of MM from the game application is 96.17% which makes game application become the primary income of MM.

We analyzed the download-pay performance of all kinds of games, and used the download-pay conversions as the indicator of revenue.

$$\text{Download-pay conversion} = \frac{(\text{payment customers})}{(\text{download customers})} .$$

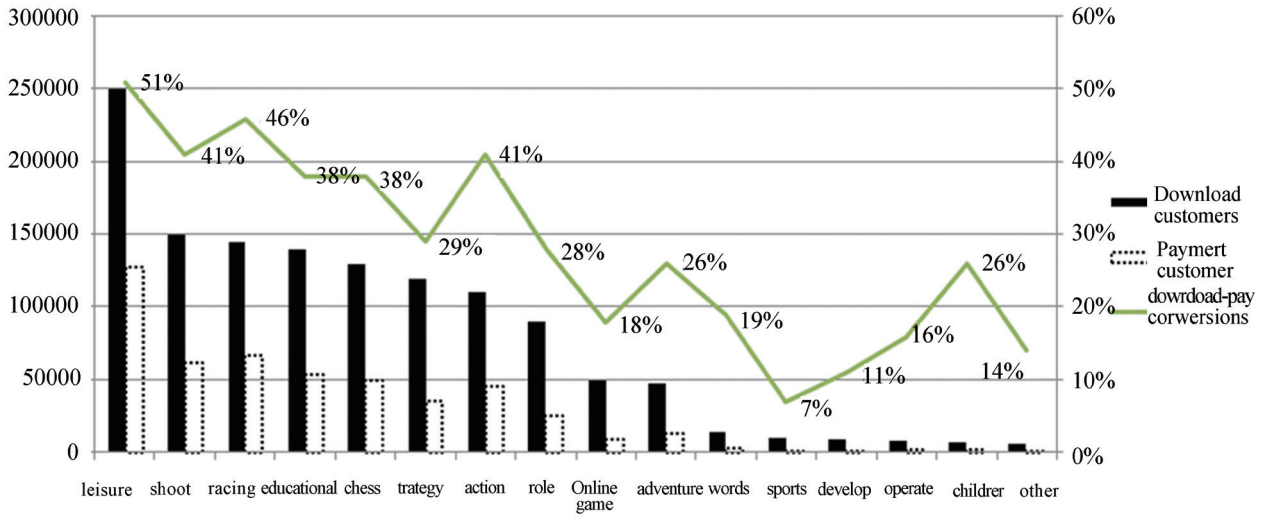

Figure 8
The Download and Payment of Different Kinds of Games

As shown in Figure 8, we can find that the download-pay conversions of the leisure games and racing games are higher than the others, so the marketer can focus on these two kinds of games to improve the download-pay conversions.

The customer choose different kinds of games just like choose the daily necessities in the market, so we introduce the method of "Market Basket Analysis" to the MM games download-pay conversions analysis and then we can analyze the preference of the customers and find out the association rules among different kinds of games in order to recommend the associated games to the customers.

Association analysis is widely used in the transaction database to extract the interesting associations (Berry & Linoff, 2004), so that the company can conduct service innovation and customization through the high quality and practical information. Here we utilize the association analysis to analyze the customer usage pattern of the games: when game A was played by the customer, how much the probability that the game B would be played by the customer also.

$D=\{T_1,T_2,.....,T_n\}$: The set of a given game payment

$I=\{i_1,i_2,.....,i_m\}$: The set of games payment

Every set from the set of a given game payment is the subset of the set of games payment that $T_i \in I$.

The association rules of the games payment are $X \rightarrow Y$, $X, Y \in I$, *and* $X \cap Y = \varnothing$. X is the antecedent and Y is the consequence. For the association rules $X \rightarrow Y$:

The confidence of a rule $X \rightarrow Y$ is the proportion of transactions in D that contains X which also contains Y. Rules that have support/confidence greater than user-specified support/confidence are said to have minimum support/confidence.

Table 3
The Association Rules of the Games

Antecedent (game A)	Consequence (game B)	Confidence
Racing games	Leisure games	30%
	Racing games	18%
	Shooting games	16%
	Chess games	11%
Leisure games	Racing games	27%
	Leisure games	17%
	Educational games	15%
	Shooting games	12%

Through the association analysis of the games, as shown in Table 3, we find that when a customer has pay for the racing games, he/she is very likely to pay for the leisure games (a possibility of 30%). When a customer has pay for the leisure games, he/she is very likely to pay for the racing games (a possibility of 27%). Thus, we suggest that when these bundles of games are detected, the company should send marketing information related to the leisure games to the racing games customer and send marketing information related to the racing games to the leisure games customer.

3.2.5 The Analysis of Refer

As the wide spread of the social media, the information diffusing through the social media platforms cannot compare to current types of advertisement. Utilizing social media platform to conduct viruses-like spreading of MM is a new and effective ways to acquire new customers. In the new version of MM, it added a function about sharing information to their friends through the social media platforms such as wechat and weibo. Thanks to the information spreading through the social media platforms, the MM was known by more potential customers. The marketer can also conduct the marketing activities on the social media platform then when the customer join the marketing activities, the information of MM can also wide spread through the social media while the cost of these kinds of marketing activities is lower than the traditional marketing activities and they are effective.

DISCUSSIONS AND CONCLUSION

Our research is based on the theory of Customer Relationship Management and utilizing the AARRR model based on the features of MM to conduct our analysis, set up some management indicators in different stage to monitor the performance of MM and realize the change of the customer in time. Using the data collected from the MM to do the data mining which shows that the AARRR model can guide the operations management of MM and has instructional significance and referenced value for the other mobile internet application operations management.

The result of our research indicate that the AARRR model can give some useful introduction to the operations management of MM that the model based on the customer life-cycle management and combine the data analysis and data mining to conduct the operations management in order to do the precision marketing of MM.

Even though this research makes significant contributions to the operations management of mobile internet applications, it nonetheless possesses limitations that open up avenues for future research. First, this study focuses on analyzing structured data. Future research could investigate how to combine unstructured data with structured data to understand customer behaviors and thereby conduct customization and innovation decision-making (Chan et al., 2016).

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