ISCTE Business School
Instituto Universitário de Lisboa

Customer Value Assessment of Sichuan Mobile

WANG Yingjie

Thesis submitted as partial requirement for the conferral of

Doctor of Management

Supervisor:

Professor Conceição Santos, Senior Lecturer ISCTE-IUL, Departamento de Marketing, Operações e Gestão Geral

Co-supervisor:

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Abstract

The present research aims to contribute with the evaluation and a segmentation index criterion of the customer group value in order to improve knowledge to the telecommunication industry, in value assessment and in market subdivision based on customer value. This thesis gives practical instrument measure and guiding suggestions to a deeper customer value assessment, combining characteristics of the communication industry in China, based on outstanding domestic and foreign research results and taking the group customers of China Mobile Sichuan Company.

A first brief crossing between theoretical backgrounds of customer value assessment, segmentation concept and group customer, allowed the selection and choices of the methodology and the variables that influence group customer value. The following empirical step complemented the development of the assessment index system to calculate the group customer value and the following cluster analysis. The results obtained included the industry experts' experience, which help the identification of the 14 factors that influence the group customer value and the data analysis from 2000 group customers, which has been extracted from the mobile BOSS system. Factor analysis and analytic hierarchy process (AHP) method are used to calculate weights of indexes.

Finally, based on current value, potential value, social value and the total value, clusters with typical characteristics are discovered using K-means clustering method. And corresponding marketing strategy is put forward.

Key-words: Customer value assessment; Customer segmentation; Factor analysis; Analytic Hierarchy Process (AHP).

JEL: L86, L96, M31

Resumo

Esta tese avalia o Valor de grupos de clientes, no âmbito da grande empresa chinesa de telecomunicações móveis, a Sichuan Mobile. O presente estudo contribui para a análise da avaliação e segmentação de grupos de clientes, nomeadamente no mercado das telecomunicações. Este, sugere, ainda, um instrumento prático de medida; um índice de medida do valor de grupo de clientes é proposto e construído com base em análise de dados secundários do sector e do mercado chinês e primários baseados opiniões de peritos do sector e de resposta a um inquérito dos grupos de clientes da China Mobile.

Após uma breve revisão do enquadramento teórico de conceitos inseridos na Gestão do Marketing, como Valor do Cliente, Segmentação e cliente-grupo, foram analisadas e seleccionadas as opções metodológicas e as variáveis que podem influenciar a avaliação do valor de um grupo de clientes. O desenvolvimento do índice de ponderação do valor de grupo de clientes foi elaborado após vários passos. Em primeiro lugar foram identificados, junto de peritos do sector, 14 factores que influenciam a avaliação do valor de grupo de clientes; Depois, efectuou-se um inquérito a 2000 grupos de clientes, retirados do sistema móvel BOSS da empresa Sichuan Mobile. Por fim realizou-se à base de dados obtida análises estatísticas como Análise Factorial e de Hierarquia (AHP), métodos que permitiram obter a ponderação do índice.

Finalmente, com base no índice de valor corrente, valor potencial, valor social e valor total foram identificados os clusters. A análise destes clusters permitiu ainda sugerir estratégias de marketing em adaptação a cada cluster.

Palavras-chave: valor de cliente, segmentação de clientes, Análise Factorial, processo hierárquico (AHP)

JEL: L86, L96, M31

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Influential accomplishment of this thesis shall owe to care and assistance from many teachers and classmates.

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When reading for DBA of UESTC, I received intimate care and circumspective direction from teaching professors and teachers, precise educational attitude, profound knowledge and active thinking modes of whom have benefited me a lot. Meanwhile, during those years' study, teachers and leaders from DBA center of UESTC have worked a lot with their shoulders to collars, creating excellent study conditions for us and helping us to improve theoretical attainment and enhance our working ability, causing me to spend those years in UESTC.

During the whole process, families, schoolmate and friends have given me utmost support and help, with which I could conquer all difficulties with courage at any moment and finally put a perfect end to study as a Ph. D. candidate. In the future, I will work harder and live happier, ceaselessly enriching and perfecting my life.

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Summary

Along with the innovation and reorganization of telecom industry, competition among telecom enterprise is increasingly fierce. Only telecom operators with deep understanding on market demand and customer features can obtain leading advantages in competition.

The present research aims to contribute to improve knowledge of telecommunication, in particular focusing on the Chinese market and the Sichuan Mobile Company. Taking profit of the professional experience in this industry and by the management of this big firm in the Mobile market, a study was carried out from consumption data of 2000 group customers of Sichuan Mobile Company. The background theory was combined with the point of view of experts from the market, from a previous exploratory study. The first chapters of this thesis summarized corresponding theories such as group customer value and customer segmentation, putting forward value assessment mode. Afterwards, dimension reduction on influencing factors of group customer value by means of factor analysis was carried out, by resorting to SPSS software. Meanwhile, calculation of objective weight of each factor was achieved as well. Then by dint of Super Decisions software, subject weight of each factor was realized by means of step analysis. Finally, customer segmentation was reached by K-means cluster, digging out typical group customer cluster, providing corresponding market strategy.

In this paper, there are some interesting variation trends summarized as follows:

The current value of all groups has little difference whatever K is equal to each value; The total value of group customers is mainly influenced by the group potential value; There is no perfect correlation between group customer value and group administrative level but the customers with the highest or lowest value have a middle administrative level; There are not many group customers of high quality.

Altogether, the theoretical and empirical analysis of this thesis, allow great contribution not only to the scientific academia, namely in theory summarize and empirical methods, but also to the business management, especially within the Telecommunication industry.

The most contribution issues on theory are the following:

Systematically give a summary to related concept of group customer and group customer

value; Give a summary to the theoretical basis to customer segmentation, including concept, as well definition and function of customer segmentation in telecom industry, etc;

The most contribution issues on measuring and empirical issues are:

Calculation on index weight and customer value, after the following steps: first according to questionnaire survey and by means of Super Decisions software, calculate objective weight of factors by AHP and calculate combination weight of factor integrating with objective weight acquired through factor analysis; after, based on standard factor score and combination weight of factors of 2000 groups, calculate the current value, potential value, social value and total value of group customer

Customer segmentation, digging out clusters with typical features , where segment group customers by K-means, dig out group customer cluster with typical features; put forward layered service, credit ratings grading and other strategies aiming at them.

Chapter 1: Introduction

1.1 Research Theoretical and Industry Background

During recent 30 years since the reform and opening-up, communication industry in China has gained quite great progress, especially in respect of mobile communication, which currently has over 800 million subscribers through years of development (Wang, A. L., 2010). Telecommunication enterprises shall not only simply provide network transmission services to the market and consumers, but also need to develop new product, new function and new business continually. On the other hand, as the role of information industry becomes more and more significant and all-service licenses are issued, it becomes necessary for communication enterprises to keep optimizing their personalized products to attract more quality customers. In addition, they shall continuously strengthen management of group market, deeply build the concept of "follow the mainline of development and the tenet of quality services" (Wang, A. L., 2010), set up brand new enterprise images by new services, so as to win the market and get developed.

At the same time, the situations where "three comparative power stand like tripod legs" expands the operators' choices of clients and group customers. The academics put forward an idea which says "customers are a resource of enterprises, which means more than material resources of the enterprise"(Wang, A. L., 2010). Such idea was soon applied to the reality, which resulted in the subject of Customer relationship management, CRM in short.

Customers, especially core customers, are the key factor for the core competitiveness of an enterprise. Major telecom operators began to pay more and more attention on how to raise their income and profits by improving the satisfaction and loyalty of individual clients and group customers and increasing client values. This was especially obvious in the group customer market. The intense competition on group customers in 2008 and 2009 is clear evidence (Wang, A. L., 2010). Telecom operators which are currently within their strategic transformation period have become more and more aware of the significance of CRM to their development. To telecom operators, the maintenance and improvement of client values is actually a business

strategy aiming to increase business income, optimizing profitability and increase customer satisfaction. The ultimate purpose of CRM is to help telecom operators to gradually shift from the past product- and service- oriented operating mode to a new one with customers and market as the orientation, and finally turn to an intensified business mode.

Winning customers is the essential for existence and development of enterprises; however, it does not mean that customers can secure an enterprise. The most important thing is to organize enterprise resources effectively based on actual customer demands, to cultivate potential values of customers, and to maintain long-term cooperation. Present enterprises has gradually become aware of such change, and transferred from “service-oriented” to “customer-oriented”. In other words, now they are trying to satisfy personalized demands of customers, improve customer loyalty and retention rate, realize the goals of shortening sales cycle, reducing sales cost, increasing sales income, and expanding market, so as to completely promote enterprise profitability and competitiveness.

Featuring high communication cost and significant social influence, group customers of the telecommunication industry are the major source of income and profit for telecom operators, as well as the main battlefield to combat with their competitors. Group customers weigh more and more in the business achievements of telecom operators, and have become the focus of competition among telecom operators. During this process, operators have generally accepted the CRM theories and applied them in their organizational structures. Furthermore, as all-service operation develops continuously, operators keep adjusting their organizational structures that are applied on group customers.

To sum up, competition in the telecommunication industry becomes more and more intense, competition methods become more and normalized, and quality differences between services more and more imperceptible. Price is no longer the major consideration of customers. Therefore, customizing marketing schemes based on customer requirements becomes a significant measure of telecommunication enterprises to win the war.

1.2 Main Goals of the Research

China Mobile now has the No. 1 network scale and customer scale in the world. Nonetheless, it suffers from pressure coming from the two domestic competitors, i.e., China Telecom and China Netcom. It is urgent for China Mobile to find a way to maintain existing customers and utilize customer resources in hand.

To efficiently manage customers, it is necessary to clearly identify customer value by classifying them into high-value customers and low-value ones. Use limited marketing resources on important customers, and quit some unimportant ones. In addition, after identifying high-value customers, subdivide them to provide differentiated marketing services and get better marketing effectiveness.

As the mobile communication market develops fast and competition becomes more and more intense, telecom operators begin to focus on the market of group customers with great potential. Contest over group customer resources is getting more and fiercer (Feng, X. H., 2008). Therefore group customer resources become an important reflection of an enterprise's competitive strength. High-value customers are especially the key factor for an enterprise to grow rapidly. Seizing advantageous customers has great strategic meaning to the development of the enterprise. In other words, group customers weigh more and more for the development and profiting of operators.

Through researching group customer value assessment and market subdivision, we can identify customer value, scientifically assess customer value and precisely apply such values, set up an assessment system that is truly oriented at application in enterprise management, avoid disjunction between fundamental work and application work, and realize the openness of value assessment work efficiency and results. At the same time, it helps us to focus on high-value group and VIP customers, make customer classification more reasonable, pertinent and efficient.

Assessment of group customer value has the following significant meanings:

1. Clarify the definition of customer value, and set up a vale assessment system for Sichuan

Mobile.

At present there is no complete theoretical system and unified standards for customer value assessment, especially for the telecommunication industry, there is no complete assessment method or practice experience for customer value definition.

Our research firstly defines the scope of customer value. Then we analyze the factors that influence the values of group customer of Sichuan Mobile. Based on characteristics of the communication industry in China, combining experts' experience and factor analysis method, a group customer value assessment system is set up.

2. Give a summary to related concept of group customer and group customer value.

Concept of group customer is such as follows: characteristics of market, importance, product of group customer market, etc.

Connotation of group customer value including objective, standard and principle of value assessment, etc;

3. Improve knowledge to the telecommunication industry in market subdivision based on customer value.

As the competition in the telecommunication industry becomes more and more intense, operators are facing more challenges from the market. Customer requirements become personalized. They ask for more standardized telecommunication business and services, and higher overall quality of telecommunication services.

To get the first chance, operators must thoroughly analyze the consumption behaviors of customers, precisely identify and subdivide the customer market, and make different service marketing plans for different levels of customers. Only in such a way they can best utilize values of all parties and realize win-win.

This thesis assesses group customer value in a scientific and objective way, understands the main characteristics of group customers, and subdivides the customer by their values, and therefore realizes customer classification, service grouping and channel distribution in customer management and marketing management.

4. Gives practical instrument measure and guiding suggestions to a deeper customer value

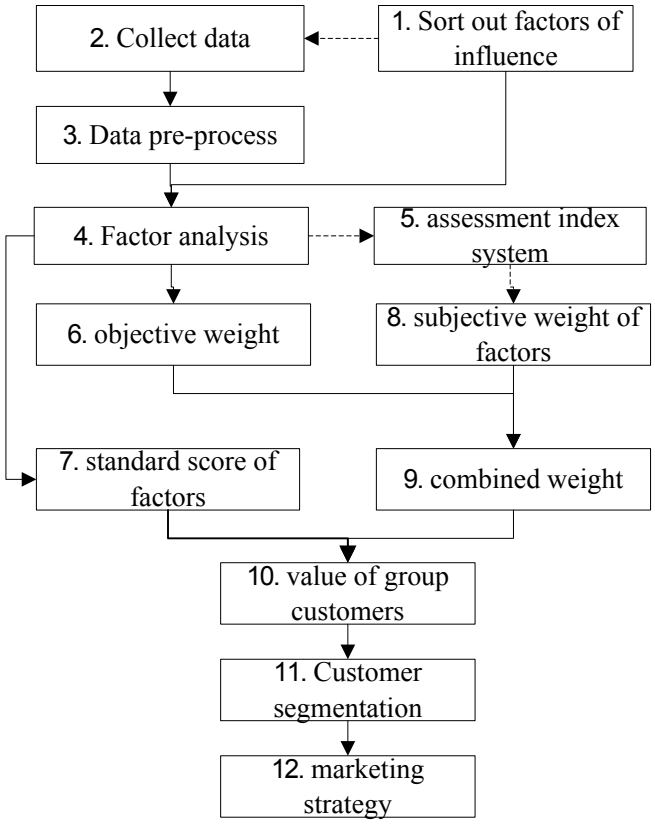
assessment.

After description about group customer, customer value and customer segmentation, according to empirical analysis, and practical instrument measure and guiding suggestions will be put forward.

1.3 The Research Steps and Methodological Choices

There are 12 main steps in this research, including building assessment index system, calculating weight of indexes, calculating value of group customers, and so on.

Figure 1-1 Research Steps



1. Sort out factors of influence: By means of reading historic documents, news reports, blogs, discussion with experts, etc. sort the factors that may have influence on the value of group customers, including individual ARPU, the number of group employees, the number of VPMN users, etc.;

2. Collect data: According to factors of influence on the value of group customers, randomly select information from 2000 group customers from BOSS system, including

individual ARPU, the number of group employees, the number of VPMN users, etc.;

3. Data pre-process: Format of some indexes taken from BOSS system is quite special, like "Date of join", "administrative level". To make it easier for further analysis and process, these indexes shall firstly be converted;

4. Factor analysis: Use SPSS software to conduct factor analysis for pre-processed data so as to sort out public factors;

5. Build assessment index system: Categorize public factors that are analyzed and sorted from the factors into three types: current value, potential value and social value, and build group customer value assessment system;

6. Calculate objective weight: Calculate objective weight of factors based on factor characteristic root obtained in factor analysis;

7. Calculate standard score of factors: The procedure can be automatically completed by SPSS software. The default standard method is "central standard";

8. Calculate subjective weight of factors: Design questionnaire according to assessment index system, and calculate subject weight of factors in hierarchical analysis method by using Super Decisions software;

9. Calculate combined weight of factors: Combine objective weight and subjective weight of factory;

10. Calculate the value of group customers: Calculate current value, potential value, social value and total value based on standard factor score and factor combination weight;

11. Customer segmentation: Based on customer's current value, potential value, social value and total value, use K-means method to subdivide customers, and find out group clusters with typical characteristics by changing the number of clusters, that is, the value of k;

12. Propose marketing strategy: Propose corresponding marketing strategy according to group clusters obtained through Customer segmentation.

1.4 Structure of the Thesis

Structure of the thesis is listed below according to the study background and method:

Chapter I: Introduction. The chapter states the thesis's background of the study, meanings

and objectives of the study, current situations of the study in the country and the world, as framework and contents of the study, and points out creation in the thesis.

Chapter II contains an overview of China Mobile Sichuan, analysis of market environment of the industry, and analysis of competitions, which build realistic foundations for further analysis in the next chapters.

Chapter III and IV firstly give relative concepts of group customers, including definition of group customer, market features, importance, meanings of development and group products, etc.; then elaborates theoretic bases of value assessment for group customers, including definition of customer value, meanings, objectives and standards of assessment of value of group customers, etc.;

Chapter V describes the concept of Customer segmentation, objective, applications and theoretic sources of Customer segmentation, definition and functions of Customer segmentation in telecommunication industry, etc.

Chapter VI elaborates study method used in the thesis, including data pre-process method, index weight calculation method and Customer segmentation method;

Chapter VII is verification and analysis. It describes in details data collection, data pre-process, index sort-out, and the process of dimensional reduction, as well as how to calculate the value of group customer from multi-dimensions, how to subdivide customers so as to find out clusters with typical characteristics;

Chapter VIII proposes strategies related to establishment, maintenance and development of group customers in accordance with the result of subdivision of customers of China Mobile - Sichuan.

Chapter IX is the summery and future work. The chapter is a summary of the thesis and future work. It points out major contribution and existing deficiency of the study, and states the direction of further study.

Chapter 2: History and Current Situation of Telecom Operators in China

2.1 History of Telecom Operators in China

In November 1949, Ministry of Posts and Telecommunication was set up as the first telecom operator in China. It was the first organization that centrally manages national post and telecommunication services of the People's Republic of China. The Ministry of Posts and Telecommunication was later divided into the GPO (general post office) and GAT (General Administration of Telecommunications). The Ministry of Posts and Telecommunication was then re-established in 1973 in hope to develop the telecommunication industry. To sum up, the telecommunication industry of China has gone through ups and downs.

After that, the telecommunication industry experienced a vigorous growth lasting over two decades. In 1994, in order to keep up with the development of market economy and to increase the competitive strengths of Chinese telecom operators, the Ministry of Electronics Industry jointly with the Ministry of Railways founded China Unicom and began to operate a GSM network step by step. In year 1998, for another time post services were separated from and telecommunication services. In addition, the telecommunication industry began to apply the "government functions separating from enterprise management" (Zhang, H. Y. , 2007) mechanism, under which the Ministry of Information Industry and China Telecom undertook industry supervision and service operation respectively.

Several years passed, and a lot of changes occurred to telecommunication operation in China. In 2000, China Mobile Communications Corporation ("China Mobile" hereinafter) came into being; China Tietong and China Satcom were also set up in the year. At that time only China Mobile and China Unicom provided mobile communication services. China Telecom and China Tietong mainly operated fixed telephone and paging services, while China Satcom focused on two major services, i.e., satellite communications radiated television and digital clustering emergency command scheduling communications. In year 2002, China Telecom was divided into two parts, one covered south China area and the other, which covered ten provinces

in north China, was named China Netcom.

China Unicom, set up in 1994 as mentioned before, has been constantly increasing its overall strength (Zhang, H. Y. , 2007). Initial services included mobile phone (GSM) and wireless paging, and now it provides mobile phone (GSM and CDMA), long distance call, local call, data communication (including Internet services and IP calls), telecommunication value-added services, as well as other services relative to the main business. Following the latest advancement of global telecommunication technologies, China Unicom kept releasing new services that are based on high and new technologies, such as prepayment of mobile phone, mobile Internet, mobile phone IP calls, mobile banking, WAP, GPRS, etc. In 2000 China Unicom got listed at NYSE and HKSE, being the IPO with the largest scale in HongKong history, as well as the largest in Asia area excluding Japan. It paved a solid foundation for China Unicom to enter the international market.

China Mobile, set up in 2000, is the only communication operator that is dedicated in mobile communication technologies in China. Both of its network size and client scale rank 1st in the world till now. China Mobile mainly provides mobile voice, data, IP call and multimedia services. It was granted with dual rights to operate as both an international networking organization and an international outgoing/incoming service provider of computer Internet. In addition to basic voice services, China Mobile also provides various value-added services such as fax, data and IP call. It owns several well-known brands including “GoTone”, “Easy Own” and “M-zone”. It covers mobile phone number segments of 139, 138, 137, 136 and 135. China Mobile (HongKong) Co., Ltd. is one of the companies with the largest market capitalization in all overseas listed Chinese enterprises.

Telecommunication industry in China has come through slow development before reform and opening-up, when telephones are mainly used by government offices and some state-owned businesses as office accommodations. During the 29 years from 1949 to 1978, telephone subscriber in China increased by 1.7 million only. Till mid 20th century, there were only 230,000 telephone subscribers in China, most among which were using fixed telephones (Zhang, H. Y., 2007).

After reform and opening-up, fixed telephone subscribers increased gradually. The

telecommunication industry presented a rapid growth, and telephones became popular in the daily life of common Chinese families. Mobile phones showed up in China in 1987. In 1989 there are only 10,000 mobile phone subscribers nationwide. We predicted this number would rise to 800,000 in 2000, and the real number in year 2000 was 87 million, more than 100 times over the estimation. Since then, the telecommunication industry of China has experienced rapid development with the total number of fixed telephone subscribers coming to No. 1 of the world.

From beginning of the 21st Century, the number of telephone subscribers in China increased in a fast while stable way by about 100 million annually. According to the statistics from former Ministry of Information Industry, such number reached 900 million in October 2007, including 370 million fixed telephone subscribers and 530 million mobile phone subscribers (Gao, D. N., 2008). Till July 2009, there were over 1 billion telephone subscribers in China. Accumulated net increase of subscribers was 43 million in the first half of the year, making the total amount of 1 billion. Among them, 330 million were fixed telephone subscribers, with a reduction of 10.43 million (including 9.59 million wireless local call telephone subscribers), and 695 million were mobile phone subscribers, with an increase of 54 million. Such a rapid rise kept the amount of telephone subscribers in China at top of the world; however, the popularizing rate in China still lagged far behind advanced countries (He, F., 2010).

As mobile phone subscribers increased continuously and non-voice services grew constantly, the simple voice services could not satisfy users' demands any more (Gao, D. N., 2008). More personalized and applicable requirements were generated. Therefore, telecommunication users are gradually divided into two extremely opposite groups, i.e., high valued and low valued. Business volume and traffic volume are the ultimate goals of competition between telecom operators. The price war that is going on can only impose hidden dangers on the development of the telecommunication industry in China.

Till the last half of 2009, all administrative villages in China would be on the telephone, and till 2020, the goal of "every household on the telephone" will be achieved (Zhou, J., 2010). At the same time, telecommunication expenses keep reducing, pushing the communication industry progressing greatly. Till end 2009, the number of fixed telephone subscribers reduced

by 22 million annually, and the ratio of such subscribers fell to 15% from 20% in the end of last year. Accumulated net increase of mobile phone subscribers was 97.30 million, making the total mobile subscriber amount of 740 million. Income from mobile communication was 13% higher than the same period of last year, and its ratio among the major telecommunication business income was 5% higher than that of the same period of last year (Zhou, J., 2010).

Along with the sharp rise of amount of telephone subscribers in China, value-added services, such as voice, SMS and WAP business, of the telecommunication industry in China also grew fast. Till end 2007, there were about 22,000 value-added telecommunication enterprises in China. In year 2007, basic telecommunication enterprises realized an income of CNY 153.6 billion from value-added telecommunication services, with a year-to-year increase of 34%. Its ratio among the total revenue rose to 21% from 16% in the end of last year. Among the telecommunication business revenue, CNY 225 billion came from non-voice business, and its service income was ratio among the total revenue rose to 31% from 27.5% in the end of last year.

As restructuring of the telecommunication industry and all-service operation are approaching, competition in the telecommunication industry is becoming more and more intense. How to keep the current client scale, and how to utilize the current client resources became the immediate concern of China Mobile. It is imperative to set up a reasonable client value system through research, so as to build a favorable environment for the competition of the telecommunication industry in China.

2.2 History of China Mobile

In 1949 the Ministry of Posts and Tele Communication was set up; in 2000 China Mobile Communications Corporation was founded; and in 2008, China Mobile became one of the three major telecom operators in China. In several decades, China Mobile has been grown steadily, making itself the largest competitor of China Telecom and China Unicom (He, F., 2010).

The following is the chronicle of China Mobile:

Table 2-1 History of China Mobile (Shown in Annexes)

2.3 Operational Environment of Domestic Telecommunication Market

The relation between a company and operational environment of market is like that between fish and water. Any marketing activity of a company cannot be successfully engaged by ignoring the environment. According to the "Grand Marketing Management" theory (Zhang, H. Y., 2007), the management expert who is honored as the father of modern marketing, any company that intends to enter a specific market successfully should harmoniously utilize economy, psychology, politics, public relations and other approaches strategically to receive cooperation and supports from each and every aspect and create an easy external environment for marketing activities. Analysis of operational environment of mobile telecommunication market is the foundation for drafting market competition strategy. Telecommunication is a strategically and pillar industry in the development of national economy. Its development is under influences of many factors (Zhao, J. Y., 2009).

On May 24, 2008 Ministry of Industry and Information Technology, National Development and Reform Commission, and Ministry of Finance jointly issued "A Notice about Deepening Structural Reform in Telecommunication Industry" (Zhao, J. Y., 2009), and started the forth structural reform for the industry in the country. The guiding idea of this reform was to take opportunities in development 3G mobile telecommunication, rationally arrange existing telecommunication networks, realize total business operation, form a suitable and healthy pattern of marketing competition so as to both preventing monopoly and avoid over competition and repeated construction, and shape three competitors with national networks, relatively equal strength and scale, total business operation capacity and strong competitiveness. Supportive policies and measures included forcefully support independent creation; enhance supervision on telecommunication industry and take necessary unsymmetrical administrative measures; and promote coordinated development of the industry, actively advance the fusion of three networks, encourage cross competition in business, etc(Zhao, J. Y., 2009).

In 2010 IOT Expo China, spokesman of NDRC pointed out that the twelfth five-year plan of the government had explicitly proposed to develop the next generation national

infrastructure with broad band, fusion and safety, and promote applications of "Internet of things"(Zhou, J ., 2010). It means that the central government keeps increasing the importance of informatization, which would have important and deep influences on promotion of national economy and social informatization, and that demands of the society on information telecommunication technology network and services will continuously increase, and the development of telecommunication industry will be presented with historic opportunities.

In economic environment, macro national economy increases steadily. In 2011, although under influences of unfavorable factors in international financial crisis, GDP of the country kept the increase speed of 9.6% for the first six months; Social investment in fixed assets increased 25.6% on year-to-year scale; social retail goods increased 16.8% in total on year-to-year scale; disposable income per capita of urban citizens was CNY 11,041, at 13.2% on year-to-year scale, and the actual increase was 7.6% with price factors excluded; cash income per capita of rural citizens was CNY 3,706, at 20.4% on year-to-year scale, and the actual increase was 13.7% with price factors excluded (Zhao, J. Y., 2009).

With the growth of national economy, consumer power of society enhances and disposable income of rural and urban residents increases, giving rise to increasing demand for communications and information and laying an economic foundation for the development of telecommunications sector.

From a cultural perspective, the *Culture Industry Promotion Plan*, adopted by the State Council in September 2009, defines work in eight aspects for now and the short future. The 7th aspect, developing newly-emerging cultural sectors, requires the deployment of digital and network technologies to vigorously promote culture industry upgrading. It also stipulates that we should support the development of mobile mass media broadcasting, network broadcasting, digital mass media broadcasting and cellphone broadcasting; that we should develop value-added services such as mobile cultural information service and digital entertainment products for portable display terminals; that we should do a better job in constructing the next generation broadcasting (NGB) and give full play to the third generation mobile telecommunications network, broadband, fiber and other network infrastructure; and

that we should formulate and improve network standards, promote inter-connection and resources sharing so as to push forward the tri-networks integration (the integration of telecommunications networks, cable TV networks and the Internet). The unveiling of *Plan* has in brought in god-given opportunities for development of cellphone broadcasting industry, and will indirectly drive the development of telecommunications industry and gradual formation of social cultural environment.

With the development and maturity of relevant technologies, the integration of the Internet, mobile phones and other cultures like the micro blog has been all the more close. Particularly with the advent of the 3G Generation, the mobile phone has become a powerful media and also an individualized style of life and entertainment. Serving as a telecommunicator and a bearer of culture, the mobile phone has gradually evolved into a new type of media called the Fifth Media. It exerts great influence on people's cultural life styles and even the operation of society. It dual functions not only meet the increasing cultural demand of the people, but also reflect the progress of knowledge-based economy and science and technology, a sign that culture and technology are becoming all the more interwoven in the information age.

From the technological perspective, the telecom industry is highly technology-intensive. New technologies and the combination, integration and innovation of new services will have a huge influence on the industry.

The telecommunications is developing towards broadband-based and mobility-based. New demand for broadband arises as some customers need much data traffic and highly real-time services such as videoconferencing. In the meantime, increase of subscribers needs to be supported by corresponding broadband. People need telecommunications anywhere anytime by their sides, a fact that encourages telecom companies to develop new technologies and services based on the mobile network. The multi-media and multi-functions embedded in mobile terminals enable diversified mobile information services and enrich user experience. With the issuance of 3G licenses in early 2009, China Telecom, China Unicom and China Mobile have adopted different 3G technology standards. Currently, the three major operators are busy with 3G work. It will become more obvious that the scale application of 3G will

move towards broadband-based and mobility-based.

Various telecommunication technologies are all the more integrated to support new services. Technological integration also creates favorable conditions for the integration of networks, of services and even of industries. Market demand has shifted from pure telecommunications demand to comprehensive informationized solutions, with more cooperators getting involved into the industry chain of telecommunications to promote the development of this industry.

2.4 Competition in Domestic Customer Market

The domestic telecommunications market had previously undergone three restructurings respectively in 1994, 1998 and 2001 before it witnesses the fourth one in May 2008. In face of the new challenges and opportunities after the restructuring, major operators compete in their own fields with their comparative advantages. Due to difference in network distribution, target groups and development trends of different operators are varied, with China Telecom orienting at family and group customers, China Mobile advantageous in individual customers and China Unicom including all three kinds of subscribers in its service (He, F., 2010).

Before the fourth restructuring of the domestic telecommunications market, there were six telecommunication companies, China Telecom, China Mobile, China Unicom, China Netcom, China Tietong and China Satcom. All of the six companies carried out group customer marketing, complementing one another with their own scales and competitiveness for common development. Analysis of market share and revenue shows that the ranking of the six operators has undergone great changes, with China Mobile occupying the leading position with its absolute advantage in the market share of individual customers, followed by China Telecom, China Netcom, China Unicom, China Tietong and China Satcom (Feng, X. H., 2008).

After the issuance of three 3G licenses, the license problem that once hindered the development of 3G industry chain was eliminated. China Mobile acquired TD-SCDMA license, China Unicom, WCDMA license, and China Telecom, CDMA2000 license. China Mobile merged with China Tietong, China Unicom with China Netcom, and China Telecom,

after acquiring C Network service of China Unicom, emerged with China Satcom. Therefore, three competitors with all-round services and similar scale and competitiveness emerged in the market. Hence the domestic telecommunications industry ushered in a new era where the three major operators compete with one another.

China Telecom has for long set being the first comprehensive information service provider as its core strategy. Unfortunately, it has not achieved any remarkable results before the issuance of the 3G license. However, after combining its traditional advantage in landline broadband with mobile internet service, China Telecom broke through traditional voice services and began to orient towards commercial subscribers, enterprises and regional groups. In the meantime, while tri-networks integration leaned towards broadcasting and television, China Telecom and China Power ushered in a new phase in their discussion about fiber net cooperation. The integration of various networks has brought China Telecom enclosure benefits in rural informatization, urban network, corporate information solutions and the construction of commercial logistics network. With its all-around progress in services, China Telecom bridged the gap with China Mobile in value-added services (value-added market) and saw bright prospects in trans-industrial cooperation in information service with oil, railway, finance, electric power and civil aviation sectors. Notwithstanding, China Telecom is too reserved to make enough innovations, which will pose great hindrance to its advantages displaying in the era of all-round services.

After the 2008-2009 integration period, China Unicom gained momentum. Fully aware that resources shortage is the greatest bottleneck for developing all-round services in the value-added filed, China Unicom in 2010 began to make breakthroughs in particularly defined areas, enhanced performance in markets where it enjoyed advantages and boosted its storage market. It totally occupied the landline broadband market in Northern China where it enjoyed advantages and prevented the entry of China Mobile and China Telecom by all means. Apart from its total control in this regard, China Unicom also developed information programs that are at the central concern of governments at all levels in the “Twelfth Five Year” Plan period, including such programs targeted at local governments, big companies, big communities and major industrial bases as “Wireless City”, “Digital City”, “Digital

Community", "Online Society", "Corporate Platform for Information Sharing", "Open Government E-Administration" and "Urban Safety and Emergency Response System". However, imperfections of its internal system have greatly hindered the development of its advantages in all-round services. Its lack of innovation and failing comprehensive capability incompatible with market expansion will become all the more acute with market competition.

After the restructuring, China Mobile became a monopoly in the individual customer market. Its absolute advantage enabled it to enjoy revenue and capital expenditure that are more than the aggregate of new China Telecom and new China Unicom. However, compared with the latter two, China Mobile are inferior in traditional landline and especially in broadband, which will pose obstacles for future development. Immaturity of TD technology will also put China Mobile at a disadvantageous position in 3G competition. China Mobile, as a new comer in corporate subscriber market, has no advantage against competitors who have abundant experience. Notwithstanding its large number of individual customers that will maintain its strong ability in profit making in the next three years, China Mobile will surely face slowdown of revenue growth with China Telecom and China Unicom promoting 3G services and competitions. An insider of China Mobile in 2009 observed: "China Mobile is a monopoly in individual customer market, but is in a disadvantageous position in corporate subscriber market." He also pointed out that although the three major operators all provide all-round services, China Telecom and China Unicom have their own SI companies and strong technical teams for operation and maintenance; once they acquire off-the-rack mobile telecommunications network, they will be able to give full play to their advantages, which will surely broaden the gap between China Mobile and themselves in corporate subscriber market (Feng, X. H., 2008).

Table 2-2 shows post-restructuring services and subscribers of the three major operators (Zhou, J., 2010); Table 2-3, their respective service revenues and profits (Zhou, J., 2010).

Table 2-2 Comparison of Post-restructuring Services and Subscribers

Post-restructuring	New Telecom	New China Mobile	New China Unicom
Number of landline subscribers in 2010	170 million	27.745 million	96.635 million
Number of Mobile service subscribers in 2010	90 million subscribing CDMA	615.6 million subscribing GSM	153.4 million subscribing GSM
Number of broadband subscribers in 2010	60 million	10 million	47.224 million
3G license in 2010	CDMA2000	CDMA2000	WCDMA

Table 2-3 Comparison of Post-restructuring Service Revenue and Profit

Post-restructuring	New Telecom	New China Mobile	New China Unicom
Revenue of 2010	219.367 billion	485.231 billion	171.3 billion
Profit of 2010	15.262 billion	150.754 billion	3.85 billion
Capital Expenditure of 2010	43.037 billion	124.3 billion	70.19 billion

Table 2-2 and 2-3 suggest that China Telecom has obvious advantage in family and corporate subscribers, making it more adaptable to competition in all-round services in the future. Brands such as “BizNavigator” targeted at government and corporate subscribers and “My e-Home” targeted at families have already been established while initial results have been achieved in corporate and family gateways, creating favorable conditions for providing indoor digital services in the future. Therefore, China Telecom is the biggest rivalry of China Mobile.

No matter where their respective advantages lie, the three major operators will prioritize corporate subscriber service as it can promote development and bring larger profits. It will be a focal point in their competition to not only maintain current corporate subscribers but only

stretch out for new ones. Corporate subscriber service is an integral part for all the three operators.

2.5 Status Quo of China Mobile Sichuan

On July 28, 1999, China Mobile Group Sichuan Co., Ltd. (hereinafter referred to as Sichuan Mobile) was formally established. As approved by the State Council and arranged by China Mobile Group, Sichuan Mobile successfully became a listed company in HKSE and NYSE in June 2002, thus completing major reforms in its operational system. Hence, Sichuan Mobile became a subsidiary wholly owned by China Mobile Group. Since its establishment, Sichuan Mobile has acted in accordance with its long-term strategy, "being a world class telecommunications company" and sought development in line with its guideline, "moving forward step by step without stop" (Tan, X, H., 2010).

Currently, Sichuan Mobile is the largest mobile telecommunications operator in Southeast China. According to the arrangement of China Mobile Group, Sichuan Mobile is in charge of the network development plan, project construction, and network maintenance and service delivery in Sichuan. It has such famous brands as "Go Tone", "Easyown" and "M-Zone". Mobile phone numbers starting with 139, 138, 137, 136, 135 and 134 have been popular among households. In 2005, new numbers starting with 150, 151, 152, 158, 159, 187 and 147 were added, and in 2009, numbers starting with 188 were designed especially for G3 users. Sichuan Mobile has a registered capital of CNY 7.483 billion, assets scale of CNY 29.6 billion, 5,286 staff members and branches in 21 cities and autonomous prefectures and 192 counties. Sichuan Mobile, with its center on customers, provides differentiated services. Its business concentrates on constructing and investing in the mobile telecommunications network within the province, voice, data and multi-media services, IP telephone services, linking computer network with international networks, various value-added services based on mobile telecommunications, related services in system integration, roaming settlement, technology development and other telecom and information services.

By 2010, number of mobile subscribers of the company exceeded 30 million, occupying a market share of 80%. Base stations grew from 1,100 in the beginning to 13,062, with more

than 37,000 carrier and 9.68 million lines of GSM exchange capacity. Urban areas, scenic spots highways and rural areas all enjoy 100% coverage. Currently, the company has initiated international roaming services with 292 operators from more than 220 countries and regions to meet customers' growing demand. All network quality indicators have met world-class standards (Zhou, J., 2010).

Currently, Sichuan Mobile has established a top-notch mobile telecommunications network of wide coverage, high-quality and varied services. The number of subscribers has exceeded 35 million. It has also initiated international roaming service with 404 operators in 237 countries and regions. By May 2010, 21 cities, autonomous prefectures counties and townships in the province enjoy 100% coverage; highways, national tourist resorts and hot spots enjoy continual coverage; and Chengdu, together with some other cities, enjoys TD-SCDMA coverage (Zhou, J., 2010).

Sichuan Mobile sticks to its strategy of "becoming a world-class telecommunications company" and its target of "becoming the best company in the Sichuan's telecommunications industry" (Zhou, J., 2010). It has kept innovating to strengthen its capability, evolving into a competitive and culturally-advanced company that is responsible to society. By now, Sichuan Mobile has become the largest mobile telecommunications operator in western China, occupying the dominant position in the industry.

Currently, Sichuan Mobile's all-round services are still in a fledging stage. In face of the new landscape after the restructuring, Sichuan Mobile has, according to the strategy and guidance from China Mobile Group, put the operation of all-round services at the top of its strategic agenda. The operation of all-round services requires the full integration of the operator, services and contents. In this respect, Sichuan Mobile will build upon its initial progress in all-round services and develop with the trend.

Centered on customers, Sichuan Mobile provides differentiated services that are tailored to individual customer need. It has developed WAP, "E Mobile Terminal" and "Qunying Group" services for Go Tone subscribers, mobile games, music and entertainment services for young people, "Holiday Roaming Package" and "Campus V Network" for college students, and FNS and "Happy Family" set for individual customers. In recent years, Sichuan Mobile

ranks favorably in its charging support system, 10086 service hotline, business hall services, group informatization and network quality (Xie, L. Q., 2009).

While its profits are snow-balling, Sichuan Mobile has not forgotten its responsibility towards society. In return, it has initially evolved into a competitive and culturally-advanced company that is responsible to society. Looking into the future, under the leadership of China Mobile Group and interests from the Provincial Committee and Government, Sichuan Mobile will unswervingly deliver its commitment to promoting local economy and the construction of informatization. It will also take an active part in public benefit activities and charity work, so as to make a contribution to the construction of a harmonious society and the realization of leaping development in local economy.

2.6 Current Situation of the Study in China and Abroad

2.6.1 Domestic Study about Customer Value

The study by Chen Mingliang (2001) involved the issues of customer value. The author used customer profit and customer purchase as two indexes to describe customer value, categorized customer by customer value and customer loyalty, suggested to use transaction amount and profit as the characteristic variables to indicate the level of customer relationship, and divided customer's life cycle into four stages: study stage, formation stage, stable stage and regression stage. At the same time customer value (net cash flow) synchronized with fluctuation of loyalty and trust, and formed a curve like an inverted "U". It means that current loyalty/trust of customer can, to some extent, be used to forecast the change of indirect calculation evaluation of the customer's value for some time in the future. If current loyalty/trust of the customer is quite high, it means his monetary value will take a trend to increase in some time after this; or, on the contrary, it will take a trend to drop. One of the meanings of the variable of customer relation characteristics lies in that it can provide enterprises with a shortcut to judge potential value of customers in the future. Keeping valuable customers in stable stage for a long term can maximize the lifetime value and bring long term profit to a company.

Qi Jiayin (2002) thought that customer value could be shown in two aspects: firstly, in customer's current value, that is, customer's current net cash flow; secondly, in customer's potential value, that is, the potential of net cash flow of customer in the future. The study stated that customer value should refer to the overall capability of a company's key decision maker to sense current and future net cash flow from customer under the conditions of management for him. Customer value assessment index system should be built by using current value and potential value as overall indexes so as to assess customer's value to a company. The study set off from quantitative approach, used dynamic variables to shape CLV model of typical customers and of any individual customer under dynamic conditions, and proposed the best investment plan for companies and general rules of customer investment in full life cycle for companies.

Other scholars conducted further study on the base of predecessors' studies. For example, Tan Yuexiong, Zhou Na and others (2005) thought that on the base of analyzing current studies in customer life cycle value model and influences brought about by the changes of parameters in the model, by introducing dynamic customer preservation rate and related customer life cycle time, discussed the extension of customer life cycle value model, applied the extended model in subdivision of company customers, and proposed company Customer segmentation and customer relation management strategy based on customer value. Based on customer value assessment theory and aiming at specific features of customers of telecommunication carrier group, Guo Liang and Zheng Feng (2006) conducted analysis and research, and designed group customer value assessment index system, value calculation method and customer division method that include 3 current value indexes and 6 potential value indexes. Lv Zhiguo and Jin Yongsheng (2008) designed an index system for measuring the value of group customers, and proposed marketing strategy to increasing the value of group customers. Cao Qingyuan and Yin Tao (2009) utilized hierarchical analysis method to discuss models for subdividing the value of VIP customers of carriers, and conducted marketing tests in field. Meanwhile, they proposed marketing strategy in accordance with features of value of different VIP customers. The effect of channel marketing, services marketing, product business marketing and other specific measure can provide references for

subdivision of customer value and featured marketing strategy for telecommunication carriers in the future. Xie Liqin (2009) made overall discussion about customer value assessment method in related study documentations, analyzed current customer value and the study of current conditions of customers subdivision, established corresponding customer value assessment system, combined customer value subdivision and customer activities subdivision together, proposed Customer segmentation based on customer value, and drafted flow for customer value analysis and development strategy according to the subdivision. Yang Nanfei (in 2010) studied marketing strategy of group customers of China Mobile CD, and proposed marketing strategy, competition strategy and implementation plan for the market of group customers. Principal component analysis was used to prove and analyze the current value - future value structure of group customers, and 4 types of values of group customers were divided according to high value and low value in two dimensions of current value - future value of group customers. Zhou Jian (2010) used China Mobile ZG as the object of study, utilized customer related management theory to build group customer value assessment model, defined index system for value assessment from three dimensions: customer contribution, customer property and customer influence, and built group customer value assessment model for China Mobile ZG, in which group customers were subdivided into three categories and five levels including high value customers, strategic customers, model customers, etc.

2.6.2 Oversea Studies about Customer Value

The study of group customer management was originated from the study of VIP customers by western scholars. In 1980s "Important Account" (Fioeea, 1952), "Major Account" (Colletti & Tubridy, 1957) and "National Account" (Shapiro, Moriary, 1985) were mainly used. McDonald (2002) thought management of VIP customers should refer to "the process to allocate and organize resources by balancing specific customers that are helpful for reaching the company's targets or are very important and key for reaching the company's target so as to achieve the most optimized transaction". Gosselin and Heene (2005) proposed the concept of strategic customer management, and believed that "strategic customer management should refer to identify and select strategic customers, and establish the proposition of a series of unique value by capability construction and leverage in the

partnership with strategic customers." A lot of scholars conducted studies about the management of group customers.

There are also a lot of studies overseas about group customer value assessment. For example, Shapiro (1993) believed that customer value should be the difference between the price paid by customers and the costs invested by a company, which is customer profit. Conway and Fitzpatri (1999) defined customer value as customer profit, and elaborated five sources of customer value. Meanwhile, the study used customer value and customer loyalty as two indexes to subdivide customers, structured customer category matrix into golden customers (that is, high-high), risky customers (that is, high-low), marginal customers (that is, low-high) and customers without extra services (that is, low-low), and proposed different customer relationship development strategies for different types of customers. The study used customer value and customer loyalty as two separate variables. Customer value stilled referred to customer's current net cash flow, and customer loyalty implied forecast about the potential of customer's cash flow in the future. But, the two variables were not put together into customer value. Hogan, Lemon and Libai (2003) believed that there were two direct sources of customer value: primary consumption value and periodic consumption value. After customer's purchase, there were little relations or no relations at all between customers and companies. Thus, the contribution of value only existed in primary consumption value. While for services, there might be not only primary consumption value, but also value of periodic consumption or periodic use expenses.

Chapter 3: Relevant Concepts of Group Customer

3.1 Definition of Group Customer

Bulk subscriber, government and corporate subscriber and group customer are three concepts into which telecommunications operators usually classify their customers. China Telecom combines subscribers from governments, enterprises and institutions into government and corporate subscriber while China Unicom and China Mobile call them group customer or bulk subscriber. From the perspective of operators, there is no clear definition of group customer yet. Generally speaking, group customer refers to customers from governments, enterprises or institutions, customers from a whole industrial sector or related customer groups whose consumption mode is similar to group customer. Group customer is an important strategic resource for operators (Zhao, J. Y., 2009).

The three concepts mentioned above evolve with the development of the telecommunications industry, of which, the concept of bulk subscriber is one of the three strategic groups of China Telecom. As domestic telecom transformation deepens, China Telecom formed new strategic groups based on the characteristics of governments, enterprise, families and individuals. China Mobile, however, classified its customers into individual and group customer. As there is no such concept as family subscriber in China Mobile, its group customer is very similar to the government and corporate subscriber of China Telecom because they are all customers from companies. However, the business scopes of the tow operators do not totally overlap.

Bulk subscriber refers to customer groups that use various type and large amount of services. They usually require trans-regional networking and generate great profit for operators. They can also be potential groups operators try to seize in their competitions. Bulk subscriber includes key subscribers, high-value subscribers, group customers (here refers to the group customers of China Telecom) and strategic subscribers. Key subscriber refers to customers from governments, administration, military and other departments; high-value subscriber refers to non-household customers who spend more than CNY 300 per month for

their bulk use of services; group customer refers to groups that are interconnected in economy or business, with their telecommunications services clarified by a single institution or department; strategic subscriber refers to customers that have a exemplary role in their own field, their behaviors greatly influencing other customers in their sector and their great potentials making them hot for competition among operators (Zhao, J., 2008).

China Telecom has built government and corporate subscriber services upon sectoral applications and is gradually expanding services into cross-sectoral applications. Government and corporate subscribers refer to customer groups of enterprises and other non-for-profit organizations, including bulk subscribers and commercial subscribers. Experience from some IT service providers has shown that a solution provider is more likely to succeed in the government and corporate market when it classifies subscribers in specific ways according to customer sectors and construct powerful solutions based on customer needs (Xu, Q. H., 2006).

Group customer of China Mobile refers to institutional units (or establishments attached thereto) that sign, in the name of the party, government or military, institutions, enterprises or NGO, sales contracts with mobile operators for products or services and thus establish customer relationship with operators. As the definition suggests, there are three characteristics for group customer of China Mobile: first, a group customer should be an institutional unit of establishments attached thereto; second, it must buy and use products or services from China Mobile; third, its purchase belongs to organizational purchase and contacts or agreements are signed (Wang, L., 2006).

Number of group customers that have signed specific business agreements and are included in the group management of China Mobile is called statistical caliber. Information typed into the system must include such contents as corporate name, sectoral category, contact number and address, number of China Mobile phones, information of group customers and purchased services. The system must also be able to provide such information as the number of individual customers in the group, unified payment from the group, total payment and payment of respective services. Inclusion into group management means that relevant information is typed into the group customer support system to provide products and

telecommunications solutions and auxiliary service resources to subscribers.

The key to competition in the group customer market depends on whether an operator has a loop-locked management process. It must, through coordinated optimization in the front and back, discover, define customer needs and provide quality group services through plan designing, implementing and after-sale maintenance. The application of telecommunications in group customers can not only provide guarantee in telecom, but also raise corporate management levels. It plays an important role in marketing and operation: group customer market has enough room huge value for application. The parent company of China Mobile has world-class quality networks whose coverage and stability have been test stone for the capability and service delivery in the telecommunications industry. In addition, China Mobile has abundant group products and is able to provide suitable products and services for group customers. China Mobile upholds technological innovation and professional service delivery. It always gets ready to provide sectoral solutions tailored to individual customer needs.

The strategic importance of group customer in the mobile market is becoming all the more obvious. In the initial stage, China Mobile provided free calls within the V network and reduced fees so as to bind and penetrate into group customer. It viewed group customer as an important means to develop and maintain customer relationships and prevented customers from unsubscribing China Mobile. In the whole development stage, group customer shows “two highs and one low” (ARPU of individual customers in group customer is high; percentage of high-value individual customers in group customer is high; and unsubscribing rate of individual customers in group customer is low). This is of key importance in a time when mobile customers are subscribing and unsubscribing in large numbers (Ruan, X. W., 2007). Presently, group customer market is moving towards mobile informatization. To meet such a demand, expenses of informatization of group customer is included in the revenue of telecommunications operators, a phenomenon that has never existed before. Therefore, group customer is by no means the simple adding-up of individual customers. It is a brand new market of complex and inter-related structures. It has unique customer demands and market characteristics.

Group customer and individual customer are two different types of customers. The

former has distinct characteristics and differences in promotion mode, product characteristics, service management and operation management.

From the perspective of customer characteristics, though the number of group customers is small, number of individual customers included is huge. They have varied demands, mainly demands in voice communication, data information, application in certain sectors and personalized services. It usually takes them a rational reasoning process to transform those demands into purchasing activities. Individual customers, however, mainly need voice communications and they are mostly perceptual in decision-making.

From the perspective of products, services and characteristics, client integration system and application and personalized solutions are provided to group customer. Prices are determined through negotiations and according to product characteristics, with personalized fees and discounts added. For individual customers, service combos are the primary way to bind customers.

From the perspective of services and management, marketing methods directed at group customer usually involve elite teams that provide marketing service system for group customer, including client managers and plan managers, as well as sectoral consultants. Group customers are classified for management according to customer value, sectoral characteristics and the complexity of services provided. For individual customers, they are classified for management according to standardized services pursuant to customer value, ARPU and customer groups.

From the perspective of operation management, what matter for group customer are operation standards and commitments, green passages and SLA. For individual customer, what matter are basic network charging, maintenance and guarantee. This shows that what is mature in individual customer market will not necessarily, or even absolutely can not, apply in sectoral market. Currently, group customer centers of China Mobile and China Unicom have separated their operations from the market departments. If ideas of individual customer market are copied and overall management, marketing, services and operation modes still originate from operation and service modes of individual customer or bulk individual customers, no efficient modes will be achieved notwithstanding optimization and no efforts

can lead the way to success.

In general, compared with individual customers, group customers have complex and capricious demands that are hard to predict. As they are highly professional, informatization products need to be combined with the production of subscribers. Group customers have strong ability in negotiating prices and huge demand for services. A single product or price cannot easily persuade customers. Successful marketing requires through supports from providing products and functions to maintenance of customer relationships.

Difference between group customer and individual customer are summarized in Table 3-1.

Table 3-1 Comparison of Characteristics of Group customer and Individual Customer

	Group customer	Individual customer
Sales cycle	long	Short, one-time visit
Customer relationship	Long-term, extensive	Short-term, partial
Decision-making in purchasing	Many decision maker or influencers	Relatively few decision makers
Decision-making process	complex	simple
Sales team	teams	individuals
Returned customers	Many	Relatively few
Products	Solutions, for the use of many	Single combo product, for individual use
Marketing focus	Value to subscribers	Product functions

The comparison suggests that there are huge differences between the demand of group customers and individual customers. Therefore, while dealing in differentiated ways with marketing and customer service strategies of group customers and individual customers, it is important to clarify where the potential value of group customers lies. It is also important to

tell real group customers from ordinary individual customers because only by this can operators consolidate their foundations against the backdrop of network integration, restructuring and market transformation.

3.2 Characteristics of Group Customer Market

As mentioned above, there are huge differences between group customers and individual customers. This section will explore the issue in detail.

1. Purchase made by professional personnel(Gao, D. N., 2008)

Purchasing personnel in group customer are usually professionals with technical background. For instance, when we provide MAS service for customers, the opinions of technical personnel for group customers are very important, which, to a large extent, directly influence the ultimate choice of customers.

In face of the professional demand of group services, mobile companies should provide detailed technical materials and special services to customers and explain the pros and cons of their products and services from a technical perspective.

2. Derivative demand(Gao, D. N., 2008)

It is for providing products and services to their customers that group customers use services of mobile companies. Therefore, mobile services are the derivatives of consumption goods and should change with the demand changes in consumption goods. For instance, banks use text message service to give us reminders of deposits, withdrawals and consumptions. On this basis, some banks have asked whether mobile companies can provide such services that enable banks to care for their customers through text messages or conduct market surveys.

Therefore, when we are providing products and services, we need to improve the flexibility and restructurality of existing standardized products apart from personalized services.

3. Many influencers in purchase decision-making(Gao, D. N., 2008)

A blog once referred to “plum blossom petals” in member information, a comparison which indicates that the plum blossom petals are the influencers in purchase decision-making

of group customers. In general, the following people have influence in purchase decisions: users, influencers, decision-makers, approvers, purchasers or funders and information controllers.

However, for some group customers, decision-making is actually an autocratic process where few parts participate in it. Therefore, when promoting services and doing public relations with group customers, we must understand and analyze their internal structure and relationships among various powers.

4. Long-term purchase(Gao, D. N., 2008)

The promotion of group services and products will be nothing as easy as account opening or ringtones, services that can be completed in minutes. Especially for projects like sectoral application, many departments and personnel will be involved in demand discovery, intention negotiation, project initiation and related application, implementation, testing and final acceptance by customers. Many projects require long-time implementation. The writer, for example, once followed a project from initiation to testing and acceptance. That project lasted for more than 10 month, surviving two managers of the center. Another project, also, lasted for over a year from initiation to acceptance.

Therefore, it is necessary to, while taking into consideration characteristics of customers and services, effectively manage projects from initiation with project teams centered on projects themselves or customer managers, so as to improve the purchase efficiency of group services and save time. Actually, a project manager should, upon project initiation, undertake the pre-work to establish a project team that includes the customer manager, technical support, network department and engineering department.

5. Personalized and professional demand(Wang, A. L., 2010)

Group customers have huge demand for complex and high-quality services that are prone to changes. They are highly professional and have diversified need for information products. Only high-performance and diversified products can meet the consumption concept of group customers. Operators should combine their products and solutions with the actual operation of group customers, and in the same time, improve productivity and reduce costs.

6. High standards for quality(Wang, A. L., 2010)

Group customers pay more attention to the stability and reliability of telecommunications products. When choosing products, they take favorable considerations brand effect of a product it because brand advantages can to some extent reflect the integrity and authority of products and, in the same time, meet the status of a group customer. Stability and reliability is the basic quality group customers seek in information products, including the concept of dual stability of product functions and marketing services. Group customers have high standards for services and a single product or price cannot easily persuade them. Successful sales require a whole-process service support system from providing product functions to delivering service, from technical training to technical support, from products maintenance to maintenance of customer relationships, and from pre-sales to after-sales.

7. Enormous market value(Cao, Q. Y., and Jin, Y. S., 2009)

High-end customers can usually be found in group customers. With group consumption, individual customers in group customers can reimburse some of the telephone charges and therefore and less sensitive to charges. For group customers, decision-makers are relatively separated from users. Successfully persuading a decision-maker can motivate a batch of users to subscribe or unsubscribe a network. Therefore, high market development efficiency is achieved. There has been hard evidence that average ARPU of individual customers in group customers is generally higher than ordinary individual customers.

8. High loyalty of subscribers(Cao, Q. Y., and Jin, Y. S., 2009)

Group customers pay more attention to practical value, instead of prices, than individual customers do. Experience has shown that unsubscribing rate of group customers is much lower than individual customers. The application of group informatization products and personalized corporate solutions add to service adhesion, increasing unsubscribing costs for group customers and therefore substantially reducing unsubscribing rate.

9. Fierce market competition(Cao, Q. Y., and Jin, Y. S., 2009)

All telecommunications operators are targeting at the group customer market and establishing respectively independent operation systems. It is especially worthwhile to note the marketing team for executives of China Unicom. As Yimin Coal and Electricity Co., Ltd. is an important quality customer of Hulunber branch of China Unicom, the General Manager

of the branch does marketing in person for the executives of Yimin. He adopts flexible charging policies, giving up a large part of cellphone costs to preemptively occupy quality resources in the group customer market. Though PAS has only an extremely small share of the market, the original China Netcom in Yimin River, with its years of experience of organization and operation in group customer market, bound products together to stabilize its preemptive advantages. Competition in the group customer market is becoming all the more fierce.

10. Relatively simple competition method(Cao, Q. Y., and Jin, Y. S., 2009)

From the competitive behavior of operators in the group customer market, competition schemes and behaviors are diversified. However, as service improvement and brand promotion need a relatively long time, competitors in the initial stage all resorted to directly lowering down service charges and offering free telephone traffic and terminals. They aimed to provide preferential customer experience through these simple and direct ways. However, this may cause customers who are not sensitive to charges or services to consider or even decide to unsubscribe.

3.3 The Importance of Group Customer

China Mobile announced on Oct. 11, 2011 that its group customers had exceeded 3.15 million, an increase of 9.8% compared with the same period the year before. Customer coverage reached 40.4%, with coverage of important group customers reaching 67.8% (Xu, X. Z., 2011).

Group customer is the new prospect for the telecom market in recent years. In 2008, China Mobile established the department of group customers and began to expand into the group customer market. According to data provided by China Mobile, in August 2011, its group customers witnessed a net increase of 40,000 subscribers compared with the previous month, in which, individual customer increased by 2.331 million, reaching 220 million in total. In the same time, revenue from group customers also increased by 21.4% compared with the same period the previous year (Xu, X. Z., 2011).

From information disclosed by China Mobile in 2011, the greatest increase in customer

scale and revenue can be found in governments, the educational sector and the financial sector. Relevant materials show that China Mobile's group customers from governments reached 338,000, an increase of 24.2% compared with the same period last year; group customers from the educational sector reached 195,000, an increase of 26.6%; group customers from the financial sector reached 78,000, an increase of 36.6% (Xu, X. Z., 2011).

Experts have pointed out that China Mobile's expansion in the group customer market has combined the development trends of mobile internet and the internet of things. Wireless City will be the most important carrier for its expansion.

With restructuring and the issuance of 3G licenses, the telecommunications industry ushered in a new stage of competition. As China Telecom, China Mobile and China Unicom are competing in a comprehensive manner, the strategic group customer market will inevitably become the focus of competition (Zhao, J. Y., 2009). There are three main reasons. First, compared with individual customer market, group customer market has the characteristic of "two highs and one low", that is, high ARPU (Average Revenue per User), high share of revenue and low unsubscribing rate. Take China Mobile as an example. From January to October in 2008, the accumulative ARPU of group customers reached CNY 89n, CNY 32 higher than the overall market. Aggregate revenue from group customers reached CNY 108.9 billion, accounting for 31.2% of the total operation revenue. Unsubscribing rate of group customers stabilized at around 1%, 2.22% lower than that of the overall market. This feature became all the more obvious as market competition grew fierce. In 2009, unsubscribing rate of the individual customer market bordered 10% in some highly-competitive provinces, with super-low-end customers accounting for more than 5% of all subscribers (Zhao, J. Y., 2009). The phenomenon of subscribing and unsubscribing in large numbers was becoming acute. Therefore, the stability of group customer market, as a core market, becomes especially important. Second, most group customers enjoy high social status and strong influence in society, especially such agencies as the party, governments, military, new media and such sectors as banking, electric power and transportation. They can not only bring direct economic benefits to operators, but also, to some extent, influence their market expansion. Third, group informatization revenue has become an important source of

newly-added revenue of operators. With integration of industrialization and informatization, group customers begin to value the corporate informatization drive. Reductions of unit price charges and slow revenue growth of traditional voice services encourage operators to put more energy into the development of such strategic services as broadban internet and the application of group informatization.

Compared with non-group customers, group customers have high value, high loyalty, high adhesion and high competitiveness. Take the data from a mobile branch in 2009 as an example. ARPU of individual customers was CNY 60 while that of group customers was CNY 70; unsubscribing rate per month of the individual customer market was 4.3% while that of the group customer market was only 0.5%. In general in group customer market, China Telecom is temporarily in the leading position due to its advantages in traditional landline and broadband (Zhou, J., 2010).

The group customer market, as the most valuable market in the customer categories of the mobile telecommunications industry, contributes to nearly 40% of the profit. Group customers not only reflect the telecommunications demand among staff within the group, but also the corporate informatization demand for publicity and mobile office. Therefore, group customer market is full of competition and has become the first test for operators build foundation for all-round services.

From the consumption habit of group customers, China Telecom and China Unicom, through years of experience in landline services, are naturally related to group customers. In the blank area of group customer market, China Unicom and China Telecom focus on the binding of landline and broadband, and thus enjoy much lower entry costs than China Mobile. In addition, China Telecom and China Unicom have already had more than half a year of experience in the organization and operation of group customer market.

Therefore, according to the “20/80 Rule” (20% of customers produce 80% of the profit) proposed by Italian economist Pareto and years of experience in the mobile sector, we can define our priorities in group customer market: our strategies to maintain and attain group customers should be differentiated as all group customers are not worth high-cost maintenance (Zhou, J., 2010).

How can we define who makes a valuable group customer? What kind of group customer is worth our efforts and high costs? These questions require us to classify the current group customer market in detail with scientific assessment methods so as to take targeted marketing strategies post to the determination of customer value.

3.4 The Importance of Developing Group Customer Market

1. Relatively low entry barrier in group customer market (Luo, W. J., 2009)

Generally speaking, successful marketing towards key personnel or telecommunications purchase teams of a group customer can upgrade it to a high-value group customer. Likewise, the overall maintenance of group customers is an effective way to consolidate individual customers within the groups, thereby improving marketing efficiency and economy of resource input.

2. High value of group customer market(Luo, W. J., 2009)

Compared with individual customers, group customers have high credibility and ARPU. Market surveys have shown that subscribers whose charges are paid by institutions or enterprises account for more than 15% of the total. Among these subscribers, mid and high-end customers occupy the lager part of the pie and enjoy an ARPU 30% higher than individual customers. It can be said that consolidating group customers is beneficial to cover the golden customers in the individual customer market.

3. Relatively low unsubscribing rate of group customers(Luo, W. J., 2009)

In face of the phenomenon where mobile customers subscribe and unsubscribe in large numbers, individual customers within group customers witness obviously lower unsubscribing rates than ordinary individual customers. This is an important signal for operators to seize this characteristic for more powerful service development.

4. Group customer market is an important foundation for data service development (Li, G. Q., 2008)

Data service will be the revenue generator for telecommunications industry in the future and group customer market will be an important market foundation for the development of

data services. Group customers have communication and management demands independent from individual telecommunication needs. Their demands mainly arise from internal communication and management, communication between groups and new clients and communication between groups and old clients. In recent year, mobile sectors in foreign countries have witnessed rapid development in online work distribution, mobile promotion and management of mobile customer relationships, all of which are solutions specifically applied in the management and marketing activities within corporations.

From the perspective of the market, firstly, group customer market has initiative in learning data services and is quick to accept such service. Secondly, group customer market commonly view the application of data services as a low-cost investment to boost sales, and thus is less sensitive to price changes. These characteristics determines the fact that if operators can choose suitable data application products and penetrate into group customer market with effective publicity channels and methods, data service will have even lower entry barrier in group customer market and market capacity and profitability will in turn increase.

5. Cost-effectiveness of consolidating group customers(Li, G. Q., 2008)

Obviously, once an operator establishes sales relationship with a group customer, this relationship will last relatively for a long time because its establishment and cancellation will influence an extensive group of people. No unstable relationship as that with ordinary individual customers is possible. This means that once a group becomes a subscriber of an operator, the operator can secure the group customer with relatively low cost and high efficiency.

3.5 Product Classification and Characteristics in Group Customer Market

There are many ways to classify informatization products. Network-based classification result in text messages, multimedia messages and GPRS, while platform-based one result in MAS and ADC. Classification can also be made according to functions. This thesis, however, tries to classify group customer products of China Mobile from the perspective of customer needs.

Group customer products of China Mobile can be classified into the following

categories:

1. Group text/multimedia message: mainly such basic passage-type products as MAS and mobile office assistant. China Mobile also has its own platforms that are connecting with MAS and is carrying out re-development. Application covers office network, webmaster network and production network. MAS, however, act only as a middleware in the message passage and service platform.

2. Group ringtone: group ringtone. Group ringtone is separated because as a wireless value-added product, it has close tie with individuals in groups, which results in different policy-making process from other group products.

3. GPRS special network: mainly GPRS network and M2M platform. Internet of things has become a new revenue generator and the development of GPRS, to a large extent, equate to the development of internet of things.

4. Group ICT products: including such integration-type products as Truck Trafficking and One-Card. They are also products or projects highly coupled with telecommunications.

5. All-round services: including group voice special line, calling center, TD landline, mobile manager, and international internet special line, WAN and other products closely related to video surveillance or special line service. These products enjoy group payment and are, to some extent, substitutable.

6. Internet or mobile internet: mainly including corporate real name, corporate fetion, corporate e-mail, and corporate website construction. They are the first products an enterprise use after entering mobile internet.

7. Products oriented towards individuals in a group: “Nongxintong” and “Caixintong”. These products are not suitable for promotion of customer managers because they are not so closely related to groups.

8. Products oriented towards individuals in a group but also related to the group: “Jingwutong” and “Chengguantong”. These products must be negotiated with group customers. After platform construction, only individuals in the group have access to the platform. However, it is still the group who has the decision-making right of the project.

9. Application platform combined with China Mobile and platforms with industrial characteristics: CRM, ERP and OA of China Mobile.

It has become a priority for China Mobile to find ways to give full play to its advantages in scaled subscribers and promote products with more added values faster than its competitors. Against this backdrop, informatization products targeted at group customers, represented by MAS and ADC, have become China Mobile's focal products for promotion. China Mobile hopes to increase revenue and strengthen service ties with customers through such promotion, namely, to integrate personalized products into the real work of customers so as to make the more dependent on its products and prevent competitors from stealing customers through pricing measures.

Main group products promoted by China Mobile Sichuan are shown in Table 3-2 (Tan, X, H., 2010).

Table 3-2 Main Group Products Promoted by China Mobile Sichuan

Traditional group products		Group informatization products	
		MAS MAS	ADC ADC
IP Zhuanzhangtong	Community messages	Mobile OA (MAS)	Mobile OA (ADC)
Group V Net	Corporate E-mail	Mobile Finance (MAS)	Mobile Finance (ADC)
Group Ringtone	Mobile Office Assistant	Mobile Purchase, Storage and Sales (MAS)	Mobile Purchase, Storage and Sales (ADC)
Conference	Voice message notice	Mobile customer service (MAS)	Mobile customer service (ADC)
Group wireless special net	Mobile location	Mobile phone mail (MAS)	Mobile phone mail (ADC)
"Yijiantong"		Wireless website (MAS)	Wireless website (ADC)

3.6 Advantages and Disadvantages of China Mobile in Group Customer Market Competition

Due to historical reasons, China Telecom has rich experience in internet resources and landline operation, occupying an advantageous position in government and corporate market. After restructuring, China Telecom made use of its advantages in customer relationship and comprehensive services to seize group and individual customers of China Mobile. From a geographic perspective, China Unicom has obvious competitiveness in North China. Although China Mobile has absolute advantage in traditional individual customer market, group customer market is still a weak link. Organization structure, technical support, human resources and network resources are in an inferior position, making it possible that the gap in group customer market between China Mobile and China Telecom, China Unicom will widen. Group customers of China Mobile are mostly financially important customers. Group customers of China Telecom and China Unicom, however, are not only financially important, but also important in comprehensive services, thereby more viscosity than those of China Mobile.

In the competition of all-round services, centering on group customers, lowering down charges, offering free terminals and binding services are the basic means of attracting high-end subscribers for China Telecom and China Unicom. The two operators have launched brand combos or low-charing combos specialized for group customers in many provinces, such as BizNavigator and “Government Dangzhengtong”. They have reduced charges by 20% to 30%. For executives and core members in a group, they offer free cellphones. With group guarantee, members in a group enjoy free cellphone or cellphones with a small amount of pre-deposit, thereby reducing 50% to 100% of cellphone purchase of subscribers. They have also constructed a “comprehensive virtual net” for landlines, PHS and cellphones for individual members, marketing broadband, information, landline and terminals in a “product package”. This measure has, to some extent, attracted telephone traffic and revenue from China Mobile in group customer market. In the information field, China Telecom and China Unicom initiated “Digital Urban Management” and “Wireless Urban Construction”,

vigorously expand ICT services, thereby projecting a image of a leader in this field and further showing China Mobile's disadvantages in group customer market.

China Telecom and China Unicom have relatively improved operation support system in group customer market. From the perspective of organization structure, the two operators have long established a tertiary structure of headquarters, provincial and urban organization. China Mobile, though has headquarters for group customers and more than 20 provincial ones, is not uniform in its branches in cities and counties. By Feb. 2009, local branches in several provinces have not established independent headquarters for group customers. Compared with China Mobile, China Telecom has better management teams, customer managers and its support teams. Its management personnel and personnel quality all exceed that of China Mobile. Particularly, China Telecom, through vertically integrated management and control, has formed a unified brand and image for its major customers nationwide, enabling customers to enjoy non-differentiated services anywhere in China. China Telecom has also established nationwide customer manager responsibility system and virtual teams to provide organization guarantee for major customer service and effective operation. A vertically integrated coordination and support team, account managers included, has been formed in organization system and operation mechanism through pre-sales, sales and post-sales processes.

However, the quality of customer manager team of China Mobile is not high enough. In most cases, individual customer manager is concurrently the group customer manager, lacking systemic and highly efficient management and support teams. In the operation support system of group customer market, China Telecom and China Unicom have established dedicated system integration companies while China Mobile resorts to outsourcing without specially-established integration companies. Major projects of China Mobile are performed under cooperation with other companies.

Of course, China Mobile has its own advantages in developing group customer service. First, it has a relatively long time frame; second, it has a good vision of customer demand for mobile informatization, thereby knowing in advance the relationship between mobile informatization and the original informatization of customers; third, it has a large market. The detailed analysis is as follows:

First, landline operators, though with mobile licenses, are only able to start with some voice-related services. They need some time to integrate network, systems, agencies, personnel and procedures, which at least requires two or three years. Therefore, China Mobile has a relatively long timeframe during which it can do something great with poise when its competitors are in a mess. Especially for now when China Mobile is in good operation with abundant funds and competitiveness, it needs to build its foundation by investing in resources. The most valuable target for group customer market in the next two or three years is not profitable revenue indicators, but the improvement of basic capability and market competitiveness. A sound standards system separated from KPI indicators is needed to assess whether that target is achieved. KPI mostly emphasizes results and achievements. Though result-orientation and indicator guidance are good management measures, they only apply before the operation of all-round services. Therefore, a sound standards system is as important as, even more important than, KPI.

Services launched today should be compared and contrasted not only within China Mobile, but also with that of future competitors. It is important that China Mobile makes good use of the timeframe to transfer resources into real ability. Therefore, first of all, we should stay poised when others are scrambling, so as to nurture our advantages. We need a set of ideas, means and systems to define what is important and what is not. Some original priorities may seem not that important in the new environment. The first target of landline operators after entering group customer market may as well be voice service subscribers. This important move is an attack for defense. Under the new backdrop, a sound system, apart from KPI, is important for assessing importance. In this respect, China Mobile has great opportunities and even comparative advantages.

Second, China Mobile has a good vision of customer demand for mobile informatization, thereby knowing in advance the relationship between mobile informatization and the original informatization of customers. China Mobile today is faced with a lot of practical problems which it may have solved completely or incompletely before landline operators take moves. Though it takes a while for China Mobile to learn more, it has preemptive advantages in mobile informatization. It is totally possible that China Mobile can shorten the learning period

and build strengthenable systematic capability.

Third, China Mobile has a huge market. It needs to expand the storage market into a big one because a big market has many advantages. Some services may seem to be in the B2B mode, serving the group customer or the agency or institution itself. However, this is not fixed as they companies or institutions have their own business contacts as well. Therefore, what is more explored today is the B2B2C mode and a big market has conspicuous advantages in progress towards such a mode. China Mobile has a great influence on low-stream customer groups, thereby further influencing the direct contacts of such customer groups. Trans-network charges and intra-network settlement left alone, he who controls low-stream customers has advantages in negotiations and pricing. Therefore, the advantages of this big market must be fully tapped, for it is a cornerstone for starting services from scratch.

With valuable timeframe and abundant resources, China Mobile can build its capability within limited support framework. China Mobile has been involved in mobile informatization in advance, bringing objective and mature experience in learning curves. As long as it can absorb such experience quickly, it can move faster than its competitors. As a big market cannot be built in one day, such advantages can make China Mobile an important player in group customer market.

Chapter 4: Assessment of Group's Customer Value

4.1 Implication of Customer Value

In reference to "customer value", it has meanings in two layers: one is the value brought to customers by enterprise; the other is the value brought to enterprise by customers. The two meanings have strong relevance: on the one hand, only the value provided for customers by enterprise is improved, can the value brought to enterprise by customers be realized continuously; on the other hand, only customers' ceaseless growth can bring enterprise's sustained development, and only customers' constant growth can bring sustained development of the enterprise. The origin of the development of customer value theory can trace back to relationship marketing theory. Numerous research results have come out in the whole process of the development of customer value theory, for example (Feng, X. H., 2008):

The cost for developing a new customer is several times of that for retaining an old customer;

Repeat purchase of an old customer can shorten purchase cycle, which benefits the enterprise to formulate production plan, improving the enterprise's efficiency to make a strategic decision;

By maintaining old customers and improving their satisfaction, the enterprise can build corresponding public praise effect, and carry out cross-selling and up-selling to customers. Meanwhile, the propagation effect of old customers' public praise will also become an important way to attract new customers.

In consideration of the versatility and different connotations in different angles of customer value theory, the assessment of customer value will mainly be considered in aspects of customers and the enterprise:

On the part of customer, customer value theory means that products and services create value for customers, and the enterprise (customer) improving its own value by products and services;

On the part of enterprise, it refers contributions that customers bring to the enterprise in a whole life cycle.

Sum up, the definition of customer value needed for this research is very clear and distinct. The so-called customer value is the judgment of enterprise for real and future contributive capacity in current management situation, which can be described in following aspects:

Customer value is an objective reality. Different results of analysis on customer value can be obtained with different purposes and in different angles by different methods; therefore we often carry out judgment to objectively existing customer value by method and standard of subjective affirmation.

Customer value is subject to management situation of the enterprise. There exists distinguishes for the enterprise on the cognition of comparative importance of current and future monetary value of customers in different external business environments and on different stages of self-development. The judgment for the enterprise on customer value can be clearly divided into current contribution and future contribution, which therefore can highlight the importance of future contribution.

Focusing on two views on time demarcation of customer value (one thinks that time demarcation of customer value refers to remain life cycle from now to disintegration of customer relationship; the other believes that time demarcation of customer value refers to the whole life cycle from the beginning of customer relationship to its disintegration), this research will adopt remain life cycle as time demarcation of customer value (namely, the first view) (Luo, W. J., 2009).

Though the definition of customer value is diverse without unified statement yet, we can still describe it from following three main aspects:

1. The value provided for customers by the enterprise

That customers are feeling subjects of value and the enterprise is feeling object of customer value is to perceive the value of products or services provided by enterprise in customers' point of view, which is the most abundant and profound content in achievements of the research field of customer value at present. This customer value measures the size of

consumer's surplus provided for customers by enterprise. Customers make purchase decision by the compassion of consumer's surplus provided by different enterprises. How to understand and cater to customers' demands is a key research point for this field.

As to this implication, understand of Woodruff and Kotler (2002) to customer value has been recognized by most scholars. By empirical research of how customers regard the value, Woodruff puts forward that customer value is the preference and assessment perceived by customers of product attributives which are for (or against) realizing their own goals or purposes in specific situation of use, actual effect of those attributives and the result of use, in addition, it also combines products, situation of use, and relative results experienced by goal-oriented customers. Kotler presents customer value in the opinion of customer delivered value and the satisfaction of customers. The premise of research is that customers will purchase products from those companies they think can provide the highest cognitive value. Customer delivered value refers to the difference between total customer value and total customer cost. Total customer value is the serial benefits obtained by customers from certain specific product or service, including the value of product, service, personnel and image, etc. Total customer cost is the serial costs paid by customers for purchasing products or services, including monetary cost, time cost, spiritual cost, labor cost, etc. The customer is a pursuer for maximum value, and always wishes to obtain maximum benefits by minimum costs to satisfy his own needs to the greatest extent when purchasing products or services.

2. The value created to the enterprise by customers

Enterprise is the feeling subject of customer value and customer is the feeing object of the value, which is an emerging research direction related to customer value in recent years. This customer value measures relative importance of customers to enterprise, beneficial the enterprise to provide products, services and solutions under the goal of long-term maximum benefit.

The theory of customer value and customer relation originates from relationship marketing, so customer value theory initially focused on whether the enterprise can provide customers with individualized services and improve the value for customers. With the development of theoretical research and ceaseless change of actual situations of the enterprise,

both scholars and administrative staffs of the enterprise understand that treating all customers equally without discrimination by single consideration of providing value for customers will waste enterprise's resources and impede enterprise's development. According to the "20/80 Rule", enterprise should recognize those important customers and provide more excellent services and products for them rather than assign resources to all customers averagely.

3. Customer value with enterprise and customer being feeling subject and object of the value

This is a brand new research field, with very limited influential research achievements. By means of relation, partnership and alliance to achieve mutual benefits is the key research point of this field at present.

Research of this text focuses on customer value under the second meaning, namely, research the customer value in enterprise's point of view in terms of the demarcation, assessment, quantification, optimization and relative management application of customer value. As to the definition and explanation of customer value, experts at home and abroad such Frederick Reichheld (1996) , Kelly D. Conway (1999) , Chen Mingliang (2001) , Qi Jiayin and Shu Huaying (2003) , have made numerous profound and rigorous research.

4.2 Significance and Demand of Value Assessment

Since the development and retaining of group customer is critical for sustained rapid development of the enterprise, and not all group customers have equal contribution on value, it's very significant to assess its value, with following several aspects:

1. Strengthen aggregate analysis on group customer (Gao, D. N. , 2008)

Carry out analysis on contribution of group customer and learn about customer's value, so as to provide vigorous support for differential services and accurate marketing; set up group customer value assessment system, realize effective assessment on the value of group customer, conduct real-time monitoring to scores of the value of group customer, and carry out effective analysis aiming at the change of group customer's value.

2. Strengthen the analysis on informatization application of group customer (Wang, A. L., 2010)

In order to realize effective analysis on industrial application and products of group customer, it's necessary to demonstrate the development condition of group customer's businesses in multi-aspect according to customer's development situation, using situation of businesses and revenue situation, so as to provide effective support for refined management of group customer's businesses. With the establishment of MAS and ADC platforms, only the expansion of industrial application on different load-bearing platforms and detailed analyzing work of group's products can further promote smooth development of MAS and ADC businesses.

3. Deepen marketing analysis of group customer (Wang, A. L., 2010)

Construct and develop business themes related to the marketing of group customer, excavate potential customers and customers' potential demands, and analyze customers' development quality, realizing vigorous support to precise marketing.

4. Perfect comprehensive appraisal and statements of group customer (Gao, D. N. , 2008)

Form comprehensive appraisal index and assessment system of group customer by integrating statements submitted by each company, so as to provide good basis for better value assessment.

The establishment of group customer value assessment system is crucial for providing corresponding services for each classified customer, while the construction of marketing system based on value assessment is a specific way for the enterprise to maintain and stabilize market share as well as detailed application of market segmentation theory in marketing practice. Stratified stereo marketing service standard parallel to each classified customer can not only save the enterprise's operational resources to the greatest extent, but also benefit to increase customer's viscosity and improve the satisfaction of customers to relative products and services.

Group customer value assessment is the most key step to implement and confirm group customer strategy. During the whole assessment process, staffs from the highest leaders to consumer managers in basic level should understand the meaning of value assessment profoundly and reflect the situation of group customer actually and objectively.

Group customer value assessment is fundamental work done for transition of telecom operation enterprise facing with information-based society. When establishing corresponding marketing policies, it's necessary to excavate potential demands of group customer in depth on the basis of value assessment, develop various information-based products which can closely combine production activities of group customer, and become guider of the market rather than follower.

Each provincial-level Mobile Corporation subordinated to China Mobile should strengthen group customer's assessment and the communication and use of marketing experience. When combining characteristics of group customers in Sichuan Province, simultaneously cooperate with and develop trans-provincial and even transnational group customer value assessment system, and formulate corresponding marketing strategy.

4.3 Major Objective of Value Assessment

Guarantee core customers with most value and stability and development of key groups by carrying out assessment of group customer value, highlighting key points and tilting resources. Assessment of group customer value can scientifically quantize and segment the market, reasonably planning development layout, optimize allocation system of resources, centralize advantageous resource and power, ensure stability, promote the value of key customers and strategic customers, and seize the commanding height of competition in future market, so as to form solutions of optimized management for group customer (Gao, D. N., 2008).

The value assessment of group customer is not a single system. The object of assessment is customer, and the result of assessment is to provide products and services for customers by operational enterprise in an even better fashion, striving to achieve win-win effect. In detail, purposes of group customer value assessment mainly include:

1. Profoundly understand key factors influencing characteristics of customer value, carry out scientific and effective classification, and grasp core customer resources (Gao, D. N., 2008).

2. Formulate differential products, prices and service strategies to expand market rapidly and accurately (Gao, D. N., 2008).

3. Establish group customer channel system, and cover the market segment by multi-way and stereo means, making concentrated and efficient use of limited resources of group customer (Li, X. Z., 2010).

4. Carry out assessment on application value of group customer's industry, and implement pertinent measures for market's expansion and popularization by means of industrial application (Li, X. Z., 2010).

5. Quantize various kinds of appraisal indexes, and formulate scientific and effective performance appraisal system and effect assessment method. Doing businesses related to the market, it's necessary to understand the market first. Group customer value assessment needs relatively complete and accurate information about customers to provide support; the implementation of value assessment promotes operational enterprise learn about the condition of relevant group customer further (Guo, L., and Zheng, F., 2005).

6. As to the plan and popularization of industrial application of group customer, it's necessary to assess industrial application value of group customer at first, which can promote the enterprise to conduct the market's expansion and utilization of industrial application pertinently(Guo, L., and Zheng, F., 2005).

7. The service resource of group customer is very limited, with irrational allocation, which has become the common problem facing by Mobile operational enterprises across the country. The enterprise needs reasonable classification of group customer, and then should provide service sources aiming at different classifications of group customer, so as to guarantee stable and efficient utilization of group customer's resources. Formulating feasible measures for group customer service should be based on effective classification of group customer (Guo, L., and Zheng, F., 2005).

8. Formulate pertinent marketing tool and charge strategy for group products, on the basis of deep segmentation of group customer. Value assessment is beneficial to accurate positioning and market segmentation of group customer, being the fundamental work to promote marketing service level of group customer (Li, X. Z., 2010).

4.4 Main Direction of Value Assessment

It's significant for assessment work to confirm the direction of group customer value assessment reasonably, which can guide the implementation of the whole assessment proposal.

1. Enterprise's goal is to create value continuously, and the resource of enterprise value is the customer. However, a problem troubling the enterprise all the time is how to make clear which customers are creating value, which are high-value customers and which customers are consuming value. It's not affirmative that customers with high income or of large scale are of high value. As telecom operators, the development of group customer businesses has already turned to the promotion of value from the expansion of scale and income. At present, the competition of group customer has entered into the stage of storage competition. Homogenization of telecom business results in the transition of competitive focus to the relationship between its own customers, and key point of value increase has transited to value promotion brought by business innovation (Li, X. Z., 2010).

2. The core of group customer work is management of customer value. The philosophy of former management system is taking products as the center, optimization of income and profits brought by selling products as the goal, products and product combination as the objects, and promotive management as the management way, segmenting customer classifications by means of customer positioning, promoting and strengthening competitive advantage by technology and products. However, the philosophy of customer value management is to highlight customer value as the center, maximization of customer's long-term value as the goal, customer relationship and combination as the objects, dynamic and interactive management as management way, and customers' trends as segmenting principle, building competitive advantage by promotion and maintaining of customer value (Li, X. Z., 2010).

3. Group customer value management is the only way for the development of group customer. When customer relationship is in entering stage, the main goal of customer relationship is to establish relationship, and main contents of customer work are intersection of customer's demands and enterprise's business, recognition of new customer and establishment of new relationship; when customer relationship is in development stage, the main goal of customer relationship is the promotion of customer value, and main contents of customer work are customer value assessment, customer segmentation and promotion of customer value; when customer relationship is in stable stage, the main goal of customer relationship is the maintenance and increase of customer value, and main contents of customer work are customer value assessment, the secondary customer segmentation and maintenance of customer value; when customer relationship is in degenerating stage, the main goal of customer relationship is the recovery of customer value, and main contents of

customer work are recovery of customer value or termination of customer relationship (Guo, L., and Zheng, F., 2005).

4. Value assessment is the starting point and basis of value management. Quantization is the core basis of management idea at present. Only the quantized matters can be implemented as standards and have basis for assessment and appraisal. Realize effective conversion from visible value to value management through the whole process of quantization, understanding, control, improvement and scientific management. Quantization is the most primary characteristic of value assessment. The process of quantizing customer value is to carry out assessment on customer value. Group customer management needs to conduct quantization of customer value, and value assessment is the fundamental condition to promote group customer management level and realize the promotion of group customer value (Gao, D. N., 2008).

5. The foundation of customer value management is the quantization of customer value. Customer value management refers that by dynamic track and management of resources of target customer, the enterprise expects to realize long-term value interaction between enterprise and customer, so as to maximize the effect of such relationship and achieve win-win goal between customer and enterprise. Value assessment is the specific quantization of customer value, and the starting point and foundation of customer value management. Quantization is the first step of scientific management. It can direct control and obtain final purpose in the end. If you can't quantize certain things, you can't understand it, and then you can't control it, so that you can't improve it (Guo, L., and Zheng, F., 2005).

6. Value assessment becomes more important after all-round operation, which need to excavate storage customer deeply, discover potential customer, identify high-value customer, maintain important customer, incite defection of customers belonging to competitors, and strengthen important competitive foundation. By integrated value assessment system, optimize the allocation and utilization of relevant resources, concentrate advantageous resources, and ensure to stabilize and promote the value of key customers and strategic customers, forming total solution that all-round era carry out optimized management and control to group customer (Gao, D. N., 2008).

4.5 Standard of Value Assessment

Optimization of economic utility is the standard advocated by many scholars in reference to assessment of customer value. The satisfaction of customer is to satisfy customers equipped

with long-term profits, and relationship between enterprise and customer must guarantee profits are larger than costs. Customer relationship management reflects such principle centrally. It achieves the optimization of economic utility by identifying, maintaining and developing enterprise's customer of value.

In addition, many scholars think that total customer value mainly include two parts, namely, total customer value=current value + potential value. At present, all researches on both current value and potential value are considered centering on incomes provided for enterprise by customers, namely, monetary value. For example, current value can be interpreted as that incomes provided for customers subtract product or service costs provided for customers. However, though potential value takes into account of the possibility that customers use enterprise's products in the future, ultimately it should also consider revenues and profits brought to enterprise by customers in the future (Wang, A. L., 2010).

However, when measuring customer value, it's not comprehensive for assessment on enterprise value to just considering monetary value provided for enterprise without consideration of influence. "4P" (Product, Price, Place and Promotion) theory put forward by Jerome McCarthy has developed into "6P" theory—adding Power and Public Relations, which has been widely recognized by academic circle and industrial circle.

Nowadays, with fierce market competition, it has become an important way to keep good relations with government and other influential social organizations or groups and properly draw support from them. And some customers served by enterprise exactly possess these influences, which can't be reflected just in terms of financial incomes. For example, government departments may not make great contributions to enterprise in terms of incomes, but they are influential in aspects of formulating relevant policies, implementing market management and control, etc. In addition, if some enterprise customers are leaders of key industries in certain region with the influence of wind vane on other customers, and willing to use products or services provided for them, other enterprises in this field will be inclined to follow, which further enlarges enterprise's customer scale. Therefore it's essential to take influence as assessment index when researching customer value.

4.6 Principle of Value Assessment

Customer value assessment system is important foundation for enterprise to carry out assessment on customer. Without perfect assessment system, the assessment on customer value will contain excessive subjective randomness and unreasonable factor, with no comprehensive, objective and fair assessment on customer, which is harmful to establish long-term customer relationship.

For this reason, the group customer value assessment system adopted by this text complies with scientific and rational principle on the whole to the greatest extent, and the specific implementation process strives to abide by following important principles (Li, G. Q., 2008):

1. Scientificity

The establishment of index system and construction of assessment model should have scientific basis and vigorous support of quantized dada.

2. Comprehensiveness

Analyze influencing factors of group customer value in terms of attribute, contribution, loyalty and influence of customers, so as to comprehensively reflect characteristics of group customer and various factors influencing group customer value. The assessment should reflect influencing factors of group customer value comprehensively as far as possible and show group customer’s features accurately.

3. Objectivity

When confirm influencing factors of customer value, establish scientific assessment index system by way of mathematical statistics and data mining through data quantization process of the system. Assessment model should be constructed according to the theory of structural equation model, with scientific basis and the support of quantized data. The whole assessing process demonstrates objective reality to the fullest.

4. Independence

When construct assessment index, reduce the correlation of indexes as far as possible. Control the degree of correlation to the smallest range by relevant analytical method.

5. Dynamics

In assessment, it's necessary to measure the value contribution of group customer at present and also fully consider its increasing potential of value in the future, so as to carry out proper adjustment for key customers through some indexes.

6. Foresight

Assessment work should take into account of actual situation of group customer comprehensively, and meanwhile give consideration to both short-term and long-term goals of value assessment.

7. Operability

Though some assessment indexes are very appropriate but difficult to obtain, they are impractical, with on realistic operability. So the design of index should combine theoretical knowledge with actual condition as far as possible, which can not only comply with theoretical requirements, but also satisfy the resource limitation of realistic value assessment. Besides, the set of index system should avoid excessively fussy situation to the greatest extent, should have realistic use and simultaneously give consideration of quantization of index, the difficult level to obtain data and the reliability of data involved in index system, making the customer value assessment possess good operability.

Chapter 5: Customer Segmentation

5.1 Theoretical Sources of Customer Segmentation

Just the same as birth of any other method, customer segmentation also needs corresponding theoretical basis, which mainly includes following aspects.

1. Heterogeneity of customer demands (Tan, Y. X., Zhou, N., and Yu, Q., 2005)

Demands from different customer groups are different, if there are over 2 customers, heterogeneity exists in their demands. Diversification in demand, desire and behaviors of customers are determined by factors affecting them making consumer decisions. So, we can separate customers according to those existent differences, namely customer segmentation, inner basis of which is the heterogeneity of customer demands.

2. Consumer level hypothesis (Ding, H. T., 2009)

In today's world, economy is under substantial development with gradual increase in people's income; hence, consumption would increase as well. However, increase of consumption is not linear, but keeps on changing in the form of interzone-distributed steps, that is to say, if consumption of customer reaches a certain level, such variation trend will tend to be smooth. Just as consumer level hypothesis said, comparatively seeing within a period, consumer level or habitat is stable, so, we obtained theoretical premise and basis to divide customer groups according to their behaviors.

3. Finiteness of enterprise resources and purposiveness of effective market competition (Tan, Y. X., Zhou, N., and Yu, Q., 2005)

Generally, resources are rare, no enterprise could meet with all demands from overall market relying on its own human resource, financial resource and material resource which is caused by the finiteness of enterprise's conditions and can't be employed in terms of economic effects. Just for rareness of those resources to all customer groups in the market, distribution of resources must be selective. Different customer groups must be separated, and each enterprise shall find their most attractive customer segmentation market which could

maximize services and carry out detailed analysis on detailed issues, making different service strategy for different customer groups and pooling resources for intensive service on important customer groups, only in this way can we use resources to the most and grab the decisive occasion for competition at the same time.

4. The 20/80 Rule (Tan, Y. X., Zhou, N., and Yu, Q., 2005)

Based on CRM, customers of different relationships have different values. According to the famous 20/80 Rule: 80% of profit acquired by enterprise is brought by 20% of top customers and even in some industries, over 100% of profit of enterprise is brought by 10% of customers, that is to say, the important majority is created by the key minority. In addition, part of the profit is used to compensate customers failing to bring in profit. So, we can carry out segmentation on profit of customer sources in CRM according to the principle of cost benefits and divide customer groups into three parts: high-value customer, low-value customer and negative-value customer, meanwhile, management meaning would be different to different categories. Therefore, what need to be done by enterprises is to find out customer groups who can bring them the most benefits, namely those 20% of customers; and at the same time, find out those would bring them losses, namely negative-value customer and then make different service strategy for different customer groups.

Doubtlessly, not all rules are generally accepted, without exception to the 20/80 Rule. As the theoretical basis of customer segmentation, it is not adaptable to the whole industry. For instance, in automobile industry and real estate industry, it is obviously that 80% of automobiles are not bought by 20% of customers and so is real estate industry, where 80% of houses are not bought by 20% of owners. Only in telecom, bank and retail industries is this rule adaptable.

5.2 Concept of Customer Segmentation

Customer segmentation refers to classification made by enterprise on customers according to customer value, customer demand, customer preference and corresponding factors under condition that enterprise has confirmed market strategy, business mode and concentrated market. Consumers in same classification share similarity largely and distinct

differences exist between different segmented customer groups. Customer segmentation comprises of 2 kinds: one is predictive segmentation and another one is clustering segmentation. Predictive segmentation is carried out by supervised learning, namely, purposely looking for segmentation eigenvalues to separating customers on the basis of known characterizing definition(such as excellent customer and negative customer) of subgroup of each customer group; clustering segmentation is to divide customers in way of unsupervised learning, namely, dividing customers into umpty clusters under the condition of no clearly confirmed segmentation objective, in which customers from the same cluster share certain degree of commonness on certain aspects (Ding, H. T., 2009).

Customer segmentation is also called as relationship segmentation, which is generally considered as from market segmentation. Customer segmentation is the extension of thought of market segmentation in the management age centering on customers. The term market segmentation appeared firstly in 1956, put forward by famous marketing specialist Wendell R. Smith (Wendellr R . Smith, 1956) from USA, which refers to the progress of dividing the whole market into two or more submarkets based on certain factors affecting customer demands according to otherness of customers in industry market or consumer market. As a kind of marketing theory and method with management concept of focusing on market, market segmentation can be used for guiding enterprises on positioning of target market, thus making it easier to market products. But as a kind of marketing theory, market segmentation lacks of quantized technical support and its application in enterprise is often quite subjective. Therefore, in recent years, it was replaced by CRM based on customer segmentation and one-to-one marketing (Ding, H. T., 2009).

To enterprises, they would only get half the results with double the effort and get more kicks that halfpence if they want to completely satisfy customer demands and stress on providing services of same quality to all customers. In terms of competition, a real effective CRM system shall allow the enterprise to provide services of different level for customers of different types selectively by means of customer segmentation and achieve the largest input - output ratio. Practice on management indicates that 80% of profit acquired by enterprises is from 20% of customers, so, it is of great important for enterprises to distinguish different

customers, keep and develop those 20% of customers with the largest profit (Ding, H. T., 2009).

5.3 Objective and Function of Customer Segmentation

Customer segmentation makes differentiation possible, products and services offered by enterprises to aim at important links of customers of certain types more directly. It is the basis for product and service development as well as marketing of enterprises (Ding, H. T., 2009).

Yankelouich, D . (1964) poses that product and throughput of enterprises should meet with customer demands more effectively, which would be beneficial for reasonably and effectively configuring resources into segmented market with potential profits.

Suzanne, D. (1992) holds the idea that accurate customer segmentation could effectively reduce cost and obtain stronger and more beneficial market penetration. Enterprises should contribute limited resources into satisfying demands from customers with greater contribution to the enterprise, make sure who should be maintained and has important significance on effectively carrying out CRM, maintaining level of profits and enhancing profitability, so reasonable customer segmentation is vital on ensuring enterprise's successful maintaining customers.

Storbacka, K. (1997) points out that customer segmentation is established on relationship cost and relationship return, and effective customer segmentation relies on correlative, enforceable and homogeneous market segmentation parts. A series of correlative variables could be found for description of behavior demand on each aspect.

In early 1990s, scholars Chofray and Cary Lilien from USA put forward the famous Two-stage Theory, in which they consider market segmentation into two stages: first stage is macro-market segmentation, namely market segmentation between two or among more enterprise organizations, which is carried out based in geographic area, vital statistics, organizational buying and other "observable" characters. In this way, basic feature of market segmentation-homogeneity could be grasped easily. The second stage is micro-market segmentation, namely segmentation among organizations meeting with micro-objective

demands within the selected market scope in first stage. Main objective of micro-market segmentation is for finding common ground among each decision-making party according to actual purchase progress, motivation of purchaser, influence of participator in purchase progress and method for decision making. Practice results show that 80% of profits acquired by enterprise are from its 20% of customers, then, how to distinguish different customers, maintain and develop those 20% of customers who bring in the maximal benefits are of great significant for the existence and development of enterprise (Li, G. H., 2001).

In the management concept of centering on customers, customers are not nothing more than objects we market our products but a kind of important strategic resources. Accordingly, customer segmentation becomes an important basic analysis method, running through the whole process of CRM, involving customer acquisition, customer maintenance and customer development. Its effectiveness will never be restricted to Marketing Dept. any longer. By customer segmentation, enterprise could precisely and sufficiently identify high-value customers, launching strongly pertinent marketing thereupon then according to different demand features of customers, more adequately and reasonably distributing enterprise resources, and finally achieving the maximization of enterprise profit.

Significance of customer segmentation in telecom lies in (Chen, J. B., 2007):

1. Acquire potential customer. According to market segmentation and customer analysis, identify potential customers, improve reaction speed of enterprise in market, optimize structure of distribution channel, and offer variant products.

2. Reduce customer churn. Understand features of customer group with comparatively higher customer churn, especially personality characteristics of high-value customers, improve accuracy of prediction on customer churn and prevent customer churn in advance through real-time monitoring in customer segmentation and controlling development trends of customers with homologous personality characteristics.

3. Reduce service cost and increase operation efficiency. Through detailed analysis on service cost on each customer group, apply the optimal investment program in target market establish target strategy in allusion to each segmented market. For example, bundling of call forwarding function and off-hour service could meet with consumer demand on basic

products from customers in offices.

4. Advance customer value. Customer segmentation produces more accurate marketing information, better channel strategy, more bundling services and packaging services, timelier product demand shift, preferable cooperation strategy and management, improves possibility on added value of services and cross-selling.

5. Heighten degree of satisfaction. Through market segmentation, we can monitor product application of each customer group and yielding of enterprise. By establishing different marketing channels, customize personalized service products for different customer group based on demand and timely learn about product application situation of each customer group, heighten the overall degree of satisfaction of customers on product application.

6. Establish precise marketing strategy. Customize special price, channel, promotion and personalized product for each segmented customer group with an intimate knowledge on personality characteristics of them, achieving strongly pertinent and precise marketing.

5.4 Principle of Customer Segmentation

Enterprises are required to pay sufficient attention to any constituent of customer and market while carrying out customer segmentation and this segmentation must be with use value. So, following principles shall be watched out and complied with in customer segmentation (Sun, Y. M., 2008):

1．Acceptability

In the process of application and practice, segmentation must be carried out grounding on satisfaction of enterprise demands and shall be with significance of practice direction. Enterprise shall act according to its actual strength and ability. As to selection of target customer, intensive, fast and effective marketing ability is required and marketing activities carried out must be pertinent.

2．Measurability

Customer groups forming after segmentation are required to be of some distinct characters that could be measured. Distinct differences exist among different customer groups

while assured components which also share distinct similarities exist within each customer group as well.

3．Stability

Segmented customer groups must have potential for exhumation. For the long and substantial development of enterprise, comparatively stable customer segmentation is necessary which could increase enterprise's efficiency of exploiting market and offering strategy guide. Supposing it changes too fast, we have to reestablish new scheme according to new segmentation before completion or timely implementation of established scheme. Such segmentation would be meaningless.

Success of enterprise sometimes is decided by its selection on successful customer. By customer segmentation, an enterprise could maintain the most valuable customers and at the same time, industriously increase expenditure of potential customers, sparing no effort to transform them into the most valuable customers, thus, the enterprise can acquire the maximal profit.

5.5 General Method and Process of Customer Segmentation

Foreign scholars obtained many different methods from different research angles. Research on customer segmentation in our country germinated later with limitation on research scope and less documents for reference. On account of such situation, visible research findings of our country are not a patch on researches by foreign scholars both on research extent and deepness (Wang, G. X., 2008).

Objective for customer segmentation is for better understanding on them. On accounting of this objective, we shall carry out research on methods for customer segmentation from different angles. Difference on segmentation descriptors and identification of segmentation dimension based on clustering mining technology are the major difference between traditional and modern methods for customer segmentation. In traditional classification method, segmentation descriptors mainly include some essential attributes, such as age, education, salary, occupation and others of customers. Such comparatively simpler traditional method is

quite convenient and concise in primary understanding of customer group, but once we are required to offer services for comparatively complicated marketing strategy, classification on customers only based on essential attributes can't meet with demands any more.

Hereinafter, we will interpret methods of customer segmentation from 5 different angles.

1. Segmentation based on vital statistics

For earliest demographic segmentation which has developed into a system, geography is one of its important segmentation dimensionalities. Nowadays, dimension of demographic segmentation has expanded into sex, age, salary, occupation, family members, education, family life cycle and region, etc. Along with the gradual development of IT, OLAP tool and other data mining technologies could be applied into acquisition and processing of massive population information by improved demographic segmentation method. But to many scholars, classification based only on external features is comparatively defective but with exception to a comparatively stable market or specific sales market for specific products. So, this method is unable to do as well as an enterprise would wish in predicting the future consumer behaviors of consumers.

2. Segmentation based on lifestyle

Research with lifestyle as descriptor originated in a hypothesis that is for implementing marketing strategy in high efficiency, more understanding on customers is needed. Such method of distinguishing and segmenting customers with lifestyle as dimension was firstly put forward. Though systemization on lifestyle is required in this method, no standard on connotation of lifestyle was given out until AIO method which means segmenting customers by activity, interests and opinion was put forward and lifestyle was enriched by demographics from Hummer, connotation of dimension developed into 4D.

3. Segmentation based on activity

Many marketing specialists consider that construction of segmenting market had better start from behavioral descriptors. Measurement on customer behavior helps marketers exactly realize factors need to be improved without equalizing each segmented market, thus, sequencing principle of relationship marketing strategy could be displayed. Hence, we

developed and obtained three methods for segmentation from the angle of segmentation base on activity.

(1) RIM method

One of the generally adopted methods for segmenting customers in database marketing is RFM analysis, distinguishing important account by three indexes of consumer, respectively is consumption recency, consumption frequency and consumption money. Consumption recency is represented by R-recency, namely time distance between present consumption and last consumption, which would result in larger R value if it is shorter; consumption frequency is represented by F-frequency, which is the consumption times within specific period; and consumption money is represented by M-monetary which is limited within a period as well. Dimension on consumer behavior is the analysis element of RFM method which could be acquired easily and through them, consumer behavior could be predicted. Compared with any other elements, predicting consumer's future behavior through their recent consumer behaviors is precise and high efficiency. According to research, we found that customers with larger R and F formed new trading relationship with enterprise and meanwhile, customers with larger M were sometimes returning ones.

(2) Customer value matrix

Customer value matrix was put forward after improving traditional RFM method, in which repeated and accordant influence exists between consumption frequency and total consumption. For eliminating this influence, average consumption was put forward to replace total consumption. In addition, in traditional RFM analysis, customers are over segmented. For simplifying this segmentation result, customer value matrix brought forward at the same time, which is consisted of consumption frequency and average consumption, basic standard of which is decided by their respective average value. Consumption interval is listed separately and used with other factors. In this way, two coordinate axes are determined by basic standard, vertical axis represents average consumption while lateral axis represents consumption frequency, four quadrants are used for defining 4 different customer types respectively, including customer that is ready on consumption, superior customer, indefinite customer and usual customer.

(3) Segmentation method based on customer loyalty (CL)

CL is an important factor in segmentation method based on customer behavior. The most typical methods are compartmentalizing loyalty by behavioral loyalty and attitudinal loyalty. For the emergence of loyal customers, both active attitude inclination and existence of repetitiveness on consumer behavior are needed. Consequently, ladder model of 4 kinds of royal customer relationship emerges as the times require, which takes repetitiveness of consumption and activity of attitude as major indexes. Moreover, there are behavioral loyalty, conscious loyalty and emotional loyalty.

4. Segmentation based on value

Obviously, segmentation with value as descriptor is the segmentation based on value which scores customers by profitability. Customers of different types after segmentation are endowed with matching resource distribution and maintenance strategy and more attention is paid on high-value customer while the lower, the lesser, achieving the most reasonable distribution of resources, effectively improving profitability of enterprise. So, segmentations based on profitability and customer value are derived out from segmentation based on value.

(1) Segmentation based on profitability is also called as profit taxonomy, which means based on value segmentation, marketers divide profitability of customers into two categories, present and future, according to time dimension and segment out markets of different types according to scores of customers, affording corresponding strategies. This method is based on the segmentation thought of customer value and causes established customer maintenance strategy differentially coincide.

(2) Customer value segmentation is comparative to the whole customer lifetime profit and put forward by Chen Mingliang (2001) a scholar engaged in research on customer value segmentation, based on customer life cycle model. Chen Mingliang (2001) has referred to customer value matrix of predecessors, combining customer lifetime profit with pure consumer behaviors, making assessment from customer value more scientific.

On the premise of stable customer relationship, customer value segmentation is divided into “customer current value” (CCV) and “customer potential value” (CPV), but, in the real world, no customer relationship can be definitely stable. Therefore, measurement on quality

of customer relationship can't be carried out if we purely rely on CLP to segment customers and ignore the stability of relationship between customers, resulting in larger risk on resource distribution. So, one of the largest shortages of customer segmentation based on value is that it fails to take quality of customer relationship into consideration.

5. Segmentation based on benefit

Abandoning descriptive factors and employing factors of causality, Haley firstly put forward the concept of segmenting market, which could find out hiding real benefits through superficial behavior, attitude and motivation of consumers; this is an advantage over traditional segmentation method. From current research findings, we can find that acquisition of innovatively developing benefit segmentation lies in two aspects: one is gradually enriched benefit content and another one is diversified benefit segmentation technology.

Benefit segmentation, which is placed in the attachment of customer segmentation theory, since its putting forward, never obtained much attention from related researchers. Current research trend mainly focuses on segmentations based on behavior and value, such situation is quite obvious in China. Based on this, intensive research on benefit segmentation is in urgent need so as to acquire theoretical and piratical bases, better connecting enterprise operation with customer demands. Once we apply benefit segmentation into general marketing, production and enterprise strategy, the future will be bright.

Besides, attention shall be paid on following aspects while we are segmenting customers: 1st, confirmation on characterization factors of customers to be segmented is vital in customer segmentation, which would directly affect result of customer segmentation and assessment on different customers, indirectly affect marketing strategy which comes later. So, we must select those characterization factors and carry out value proposition according to understanding on business demands, and then the segmentation results can be applied into real business process more accurately. At the same time, we should ensure high hit rate and satisfaction of product or service. 2nd, selected characterization factors for customer segmentation must be dynamic, with rich level and angles. Therefore, we should pay close attention on environment of market and repercussions from customer constantly for the purpose of timely optimization and adjustment. So, customer segmentation doesn't mean the simple linking up of five parts, but

gradual reinforcement, close connection and common development. 3rd, customer market to be segmented must be large-scale, identifiable, accessible and with potential benefit. In addition, market after segmentation shall not be over narrow so that concentrated customer groups could afford to support all profits enterprises needed for development.

5.6 Definition of Market Segmentation in Telecom Market

None of enterprises could occupy the whole industry market, without reference to its resources, in other words, they can't acquire all customers in the same way. So, there are innumerable and dispersive purchasers with different demands and habits on purchase. Therefore, each enterprise must find out market suiting it rather than try to compete with all enterprises in the same industry. As to group client which is considered as the market target of the company needing pivotal maintenance and development, after value evaluation and classification, we shall establish corresponding pertinent marketing strategy and strictly carry it out in operating activities. The concept of market segmentation was firstly put forward by American market expert Wendell R. Smith in Product Differentiation and Market Segmentation as Alternative Marketing Strategies published in 1956, which means that an enterprise divides a whole market into empty consumer groups or submarkets according to different features of demands from consumers and consumer group with similar demand characters is a segmented market (Gao, D. N., 2008).

As to telecom operators, market segmentation equals to brand segmentation and service segmentation. The future operation content of telecom enterprises would involve large amount of various value-added services, total income of which would excessively surpass that of traditional basic services. As value-added service, it requires more creation rather than waiting, it urges telecom operators to manufacture fashion, unearth fashion, and create products of high adhesiveness (refer to highly attractive services that can interest users). Telecom market can be segmented into: primarily segmented market (KA, medium and small merchants, residential customers and flowing customers); secondary segmented market (segmented according to CPC, government, army, finance, communications, etc. or according to industry

or region, or as high, medium and low end); third segmented market (segmented according to consumption customs, or with or without mobile telephone) (Gao, D. N., 2008).

5.7 Function of Market Segmentation in Telecom Industry

Target market is clearly decided and marketing portfolio is designed in market segmentation which would be of great significant to telecom operators. Market segmentation could assist enterprise on discovering new market opportunities, causing marketing to be more pertinent, efficient and effective. As an important marketing method, market segmentation in telecom industry comes for adapting to market development of telecom industry, complying with the operation trend that action of enterprises shall be oriented by customer demand. It has following functions on successful marketing of enterprises in telecom industry (Gao, D. N., 2008):

1. Through market segmentation, the enterprise could concentrate its human resources, material resources and financial resources into predetermined market, intensively applying all limited resources into opening up key sally port of market. This is an effective method for operator with lower market share competing with those with higher market share. Meanwhile, it is also applicable to operators with higher market share on improving and firming current customer resources.

2. After market segmentation, enterprise could establish and implement marketing portfolio strategy of high efficiency in allusion to characters of predetermined market, offering service bundling and portfolio, creating new turnover point and increase operation benefit.

3. New development trend of telecom, especially mobile communication, is for satisfying user's demand on individuation. Under the circumstance that traditional pure voice service is reduced substantially while burgeoning data services are under robust increase, creation and recommendation of any new service cannot be separated from deep mining from operators on customer demand. So, market segmentation is the basis for successful recommendation of various new services.

Chapter 6: Introduction to Research Methods

Data mining is a multi-disciplinary integration research field, which includes statistics, database, machine learning, pattern recognition, artificial intelligence, data visualization, optimization theory and other methods, algorithms and techniques, which are used to analyze and process a large number of historical data, to discover implicit, unknown in advance and valuable knowledge.

6.1 Data Pre-processing

In the multi-index evaluation system, different evaluation indicators have different nature or feature, so there are different dimension and magnitude. When the indicators are different among them, if the original value is directly analyzed, the role of the higher value of indicators will be push out in the comprehensive analysis, while the role of the lower value of indicators will be relatively weakened. Therefore, in order to make sure the reliability of the results, we need to standardize the original target data.

Data Standardization is make data scale in a certain percentage expand or shrink, let it into a small data area. In some evaluation index, due to the necessary compared and weighted, a dimensionless pure number should be obtained by eliminating the unit differences in order to make it into a small specific range. When treated some evaluation indicators, the methods of removing the data unit limitation are often used to be transformed into a pure dimensionless number, so that different units or magnitude indicators can be compared and weighted.

In this evaluation system, there is the amount of money, network length, group size, and so on. There are large differences among the indicators, such as tens of thousands of network length, and group size ranging from single digits to several thousand. So if the original index value is directly analyzed, it will highlight the role of network length, and weaken the role of group size. Therefore, it is necessary to standardize the raw data. Data standardization, also known as non-dimensional data, it is a method to eliminate the impact of the index dimension by simple mathematical transformation

The most common methods of data normalization are as follows:

1. The Min-max normalization method

The min-max normalization method is also called deviation normalization method, which performs a linear transformation on the original data. Suppose that $\min_A$ and $\min_B$ are the minimum and maximum values of an attribute A. then the min-max normalization method can be computed as follows:

$$v' = \frac{v - \min_A}{\max_A - \min_A}(new\_\max_A - new\_\min_A) + new\_\min_A \quad \text{(Equation 6- 1)}$$

Min-max normalization maps the value v of A to v' in the range $[new\_\min_A, new\_\max_A]$

Min-max normalization method preserves the relationships among the original data values. It will encounter an "out-of-bounds" error if a future input for normalization falls outside of the original data range.

If $new\_\max_A = 1$ 、 $new\_\min_A = 0$, Min-max normalization is called 0-1 normalization, and the formula can be simplified:

$$v' = \frac{v - \min_A}{\max_A - \min_A} \quad \text{(Equation 6- 2)}$$

This method has a shortcoming: when new data is added, it may lead to max and min value changed.

2. Z-score normalization (or zero-mean normalization)

Z-score normalization is also called the standard deviation normalization. Data processed is in accordance with standard normal distribution, that is, the mean value is 0 and standard deviation is 1. This normalization method is the most commonly used standardization methods in SPSS. The values of an attribute A, are normalized based on the mean and standard deviation of A. value v of A is normalized to v' by computing.

$$v' = \frac{v - \overline{A}}{\sigma_A} \quad \text{(Equation 6- 3)}$$

Where $\overline{A}$ and σ_A are the mean and standard deviation, respectively, of attribute A. This method of normalization is useful when the actual minimum and maximum of attribute "A" are unknown, or when there are outliers that dominate the min-max normalization.

3. Normalization by decimal scaling

Normalization by decimal scaling normalizes by moving the decimal point of values of attribute A. The number of decimal points moved depends on the maximum absolute value of A. value v of A is normalized to v' by computing

$$v' = \frac{v}{10^j} \quad \text{(Equation 6- 4)}$$

Where j is the smallest integer such that $Max(|v'|) < 1$.

4. Broken line type Standardization

The broken line type standardization method is suitable for such a situation that the indicators have different impact results of a comprehensive analysis at different levels, region changes. For example, in multi-index comprehensive evaluation, if one attribute is less than a certain value, the changes have greater impact on the consolidated level, the evaluation value also have a greater change; and when the attribute is greater than this value, the changes have smaller impact on the comprehensive level of the evaluation object, the change of evaluation value is small. In this case, the broken line type standardization method should be applied. For example, in multi-index comprehensive evaluation, if the change in a value range has a greater impact on the consolidated level, but beyond a certain value, the degree of influence is smaller, the corresponding evaluation value change is also smaller.

If the evaluation is only to sort, without depth analysis on the gap between evaluation objects, then no matter what standard methods, would not affect the evaluation results, which is sort-based evaluation of standardization methods is not sensitive.

If the gap between objects needs to further analysis or evaluation and the evaluation object need rating, three principles should be followed:

1. Within the same indicator, the relative gap remains unchanged.

Any standardization method cannot change relative gap in the internal indicator of evaluation objects, because if the relative gap has changed, the final evaluation results have been distorted. For example, suppose a total score of A journal is higher 5% than B journal, it does not mean the real gap is 5%. It may be greater or less than 5%, but certainly not equal to 5%. Standardization evaluation methods cannot change the relative gap within the same indicator. Otherwise, the evaluation results obtained are the distortion of the gap between objects.

2. Within the different indicator, the relative gap is the uncertainty.

The relative gap between indicators refers to the development process of the objective reality, development levels of different indicators are not the same. Some indicators have rapid development, so the overall level may be higher; and some indicators have slow development, so the overall level may be lower. Data standardization must reflect this gap, to simplify this process, by poor normalized. Indicators of rapid development maybe mean a higher overall level, whereas the slow pace of development may represent a lower overall level.

3. The normalized maximum values are equal.

Data standardization must ensure that the maximum value are equal (usually 1 or 100), otherwise it loses the significance of standardization. If a standardization indicator value is less than 1, the total index value is also smaller, so that the public have a misconception of the evaluation results, such as in journal evaluation process, if the normalized maximum value is 0.95, then the first score will be ranked 0.95, not 1.

Suppose there are i evaluation objects, j criteria, the raw data values of each indicator are x_{ij}, the data normalized are y_{ij}. Based on the above three principles, this thesis applies data standardization methods recommended by Yu [57] for evaluation. If the criteria are the positive indicators, the standardization formula is as follows:

$$y_{ij} = \frac{x_{ij}}{\max(x_j)} \quad \text{(Equation 6- 5)}$$

If the criteria are the negative indicators, the standardization formula is as follows:

$$y_{ij} = 1 - \frac{x_{ij}}{\max(x_j)} + \left\{ 1 - \max\left[1 - \frac{x_{ij}}{\max(x_j)} \right] \right\} \quad \text{(Equation 6- 6)}$$

6.2 Calculating Weight of Indexes Methods

In multi-index comprehensive weighted evaluation, the key is to determine the relative weight of each index. Weather the weight of each index is reasonable or not, it directly related to the conclusion of analysis. There are lots of methods to calculate weight of index which can be summed up into two categories: subjective and objective weighting methods.

Subjective weighting method is composed of personnel evaluation and fully reflects the experience of the experts. Recently the most common subjective weighting methods are Delphi, AHP and circular scoring method.

Objective weighting method determines the weight of index according to objective information reflected from real data. The most common objective weighting methods are entropy weighted method, principal component analysis, factor analysis, variance, correlation coefficient, and the maximal deviation method.

Brief analysis of advantages and disadvantages of the subjective and objective weighting methods is given below.

1. Subjective weighting methods

At present, there are a variety of subjective weighting methods, and the research is relatively mature. The common characteristic of these methods is that the weights of indexes are given experiences and actual judgment of experts. Different experts will offer different weight.

Advantages: weights are given by experts based on experience and actual decision problem. And it is reasonably reflect the decision makers' preference and indexes' influence.

In another words, despite the subjective weighting method can not accurately determine

the weight coefficient of each index, but in most cases, it reflects the influence of indexes and the purpose of decision makers. The most important is that weights of indexes be contrary to the real situation is impossible using subjective weighting method, while it is possible if we use objective weighting method.

Disadvantage: Subjective weighting method reflects decision-makers' (or experts') view. Therefore, the main drawbacks of these methods are subjective, arbitrary and less objectivity.

Firstly, the weights determined by subjective weighting method are given by experts based on their experience and practical judgments, so the reliability of judgments is very important. Because the ability of judgments has a great relationship with the degree of knowledge, skills, experience and so on, findings vary with experts.

Secondly, even the same expert, evaluation results vary with different mood.

Thirdly, the importance of properties is often difficult to measure. Some problems and their inherent relationships cannot be identified by objective understanding. Even experts cannot understand the problem completely.

Thus, in some circumstances, results obtained only by the use of subjective weighting method may have a quite different with the practical situation.

2. Objective weighting method

The initial information used by objective weighting method should come directly from the objective environment. Weight of indexes should be determined by information provided by indexes.

If an index value is constant in all solutions, then this index is useless on the identification or sorting of program and its weight should be zero. On the contrary, if an index has a large difference for all programs, then this index plays an important role and needs to given greater weight.

In short, weight of indexes is determined by difference of index in each program. The larger the difference, the greater the weight is.

The most common objective weighting methods are principal component analysis, factor analysis method, entropy weighted method, variance and correlation coefficient method.

Advantage: Objective weighting method is based on relationships and the extent of differences between indexes. On the other hand, it has a strong theoretical basis. So it is objective and convenient to process for computer.

Disadvantage: Objective weighting method does not take evaluation of decision-makers into account; therefore, the weight may be inconsistent with the wishes of the people or the actual situation.

3. Combination weighting method

We can see through the analysis above. Objective weighting method has advantages if actual meaning of indexes needn't be considered, but this will ignore evaluation of decision-makers, or even contrary to actual situation.

Therefore, in order to make full use of the advantages of both approaches and make up for their disadvantages, combination weighting method is proposed. It contains subjectivity and objectivity, reduces subjectivity and arbitrary, and take decision-makers' preference into account at the same time.

Combination weighting method has applied into specific project by Chinese scholars recently (Yao, W. P., 2009; Xu, Y. J., 2010; Hao, G. J., 2009).

In this thesis, AHP and factor analysis method are used to evaluate the value of group customer.

6.3 Principal Component Analysis

In order to analyze and solve problem systematically and comprehensively in the field of engineering, a variety of internal and external factors should be considered. These factors are named index or variable in mathematical statistical analysis.

Each of the variables reflects information of problems from different perspectives. At the same time, there are correlations between variables themselves. After statistical analysis, it is possible for information be in degrees of distortion.

When study multivariate problems using traditional statistical method, too many variables will increase the complexity and cost in computation, or even make the problem

cannot be solved. So facing quantitative calculation problem, we hope to get more information from fewer variables. The principal component analysis is developed under this environment.

Principal component analysis (PCA) is introduced in biological theory by K.Pearson in 1901 (Pearson, K., 1901). And then it is extended to the psychology by H.Hotelling in 1933 (HoteUing, H, 1933).

The main idea of principal component analysis is using a linear combination of portion of the data to represent the original data, and reserve original information as much as possible.

In the analysis process, if we cannot obtain more information from the first linear combination, we will use the second or other linear combination. It is continued until the information obtained is close to the original data contains or meet the accuracy requirements which set by users (Zhu, J. P., 2006). These linear combinations are known as the first principal component, the second principal component and so on.

Basic idea of PCA

In order to analyze the problem comprehensively and systematically, multiple statistical indicators will be selected. However, too much index not only increases the complexity, but also leads to information overlapping. Therefore, it is preferred to obtain more information from fewer indexes.

From the mathematical point of view, there is a need for a mathematical theory and method which can use several variables to represent all original date. These variables contain all initial information, and also can ensure the correlation between indicators as small as possible.

Principal component analysis is a method can solve all problems mentioned above. In a word, it is a method condensing a plurality of variables into a few uncorrelated comprehensive indexes. These comprehensive indexes are called principal component and its purpose is to simplify data and reveal the relationships between variables.

Compared with the traditional statistical evaluation methods, the major advantages of PCA are as follows:

(1) The data analysis is objective because it is based on intrinsic correlation of indexes.

(2) The principal components (i.e., integrated index) is independent of each other, not only reduces the dimension of variable, also reduced the information overlap.

(3) It can reduce the influence of relevant index effectively, and make the main component to provide more information;

(4) There are lots of research findings in domestic and foreign countries. It can be implemented by SPSS / SAS software, and don't need too much manual calculation, so it has strong operability.

1. Steps of principal component analysis method

The calculation steps of principal component analysis method are as follows:

Step 1: the inverse index (the smaller the better) are transformed to be index (the bigger the better).

Step 2: The original data is standardized to generate a matrix $\hat{X}$ and mean of matrix X is calculated.

$$\overline{x}_i = \sum_{j=1}^{n} x_{ij} \Big/ n \ ; \ \hat{x}_{ij} = x_{ij} - \overline{x}_i \qquad \text{(Equation 6- 7)}$$

Step 3: Covariance matrix (R) of $\hat{X}$ is established.

$$R = \left[r_{ij} \right]_{n \times n} = \operatorname{cov}\left[\hat{X} \right]$$

$$r_{ij} = \operatorname{cov}\left[X_i, X_j \right] = \frac{\sum_{k=1}^{n} \hat{x}_{ik} \cdot \hat{x}_{jk}}{n-1} \qquad \text{(Equation 6- 8)}$$

In which, i=1, 2, ⋯, n; j=1, 2, ⋯, n.

Step 4: Analyze of Eigen value of R: $\lambda_1 \geq \lambda_2 \geq \ldots \geq \lambda_d \geq 0$ and corresponding unit eigenvectors $B = \left[b_1, b_2, \ldots, b_m \right]$.

$$b_1 = \begin{bmatrix} a_{11} \\ a_{21} \\ \vdots \\ a_{m1} \end{bmatrix}, b_2 = \begin{bmatrix} a_{12} \\ a_{22} \\ \vdots \\ a_{m2} \end{bmatrix}, \ldots, b_m = \begin{bmatrix} a_{1m} \\ a_{2m} \\ \vdots \\ a_{mm} \end{bmatrix}. \qquad \text{(Equation 6- 9)}$$

Step 5: When the principal component cannot be interpreted very good, then it can be rotated like factor analysis. Factor orthogonal rotation will not change common factor variance of each variable, also won't change model and data fitting.

Factor rotation is intended to find a more simple structure factor, and it can be defined as: each variable has a high factor load in only a few factors, and each factor has high correlation with only a few variables.

Step 6: Determine the number of principal components according to the cumulative contribution rate $M_d = \sum_{i=1}^{d} \lambda_i \Big/ \sum_{i=1}^{m} \lambda_i$. Generally when $M_d \geq 85\%$, the first d principal components are selected to replace the original information of m index variable. And the ith principal component can be expressed as:

$$F_i = a_{1i}X_1 + a_{2i}X_2 + \ldots + a_{mi}X_m = b_i^T \hat{X}, i = 1, \ldots, d \qquad \text{(Equation 6- 10)}$$

Step 7: Construct a linear combination based on principal components F_1, F_2, …, F_d. Variance contribution rate of each main components are used to construct a comprehensive evaluation function:

$$\begin{aligned} y &= m_1F_1 + m_2F_2 + \ldots + m_dF_d = M^T F \\ M &= m_1, m_2, \ldots, m_d \end{aligned} \qquad \text{(Equation 6- 11)}$$

Comprehensive score Y of each sample is calculated and is called the assessment index. Then all samples are ranked according to this score.

2. Characteristic of the principal component analysis method

F=[F1, F2, …, Fk] is the main component, and all Eigen values of matrix R construct a diagonal matrix

$$\Lambda = diag\ \lambda_1, \lambda_2, \ldots, \lambda_m = \begin{pmatrix} \lambda_1 & & & \\ & \lambda_2 & & \\ & & \ddots & \\ & & & \lambda_m \end{pmatrix} \qquad \text{(Equation 6- 12)}$$

Then principal component can be expressed as:

$$F = B^T \hat{X} \qquad \text{(Equation 6- 13)}$$

1st. Sum of square of coefficient of every component is 1.

2nd. Covariance matrix of principal components is diagonal matrix.

$$E\ F\ = E\ B^T X\ = B^T \overline{X} \qquad \text{(Equation 6- 14)}$$

$$\text{cov}\ F\ = B^T \text{cov}\ X\ B = B^T \hat{X} B = \Lambda \qquad \text{(Equation 6- 15)}$$

Sum of variance of original indexes equals variance of principal components. Both of them equal sum of all the Eigen value. That is:

$$\sum_{i=1}^{m} Var\ X_i\ = \sum_{i=1}^{m} Var\ Z_i\ = \sum_{i=1}^{m} \lambda_i \qquad \text{(Equation 6- 16)}$$

Therefore, the principal component analysis is decomposing total variance of original index into some variance of integrated indexes, and making variance (contribution rate) of the first component the biggest.

Assume nonzero Eigen value of $\text{cov}\ \hat{X}$ is $\lambda_1 \geq \lambda_2 \geq \ldots \geq \lambda_d \geq 0$, then λ_1 is the biggest variance and λ_m is the smallest.

3. Accuracy analysis of principal component analysis method

Definition 1 (variance contribution rate): It is the proportion of i principal components of variance in total variance. It is used to indicate the comprehensive ability of the original variables.

$$m_i = \lambda_i \Big/ \sum_{j=1}^{m} \lambda_j \qquad \text{(Equation 6- 17)}$$

Definition 2 (the cumulative variance contribution rate): The proportion of former d principal components in all variance.

$$M_d = \sum_{i=1}^{d} \lambda_d \Big/ \sum_{i=1}^{m} \lambda_m \qquad \text{(Equation 6- 18)}$$

Definition 3 (factor load): It is produced by square root of Eigen value of the ith principal component ($\sqrt{\lambda_i}$) and coefficient of jth original index (a_{ij}). That is $q_{ij} = \sqrt{\lambda_i} a_{ij}$

(Equation 6- 19)

In fact, factor load q_{ij} is correlation coefficients of ith principal components and jth original index. It reflects closeness of principal components and original index. And the absolute value of q_{ij} is important basis of economic explanation.

The matrix consist of factor loadings is called the factor loading matrix.

$$Q = \left[q_{ij} \right]_{m \times m} = \begin{bmatrix} \sqrt{\lambda_1} a_{11} & \sqrt{\lambda_1} a_{12} & \cdots & \sqrt{\lambda_1} a_{1m} \\ \sqrt{\lambda_2} a_{21} & \sqrt{\lambda_2} a_{22} & \cdots & \sqrt{\lambda_2} a_{21} \\ \vdots & \vdots & \ddots & \vdots \\ \sqrt{\lambda_m} a_{m1} & \sqrt{\lambda_m} a_{m1} & \cdots & \sqrt{\lambda_m} a_{mm} \end{bmatrix} \quad \text{(Equation 6- 20)}$$

4. Application of principal component analysis method

Because of low requirement and retaining most of the original information, principal component analysis has been applied to many areas, such as information processing in earthquake, face recognition, character recognition, data compression, and data mining and so on.

(1) Intrusion Detection in Network

Principal component analysis can be used for network intrusion detection system which is divided into off-line (or training) and online (or judge) phase (Nguyen, D., Das, A., Memik G. et a1, 2006).

Training set is as input data in offline phase. Ideally, these data record a real network environment (connections). Data are reduced and produce a set of principal components which are mutually orthogonal Eigen value / vector pair.

That is to say, a group of coordinate axis are produced, and it reflect the intrinsic properties of original data and represents normal network connection. Each Eigen value of component in the principal component represents weight of feature vector.

Component of principal component was arranged from high to low according to the weight. If a new data item can be mapped onto the first few components of principal component which have high weights, then it can be judged without being mapped onto all principal components.

All network connections data to be detected are projected onto the axis and distances between them are calculated. If the distance is greater than a certain threshold, the network connection can be malicious attacks.

(2) face recognition

With a broad application prospect, face recognition is a challenging research topic. It is important in information security, multimedia technology, and security monitoring and other related fields. Principal component analysis is a kind of typical methods in face recognition.

Principal component analysis algorithm was first used to represent human face by Sirovich and Kirby (1987). And a famous face recognition algorithm (Eigen face) was presented by Turk and Pfntland (1991).

(3) Comprehensive evaluation

Lots of indicators are selected to analyze a problem systematically in some fields, such as industrial manufacturing, agriculture, and other high-tech areas. Weight of indexes need to be calculated. Whereas normal weighting method has considerable subjectivity, so it is very difficult to calculate weight of indexes accurately.

The principal component analysis can extract most of original information from the index system, calculate objective weight of indexes, and reduce influence of subjective factors. So it is becoming more and more important in comprehensive evaluation.

6.4 Principal Component Analysis & Factor Analysis

Principal component analysis and factor analysis are multi-variable statistical methods and closely related to each other. They cover a wide range of applications, and can be applied to solve economic, technological, social and other field's problem.

Based on dimensionality reduction ideas, principal component analysis integrates multiple related variables (index) into a few irrelevant variables which contain most of the original information.

Factor analysis is the promotion and development of principal component analysis. In order to reproduce relationship between original variables and factors, it integrates variables into several factors. It also can classify variables depending on different factors.

Similarities:

1. Both of their intention is to reduce dimension;

2. Indexes should be correlated to each other incompletely;

3. Consistency of data processing:

4. It is including data normalization, calculating the correlation coefficient matrix Eigen values and eigenvectors, determining number of principal components/factors according to accumulative contribution rate.

5. Consistency of synthesis:

6. Relationships among variables and principal components/factors are processed by linear relation directly.

Differences:

1. Loss of variance

Principal component analysis explains the total variance of original variable without the loss of variance; Factor analysis explained only part of the information because of existence of special factors.

2. Uniqueness

Solution of principal component analysis is unique, while solution of factor analysis is not unique with factor rotation.

3. Practical significance

Principal components have no practical significance which common factors have.

4. Application

Principal component analysis focuses on information contribution and influence of comprehensive evaluation; Factor analysis focuses on comprehensive evaluation with clear cause.

6.5 Factor Analysis Implemented in SPSS Software

1. Normalize the original data. Dimensionless processing for traditional principal component analysis is the "center standardization". In SPSS, using “Save standardized values as variables” to perform in “Analyze - Descriptive Statistics - Descriptive”.

2. Choose “Analyze - Data Reduction - Factor Analysis”, and factor Analysis dialog box will pop-up

3. Descriptive: Choose “Coefficients” in “Correlation Matrix” box; Choose “Initial solution” in “Statistics” box.

4. Extraction: Choose “Principal components” in “Method” box

5. The results are showed in “Output”: Principal components in “Total Variance Explained” is extracted when total contribution rate is greater than or equal to 85%.

6. Rotation: Choose “Varimax” in “Method” box; Choose “Rotated solution” in “Display” box; The default value of “Maximum Iteration for convergence” is 25.

7. Scores: Choose “Save as variables”; Choose “Regression” in “Method” box; Choose “Display factor score coefficient matrix”.

8. Construct the factor score function and naming the factor.

9. Calculate comprehensive score value of factors.

10. Factors are ranked according to score.

Principal component analysis and factor analysis differ from factor rotation when implemented in SPSS software.

For principal component analysis, there is no need to rotate factors, while factor analysis need to do. And through factor rotation, load of common factors become greater. Therefore, factors become more important.

6.6 Analytic Hierarchy Process (AHP)

1. The origin of AHP

AHP (Analytic Hierarchy Process referred to as AHP) was proposed by the United States Operations Research Professor T.L. Satie in the early 70s, which is a quantitative analysis of qualitative issues, is a simple, flexible and practical method of multiple criteria decision making.

AHP is characterized by the complex problems in a variety of factors into mutual contact through the orderly and enable the principled, based on certain objective and subjective reality

of the structure (mainly pair-wise comparisons) to those expert opinions analysis objectively judge the outcome of direct and effective combination of elements to a level of importance of comparison between two quantitative description.

2. The basic principle of AHP

AHP method divided problems into layers and created a multi-level analysis of structural model, where the layers are scheme layer (the program measures for decision-making, etc.), rule layer and target layer.

Elements of the same level independent of each other, elements of the previous level for the next level of part or all of the dominant elements form a layer dominated by top-down analysis of multi-level model. At every level in accordance with certain criteria, the layer-by on the comparison of each element, the establishment of Judgment. Judgment by calculating the maximum Eigen value and corresponding eigenvectors are elements of the layer elements of the weight on the floor, then calculate the overall goal of each layer of a combination of elements of the weight to get the weight of the various options, select the best program.

3. The basic assumptions of AHP

(1) Progression between levels of structure, that is to low or from low to high progressive. Top elements of the underlying elements are completely or partially dominant.

(2) Leveling independent of each other between the elements.

4. The basic steps of AHP

The AHP was developed by Saaty (1980) and has been identified as an important approach to multi-criteria decision-making problems of choice and prioritization. The AHP also uses a principle of hierarchic composition to derive composite priorities of alternatives with respect to multiple criteria from their priorities with respect to each criterion. It consists of multiplying each priority of an alternative by the priority of its corresponding criterion and adding over all the criteria to obtain the overall priority of that alternative (Saaty, 2003; Kamal, 2001; Liu and Shih, 2005). The calculation steps are illustrated as follows:

(1)Identify the decision problem;

Identify the decision problem stated in the topmost level of a hierarchy which is broken down into different levels, where the final level is usually selected by the scenarios or alternatives to.

(2)Established AHP model;

Structure the hierarchy from the top from the intermediate levels to the lowest level, and it usually contains the list of alternatives.

(3)Structural layers Matrix (paired comparison matrix);

Structured comparison matrix by comparing with each other to determine the criteria by the target weight, AHP 1-9 scale using methods, such as shown in Table 6-1.

(4)Level of the single ranking;

The so-called single-level ranking for each factor is the level of specific factors on the importance of a layer of the sort.

(5)Consistency test;

Do a consistency test according to $CR = CI / RI$ If the test passed, feature vector (normalized) is the weight vector; if adopted, need to re-construct pair-wise comparison matrix.

(6)Levels of total order

According to levels of single-sort results, calculated level model in each layer all the elements relative to the target level of portfolio weights to work out the program level elements relative to the target level of portfolio weights, according to combined weights of the size of the evaluation of programs for gifted Poor, select the best solution.

In order to get pair-wise comparison matrix, this thesis has designed a questionnaire, for a part of the management of the telecommunications industry, and in part for our group customers.

Table 6-1 AHP Scaling Method

Relative importance	Definition	Explained
1	Equally important	The goal I is as important as j
3	Slightly important	The goal I is slightly more important than J
5	Obviously important	The goal I is more important than j
7	Absolutely important	The goal I is obviously more important than J
9	Situated between two important degrees	The goal I is absolutely more important than J
2，4，6，8		

6.7 Customer Segmentation Method

6.7.1 Cluster Analysis Methods in Data Mining

Cluster analysis also known as cluster analysis, is a kind of taxonomy, it studies the individuals and traits (variables), and which exist between the different levels of similarity (closeness). According to the classification of different objects, clustering is divided into two categories: one is to classify individual treatment, called the Q-type; the other is the classification of variables, called R type. R-cluster is based on various features of the object being observed, which reflect the characteristics of the object being observed values of the variables are classified.

The main role of the cluster analysis is to define the distance between individuals in the definition of similarity between variables, distance or similarity between the variables on behalf of individuals or the degree of similarity. So many observations based on a number of individual traits, identify a number of specific individuals or traits to measure the similarity between the statistics to the statistics by type as a basis for some individuals a greater degree of similarity (or characters) together as a class, the other a large degree of similarity between

individuals (or traits) together as another, closely related to the classification of aggregated into a small unit, estranged aggregated into a large taxonomic units; until All of the individuals (or variables) are clustered completed, said the closeness to form a cluster tree, followed by some of the requirements of the individual (or variables) for classification.

6.7.2 K-means Cluster

K-means algorithm is a classic, widely used clustering algorithm. K-means algorithm is simple, effective and can be applied to a variety of data. It is a typical method of partitioning methods, according to the given input parameters K, the data set is divided into K clusters.

K-means algorithm is first proposed in 1967 by MacQueen, and now this method has already become the most widely used clustering algorithm in pattern recognition, mathematical statistics, machine learning and data mining fields. Meanwhile producing a lot of distortion algorithm to format the K-means algorithm family. They have the rapid clustering, easy implement advantage, and can be used for text, image features and other data.

K-means clustering algorithm principle is: Firstly, the k random points as initial cluster centers are selected. And then calculate the distance from each sample to the cluster center. The samples go to the cluster of the nearest cluster center. Thirdly, compute new cluster center after the adjustment of the new cluster, if there is no change between adjacent to the two cluster centers, indicating that adjustment of the sample is to the end. At the time, one error squares sum function has been minimized, clustering criterion function has convergence. According to the initial value, dissimilarity, cluster average value of the different calculation strategies, K-means method has many variants, the data distribution closer to the spherical case has a good clustering results. K-means clustering algorithm is currently the most widely used clustering algorithm, processing the large sample data so well.

1. The conception of K-means cluster

In data mining and data warehouse, there are several typical algorithms: hierarchical methods, partitioning methods, grid-based methods, density-based methods and Model-based methods. K-means clustering algorithm is the most commonly used with a wide range of clustering algorithms. The K-means clustering algorithm tries to find a certain number of

users for a given category based on prototype, simple division of clustering technology. The centers of these categories are often represented by the average of all object data. K-means clustering algorithm is a heuristic iterative process with the objective function to optimization. Each of iteration includes two areas of both "re-division of data objects" and "re-update the class center". It is the use of class as the class representative of the center of gravity in the cluster analysis process, K-means algorithm to the parameter k, the n objects into k clusters so that the cluster has high similarity, low similarity between the clusters. Calculation of similarity of objects based on the average of a cluster (center of gravity is seen as clusters) to carry out.

2. The basic steps of K-means cluster

K-means clustering algorithm has three main processes: the first is to select the initial cluster centers; followed by the classification of sample points; finally the adjustment of cluster centers. And the latter two processes carry on iteration alternately. The following is the process of k-means algorithm description:

Input: the number of clusters k and a database containing n objects

Output: k clusters, so that the minimum squared error criterion Method:

Step1 choose k objects as initial cluster centers;

Step2 repeat

Step3 cluster objects based on the average, each object will be re-assigned to the most similar cluster;

Step4 update the average of the cluster, which is calculated for each cluster the average of the object;

Step5 until no change

3. Advantages and disadvantages of K-means cluster

(1) Advantages: Relative effectiveness: O, where n is the number of objects, k is the number of clusters, t is the number of iterations; usually, k, t << n; when the result is a dense cluster, and clusters with significant differences between clusters, it is better.

(2) Disadvantages: Only in the cluster mean was defined that could be used. May not apply to certain applications, for example, properties involving data classification; need to advance the number refers to the top of the cluster k; cannot handle the noise data and outliers.

Chapter 7: Empirical Analysis

7.1 Data Collection

At first, let's clear up influencing factors of group customer value. By reading literature over the years and discussing with experts, we extract 14 influencing factors of group customer value, including natural attribute and consume behavior, as following table.

There are 20 experts who took part in the discussion, and all of them have worked in telecommunications field for at least 3 years, so it is reasonable to extract influencing factors based on their idea.

Firstly, all experts discussed together, and all factors are put forward; then influencing factors are selected by vote. Factors are extracted only if the vote is bigger than 10 (half of number of experts).

Table 7-1 Influencing Index of Group Customer Value

Serial No.	**Index**	**Type of index**	**Serial No.**	**Index**	**Type of index**
1	Individual ARPU	Benefit	8	Number of individual customers	Benefit
2	Bundle rate of unified payment	Benefit	9	Number of call users	Benefit
3	Number of VPMN short-call users	Benefit	10	Number of group vip	Benefit
4	Number of informationized products users	Benefit	11	Number of staffs	Benefit
5	Number of VPMN users	Benefit	12	Informatization level	Benefit
6	Unsubscribing rate	Cost	13	VPMN using rate	Benefit
7	Subscribing duration	Benefit	14	Administrative level	Benefit

As above table indicates, among the 14 indexes, only “unsubscribing rate” is a cost-type index, namely, if the unsubscribing rate of group customers is lower, its value is higher to China Mobile; while indexes of “individual ARPU” and “unified payment income” are benefit-type index, namely, if their values are higher, the customer value is higher.

Definition of indexes is shown in Table 7-2.

Table 7-2 Index Definition (Shown in Annexes)

These 14 indexes are selected for the following reasons:

1. Represent dependence of group customers

These indexes are: Bundle rate of unified payment, VPMN using rate, Subscribing duration and Number of informationized products users

The bigger the indexes value are, the stronger the relationship between group customers and China mobile. And the group customers are more loyal and probably make more profit to China mobile.

2. Represent group scale or purchasing power

These indexes are: Number of VPMN short-call users, Number of VPMN users, Number of individual customers, Number of call users, and Number of group VIP, Number of staffs, and Informatization level.

The bigger the indexes values are, the bigger the group scale or purchasing power, and more potential value will be made by group customers.

3. Indicate profit contribution made by group customers to China mobile: Personal ARPU.

4. Indicate churn rate of group customers: Unsubscribing rate

5. Indicate society influence of group customers: Administrative level

When sorting out indexes, we select 2,000 groups which have the following characteristics:

1. These 2000 groups are randomly selected from 6000 groups.

2. All of them are organizations or firms of Sichuan province and belong to the same company.

3. All information about these 2000 groups is extracted from BOSS system of Sichuan

Mobile.

4. They cover various industry including government office, hospital, school, post office, Power Company, the tobacco companies and so on.

5. It contains 8 different administrative levels:" Transnational level"," National level"," Province (district) level"," Municipal (state) level"," Municipal-county level"," District-county level"," Town level" and" No administrative level".

Statistic analysis results of the groups are described as follows:

Table 7-3 Descriptive Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Personal ARPU	2000	-28.69	326.30	79.38	23.914
Bundle rate of unified payment	2000	0	1	0.08	0.185
Number of VPMN short-call users	2000	0	28248	256.91	902.989
Number of informationized products users	2000	0	5	4.97	0.255
Number of VPMN users	2000	1	31123	306.69	1018.362
Unsubscribing rate	2000	0	0.23	0.01	0.013
Subscribing duration	2000	12	241	101.55	18.679
Number of individual customers	2000	1	31158	308.33	1020.756
Number of call users	2000	1	30963	306.36	1013.499
Number of group vip	2000	0	2361	37.94	94.162
Number of staffs	2000	0	35000	277.44	1264.677
Informatization level	2000	0	6	0.06	0.465
VPMN using rate	2000	0	1	0.99	0.047
Administrative level	2000	1	8	3.67	1.446
Valid N (listwise)	2000				

We can read values of each statistic from above table, among all 2,000 group customers, “bundle rate of unified payment” and “VPMN using rate” are [0,1], and “unsubscribing rate” is between [0,0.23]. “Subscribing duration” and “administrative level” are pre-processed.

7.2 Data Pre-process

1. “Subscribing duration”

Convert time point into time slot, namely, from the moment of subscribing to August 2011, taking “month” as calculating unit.

For example, if the agreement is subscribed in “August 2010”, the duration will be “12 months”. Among the 2,000 subscribing group customers, the earliest subscription is in “July 1990” and the latest is in “August 2010”, so the maximum value is 241 and the minimum is 12.

2. Administrative level

The 2,000 group customers are in 8 different administrative levels, including “transnational level”, “national level”, “provincial (district) level”, “municipal (state) level”, “municipal-county level”, “district-county level”, “town level” and “no administrative level”. According to the height of administrative levels, we endow the 8 administrative levels with corresponding scores respectively to reflect their influence on society. There into, “transnational level” is the most influential one, winning 8 scores; and “no administrative level” is the least influential one, winning 1 score, with specific conditions as follows:

Table 7-4 Social Influence of Different Administrative Levels

Administrative level	**Influence**
Transnational level	8
National level	7
Provincial (district) level	6
Municipal (state) level	5
Municipal-county level	4
District-county level	3
Town level	2
No administrative level	1

7.3 Dimensions Reduction of Index

In the 14 indexes, several variables have comparatively strong correlation, existing redundant information. In order to reduce repetition of information, as well as reduce calculating complexity, we carry out dimensions reduction of index. In the research, by means of SPSS software, we adopt common factor analysis method to implement dimensions reduction of index.

Specific process of factor analysis by SPSS software is as follows.

7.3.1 Specific Process of Factor Analysis

Step1. Variables are selected for factor analysis

Figure 7-1 Variables of Factor Analysis (Shown in Annexes)

As above figure indicates, this thesis takes 14 variables such as "individual ARPU" and "bundle rate of unified payment" as variables of factor analysis.

Step2. Select factor analysis method, factor rotation method, and estimation method of factor score.

Table 7-5 Selection of Parameters

Parameter	Description	Remarks
Descriptive		
Initial solution	Output the result before common factor rotation, including variance contribution, variance contribution rate and accumulative variance contribution rate of common factor	Decide the number of common factors
KMO and Bartlett's test of sphericity	Output KMO value and the result of Bartlett's test of sphericity	Check partial correlation among variables
Extraction		
Method	Principal components	Estimation method of factor loading
Extract		Select "Base on Eigenvalue" first, estimate appropriate number of factor; then select "Fixed number of factors"

Parameter	Description	Remarks
Rotation, appoint orthogonal rotation method		
Method	Varimax, maximum rotation of variance	The most common used rotation method, make the absolute value of factor loading polarize towards two stages of 0 and 1 according to the row, which is convenient for explanation of factor's significance and factor's naming
Display	Rotated solution, output factor loading matrix after rotation	
Scores		
Method	Bartlett applies WLS to calculate factor score, which is an unbiased estimation of factor score	This method is suitable to small sample

7.3.2 Result of Factor Analysis

In factor analysis, variables shall have relatively high degree of correlation, which can better the dimensional result. So we should judge whether the sample data can be used as factor analysis first.

As the following table indicates, the second row of the table is KMO statistic used to check partial correlation among variables. It's appropriate for factor analysis only when the value is above 0.6 at least. If the value is less than 0.6, it indicates the correlation among variables is weak, which will result in bad result of factor analysis, and reselection of variables is necessary (Xia, Y. F., 2010). The 3rd, 4th and 5th rows of the table are results of sphericity test.

In this thesis, KMO value is 0.782 and sphericity test is remarkable, both the two requirements are satisfied. Correlation among variables is also strong, so it's appropriate for factor analysis.

Table 7-6 Output KMO Value and the Result of Bartlett's Test of Sphericity (Shown in Annexes)

The following table indicates accumulative contribution rate of factors and selection of number of factors. When accumulative variance contribution rate is larger than 80%, namely, the lost information is only 20%, the number of factors can be considered enough. According to the table, accumulative contribution rate of the first three factors is only 55.903%, which

can't satisfy the requirement of number of factors to accumulative contribution rate. At the same time, we can see from the table that if accumulative variance contribution rate wants to achieve 80%, the number of factors must be 7 at least. Therefore, we set the number of factors as 7.

Table 7-7 Total Variance Explained (Shown in Annexes)

In Extraction of Step 02, select "Fixed number of factors", and fill 7 in the following thesis box.

The following table indicates common degree of each variable. According to the table, the common degrees of "individual ARPU", "number of group vip", "number of staffs", "VPMN using rate" and "administrative level" are all relatively low, which illustrate imperfect result of factor analysis. So we continue to increase number of factors.

Table 7-8 Communalities (Seven Factors) (Shown in Annexes)

Figure 7-2 Screen Plot (Shown in Annexes)

Macadam Table shows the variance contribution of factors, and reflects the importance of factors simultaneously. According to above table, the importance from factor 1 to factor 14 is gradually decreasing. In which, factor 1 is the most important with variance contribution of 36.410%; factor 2 is the secondarily important with variance contribution of 10.582%; from factor 4 to factor 10, the gradient is relatively slow, which illustrates that the important degree of the 7 factors decreases faintly; from factor 11 on, the important degree decreases substantially again. Therefore, we increase the number of factors to 10.

The following table is the common degree of 10 factors. According to the table, except that only the common degree of "number of group vip" is relatively low, being 0.78, the common degree of other variables are comparatively high, which indicates that the result of factor analysis is good.

Comprehensively consider the accumulative variance contribution and common degree of factors, the thesis will set the number of factors as 10.

Table 7-9 Communalities (Ten Factors) (Shown in Annexes)

Table 7-10 Rotated Component Matrixes (Shown in Annexes)

Rotated Component Matrixa Table lists the factor loading matrix after rotation. We can obtain factor analysis model and understand factor structure in accordance with this table.

Secondly, it's the principal basis for naming of factor. Each variable has relatively heavy load in the aspect of some variables, while light load in the aspect of other variables. In conclusion:

Variables has relatively heavy load in terms of factor 1: number of VPMN short-call users, number of VPMN users, number of individual customers, number of call users and number of group vip;

One variable has heavy load in terms of factor 2, 3, 4,…, 10 respectively.

Therefore, we name factor 1 as "user's scale", and other 9 factors are named after corresponding variables with the heaviest load.

Through factor analysis, we can calculate the weight of each factor.

The Total Variance Explained Table demonstrates the variance contribution rate of each initial factor (% of Variance in Initial Eigenvalues). The characteristic roots corresponding to each initial factor are 36.410, 10.582, 8.911, …, 4.613, and 98.06 in total.

Carry out normalization management for the variance contribution of the 10 factors, result of which shall be the weight of each factor.

So, the weight of "user's scale" shall be: 36.410/ (36.410+10.582+8.911+…+4.613) =0.3713, and the weight of "individual ARPU" shall be: 10.582/ (36.410+10.582+8.911+…+4.613) =0.1079.

Names and weight of the 10 factors are as following table.

Table 7-11 Name and Weight of Factors

Factor	Name	Weight
FAC1	User's scale	0.3713
FAC2	Personal ARPU	0.1079
FAC3	Subscribing duration	0.0909
FAC4	Unsubscribing rate	0.0726
FAC5	Bundle rate of unified payment	0.0705
FAC6	Number of VPMN short-call users	0.0675
FAC7	Administrative level	0.0637
FAC8	Informatization level	0.0584
FAC9	Number of informationized products users	0.0502
FAC10	Number of staffs	0.0470
	SUM	1

7.4 Construction of Assessment Index System

According to the result of factor analysis, we divide the 10 factors into 3 classifications, including current value, potential value and social value, so as to construct group customer value assessment system.

Table 7-12 Group Customer Value Assessment System

Group customer value									
Current value	Potential value								Social value
Individual ARPU	User's scale	Subscribing duration	Unsubscribing rate	Bundle rate of unified payment	VPMN using rate	Informatizaton level	Number of staffs	Number of informationized products users	Administrative level

7.5 Calculation of Weight of Assessment Index

In last section, we have constructed group customer value assessment system, and gain objective weight by means of factor analysis method. So next, we just need to calculate the objective weight of assessment index, and then calculate the objective weight of assessment index combing the objective weight.

7.5.1 Calculation of Subjective Weight of Assessment Index

1. Questionnaire Survey

In order to calculate the subjective weight of index, we first design an assessment questionnaire on "influencing factor of group customer value". Some attendees of questionnaire survey are experts with rich experience in telecommunications field for over 5 years, and others are members of group customers who are quiet familiar with group businesses.

We issue 120 questionnaires and retrieve 100, among which effective questionnaires are 92. In order to make the calculation convenient, we average the result of 92 questionnaires, and calculate the weight of index by Super Decisions software.

[Questionnaire about influence factors of group customer value] (Shown in Annexes)

2. Calculation of Indexes' Weight by AHP

According to the result of questionnaire survey, we calculate indexes' weight by AHP. By virtue of Super Decisions software, specific computational process is as follows:

(1) Structuring of Model

According to the value assessment system in table 7-12, there are three layers in this model. The first layer named as "Group customer value"; The second layer includes three dimensions: current value, potential value and social value; The third layer includes ten factors, such as "individual ARPU", "user's scale", "subscribing duration" and so on.

Figure 7-3 Group Customer Value Assessment Model (Shown in Annexes)

(2) Comparison among Indexes on First Layer and Consistency Check

According to the grading result of questionnaire, we input the questionnaire result in comparison matrix.

Figure 7-4 Comparison among Indexes on First Layer (Shown in Annexes)

As above figure indicates, the current value is of equal importance to potential value; current value is three times more important than social value; and potential value is 5 times more important than social value.

Figure 7-5 Consistency Check of Indexes on First Layer (Shown in Annexes)

As above figure indicates, inconsistency index=0.028 < 0.1, so the assessment result of indexes on first layer satisfy consistency.

Therefore, weight values of indexes on first layer are:

Table 7-13 Weight of Indexes on First Layer

Serial No.	Index	Weight
1	Current value	0.405
2	Potential value	0.481
3	Social value	0.114
	SUM	1.000

According to above table, in experts' opinion, potential value is the most principal factor to measure group customer value with weight of 0.481; the secondarily important factor is current value with weight of 0.405; weight of social value is just 0.114.

(3) Comparison among Indexes on Second Layer and Consistency Check

According to the assessment result of questionnaire, input corresponding value in comparison matrix among indexes

Figure 7-6 Comparison among Indexes on Second Layer (Shown in Annexes)

As above figure indicates, "number of informationized products users" is 1.8889 times more important than "informatization level", while "numbers of staffs" is 2.5074 times more important than "number of informationized products users".

Figure 7-7 Consistency Check of Indexes on Second Layer (Shown in Annexes)

According to consistency check of the comparison result of indexes on second layer, inconsistency index=0.1371 **>** 0.1, which does not meet consistency requirement. So experts need to grade again and carry out assessment on indexes again, with the second assessment result as the owing figure:

Figure 7-8 Comparison among Indexes on Second Layer (2) (Shown in Annexes)

As above figure shows, "user's scale" is 1.6471 times more important than "VPMN using rate", and "VPMN using rate" is of equal importance to ""number of informationized products users".

Figure 7-9 Consistency Check of Indexes on Second Layer (2) (Shown in Annexes)

Carry out consistency check of comparison result of indexes on second layer, then inconsistency index=0.0581 **<** 0.1, which satisfy consistency requirement of comparison matrix.

Therefore, the weight values of indexes on second layer are as follows:

(4) Calculation of Subjective Weight of All Index

According to weight of indexes on first and second layers, calculate the final subjective weight of 10 factors, with result as the following table.

Table 7-14 Weight of Indexes on Second Layer

Serial No.	Index	Weight
1	VPMN using rate	0.136
2	User’s scale	0.224
3	Number of informationized products users	0.136
4	Informatization Level	0.072
5	Number of staffs	0.341
6	Unsubscribing rate	0.029
7	Subscribing duration	0.019
8	Bundle rate of unified payment	0.042
	SUM	1.000

Table 7-15 Weight of indexes

Serial No.	Index	Weight
1	Personal ARPU	0.405
2	VPMN using rate	0.065
3	User’s scale	0.108
4	Number of informationized products users	0.065
5	Informatization Level	0.035
6	Number of staffs	0.164
7	Unsubscribing rate	0.014
8	Subscribing duration	0.009
9	Bundle rate of unified payment	0.02
10	Administrative level	0.114
	SUM	1

7.5.2 Calculation of Combination Weight of Indexes

Combine the objective weight obtained by factor analysis method and subjective weight by AHP, then calculate factor combination weight.

$$W_j = w(s)_j * a + w(o)_j * (1-a) \quad (j=1, 2,..., 11) \qquad \text{(Equation 7- 1)}$$

W refers to subjective weight of each index, w(o) refers to objective weight of each index and W refers to combination weight. a and (1-a) respectively refer to comparatively important degree of subjective weight and objective weight with $0 \le a \le 1$. Suppose that the subjective weight is of equal importance to objective weight in this thesis, therefore, $a = 0.5$,

$$W_j = \frac{w(s)_j + w(o)_j}{2} \qquad \text{(Equation 7- 2)}$$

.

Calculation results of objective, subjective and combination weight are respectively as the following table.

Table 7-16 Objective, subjective and combination weight

Factor	Name	Objective weight	Subjective weight	Combination weight
FAC1	User's scale	0.371	0.108	0.240
FAC2	Personal ARPU	0.108	0.405	0.256
FAC3	Subscribing duration	0.091	0.009	0.050
FAC4	Unsubscribing rate	0.073	0.014	0.043
FAC5	Bundle rate of unified payment	0.071	0.020	0.045
FAC6	Number of VPMN short-call users	0.068	0.065	0.066
FAC7	Administrative level	0.064	0.114	0.089
FAC8	Informatization level	0.058	0.035	0.047
FAC9	Number of informationized products users	0.050	0.065	0.058
FAC10	Number of staffs	0.047	0.164	0.106
	SUM	1.000	1.000	1.000

7.6 Calculation of Group Customer Value

Based on the weigh obtained by combination weight method and "standard factor score" obtained by factor analysis method, calculate current value, potential value, social value and total value.

(1) Current value: $Value_i\_c = y_{i1} * w_1$ (Equation 7- 3)

(2) Potential value: $Value_i\_p = \sum^{j} y_{ij} * w_j - y_{i4} * w_4$ (Equation 7- 4), among which, $1 \le j \le 10$ and $j \ne 1,4,7$

(3) Social value: $Value_i\_s = y_{i7} * w_7$ (Equation 7- 5)

(4) Total value: $Value_i\_t = \sum^{j} y_{ij} * w_j - y_{i4} * w_4$ (Equation 7- 6), among which $1 \le j \le 10$ and $j \ne 4$

In terms of factor analysis, SPSS default carries out dimensionless disposal to original data with default method being "central standard". Factor 4 "unsubscribing rate" is a cost-type index, therefore, when calculating total value of group customer, we should get the opposite number of standard score of factor 4, and gain weighted sum with standard scores of other factors.

In order to show each group customer value more directly, this thesis carries out "minimum—maximum normalization" disposal to customer value again, which makes customer value between [0,1].

$$v' = \frac{v - \min_A}{\max_A - \min_A} = \frac{v + 2.080}{6.511 + 2.080} \quad \text{(Equation 7- 7)}$$

Calculate group customer value on the basis of minimum—maximum normalization, with results as the following table:

Table 7-17 Group customer value

Group code	Current value	Potential value	Social value	Total value
2800000068	0.0544	0.3635	0.3810	0.2589
2800000076	0.0839	0.3781	0.4777	0.2974
2800000102	0.0520	0.3697	0.2488	0.2529
2800000205	0.0569	0.4160	0.3649	0.2960
2800000123	0.1154	0.3632	0.8587	0.2854
2800000239	0.0849	0.3882	0.5882	0.2897
2800000365	0.0762	0.3216	0.8444	0.3057
2800000099	0.0918	0.2636	0.6581	0.2144
2800000133	0.0560	0.3562	0.6116	0.2655
2800000148	0.0583	0.3945	0.3596	0.2848
2800000356	0.1038	0.3091	0.6436	0.2403
2800000010	0.0664	0.3971	0.6003	0.3184
2800000040	0.0518	0.3146	0.4041	0.2264
2800000115	0.0589	0.3936	0.6107	0.2962
2800000217	0.0559	0.3498	0.6150	0.2640

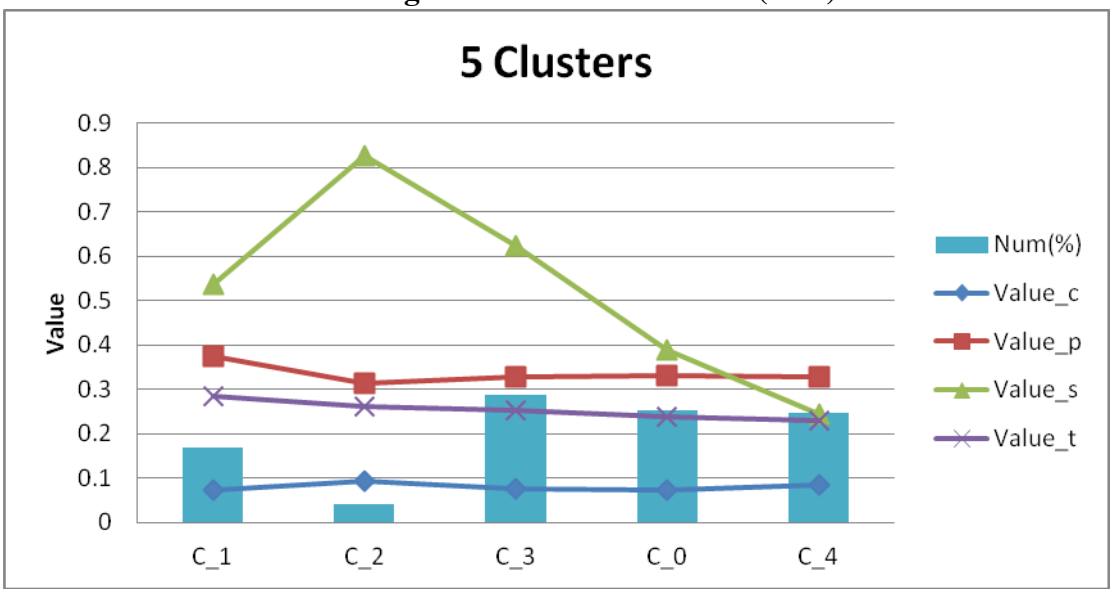
7.7 Cluster Analysis and Interpretation of Result

Table 7-18 Cluster Results (K=5)

k=5	Value_c	Value_p	Value_s	Value_t	Num (%)	Num
C_1	0.0723	0.3737	0.5363	0.284	0.17	340
C_2	0.0922	0.3147	0.8266	0.2601	0.0415	83
C_3	0.0753	0.3282	0.6235	0.2535	0.2875	575
C_0	0.0743	0.3301	0.3877	0.2394	0.254	508
C_4	0.0833	0.3285	0.244	0.2309	0.247	494

This thesis carries out cluster analysis on group customer value by the most common-used method—K-means method. Firstly, we set K=5, namely, divide the 2,000 group customers into 5 clusters.

Figure 7-10 Cluster Results (K=5)



As above figure shows, abscissa refers to different clusters and ordinate refers to corresponding group customer value of cluster center, including current value (Value_c), potential value (Value_p), social value (Value_s) and total value (Value_t)。 Thereinto, Value_t in the figure decreases gradually from the left to the right, namely $Value\_t(c\_1) \succ Value\_t(c\_2) \succ ... \succ Value\_t(c\_4)$

In addition, cylindricality refers to percentage of corresponding group number of each cluster accounting for the total number.

When k=5, 340 group customers are clustered together, as cluster 1. Since the total group number is 2,000 in this thesis, cluster 1 accounts for 340/2000=0.17% of total number. Besides, average Value_c of 340 customers is 0.0723, average Value_p is 0.3737, average Value_s is 0.5363 and Value_t is 0.284.

It's worth noting that all current value, potential value, social value and total value have been through "minimum—maximum normalization" disposal on the basis of their own dimensionality. So,

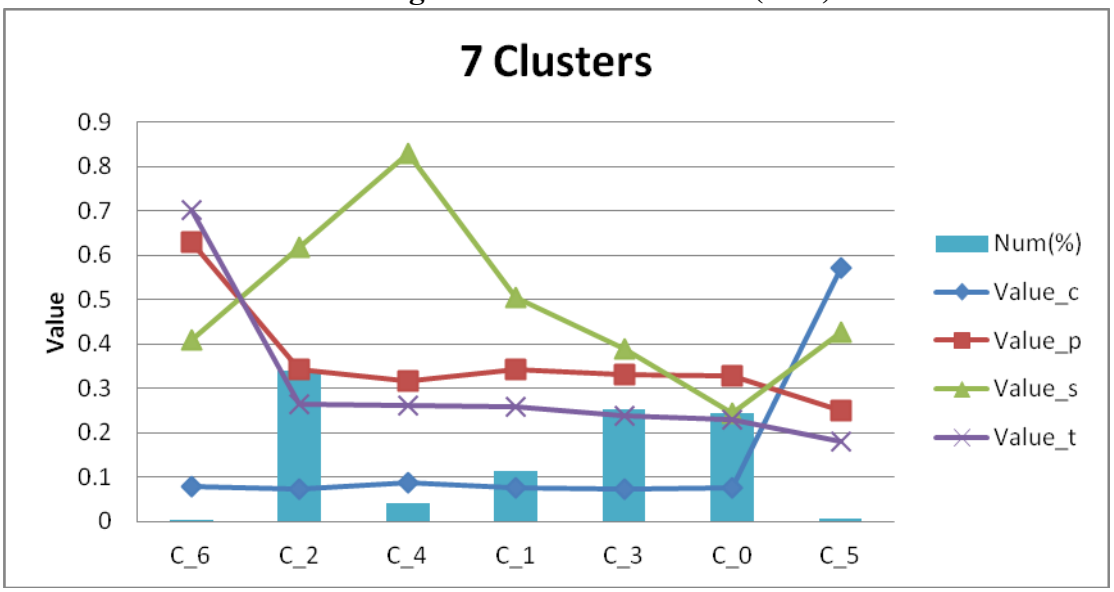
$$Value\_t \neq Value\_c + Value\_p + Value\_s \quad \text{(Equation 7- 8)}$$

When k=5, corresponding current value, potential value and total value of each cluster

don't change a lot, and only customers' social value and percentage of group number have relatively great change. Among the 5 clusters, C_2 is of the highest social value, with the largest influence on society, but such group customers are less, accounting for 4.15% of total number of total group customers.

In order to highlight features of each cluster and increase differences among clusters simultaneously, we increase the number of cluster, setting K=7.

Figure 7-11 ClusterResults (K=7)



With the increase of clusters' number, internal distance of a cluster is decreasing, while distance among clusters is increasing, and differences of each cluster are reflected gradually.

As above figure shows, when K=7, current value, potential value and total value of each cluster have great differences.

According to the figure, C_6, C_4 and C_5 have comparatively obvious characteristics compared with other 4 clusters, with summary as follows:

Table 7-19 Typical Characteristics of Cluster

K=7	C_6	C_4	C_5
Value_c	——	——	High
Value_p	High	——	Low
Value_s	——	High	——
Value_t	High	——	Low
Num(%)	Few	A few	Few

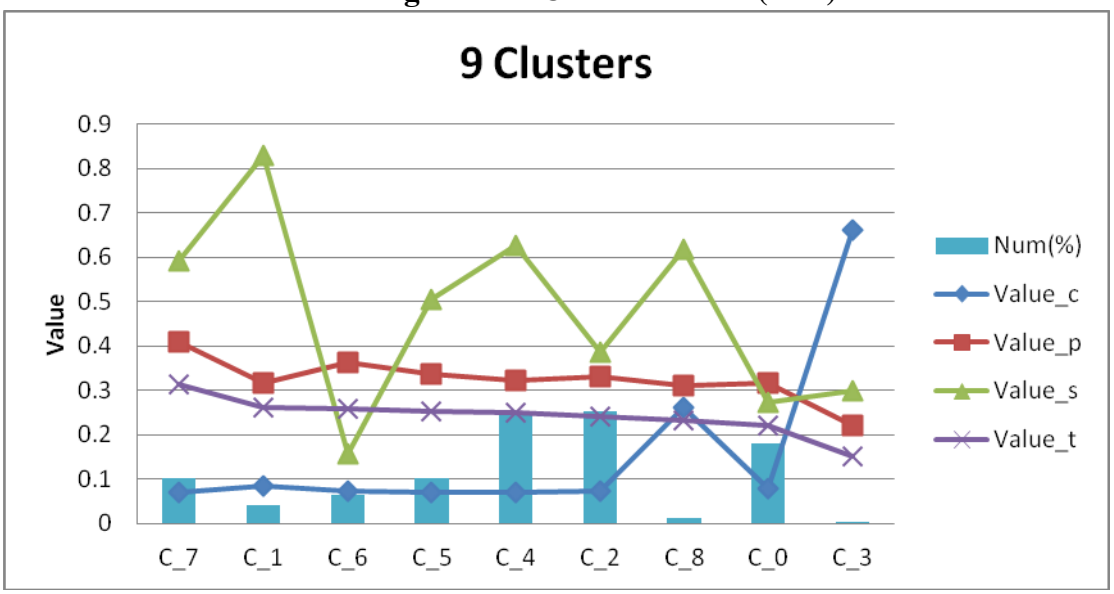
In above table, Value_c of C_6 is showed by "____", which indicates C_6 has no obvious differences in terms of dimensionality of current value compared with other clusters.

According to above table, only few (0.35%) numbers of customers belong to C_6, with high potential value and total value. If we can keep good cooperative relationship with these groups, they will create quiet generous profits for China Mobile.

4.1% customers belong to C_4, with high social value. They often give favorable leading play in terms of formulating policy or guiding consumption habits.

0.5% customers belong to C_5. They can create very high profits for China Mobile, but these groups don't have too much development space in the future with many possible reasons, including high unsubscribing rate of individual customer recently, low informatization level of groups, short subscribing duration, etc. As to such customers, we suggest that China Mobile firstly learns about real demands of customers in detail, formulates corresponding service combos, enlarges the user's scale of groups and increases bundle rate; besides, China Mobile should induce groups to purchase more informationized products by virtue of price strategy.

Figure 7-12 Cluster Results (K=9)



In order to discover more characterized clusters, we'll go on to increase the number of

clusters. The current value, social value and the percentage of group number have showed a significant difference when K=9.

The characteristic of C_7, C_1 and C_3 when K is equal to 9 is similar to that of C_6, C_4 and C_5 when K is equal to 7. So here won't narrate again. But when K is equal to 9, 1.3% group customers belong to C_8 with a high current value and social value, which are respectively inferior to those of C_3 and C_1. There is no similar cluster when K is equal to 7.

Table 7-20 Typical Characteristics of Cluster(K=9)

K=9	C_8
Value_c	High
Value_p	——
Value_s	High
Value_t	——
Num(%)	Few

Summarize the four typical clusters and record them as A, B, C, D separately as follows:

Table 7-21 Summaries of Typical Characteristics of Cluster

	A	B	C	D
K	7	7	7	9
Value_c	——	——	High	High
Value_p	High	——	Low	——
Value_s	——	High	——	High
Value_t	High	——	Low	——
Num(%)	Few	A few	Few	Few

Figure 7-13 Cluster Results (K=10) (Shown in Annexes)
Figure 7-14 Cluster Results (K=15) (Shown in Annexes)
Figure 7-15 Cluster Results (K=20) (Shown in Annexes)

Let's keep on increasing the clusters. When K is respectively equal to 10, 15, 20, there are some typical clusters which have been discovered when K is equal to 7 and 9.

As the number of clusters, namely K increasing, we can find some interesting variation trends summarized as follows:

1. The current value of all groups has little difference whatever K is equal to each value. All 2,000 group customers almost have brought the same profits to China Mobile. There are only C_16, C_14, C_10 and C_18 whose current profits are higher than the rest sixteen clusters even when K=20 and the group number of these four clusters is only 7.15% of the total.

2. The Value_t of group customers is mainly influenced by the group Value_p. The former rises and falls according to the latter, which means that Value_p factors including user's scale, subscribing duration, and unsubscribing rate and so on are important indexes when China Mobile judge their group customers.

3. There is no perfect correlation between group customer value and group administrative level but the customers with the highest or lowest value have a middle administrative level. From the figure showing K is separately equal to 10, 15, 20, we can know that customers'' current value and potential value change obviously while their social value has no obvious variation trend as the customers' Value_t decrease. But the customers with the highest group value (at far left of the figure) and the lowest group value (at far right of the figure) have an administrative level of about 0.4, which has a moderate influence to the society.

4. There are not many group customers of high quality. From the results when K is equal to 7 and 9, there are only 0.35% to 4.1% groups with high value and high influence. Therefore, China Mobile needs to improve their service strategies and develop more information products that meet customers' demands to increase more group customers of high quality.

Chapter 8: Marketing Strategies

8.1 Layered Services Strategy

1. Objective

For further normalizing and perfecting the organization and management of service work on group customer, realizing the optimal matching of group's service resources, establishing "differential" layered service criterion based on value management of group customer, ensuring the stability and development of group customer, comprehensively promoting service ability on group customer. China Mobile shall implement layered service strategy on group customer.

2. Goal

Provide standard and personalized service for group customer, deepening services on group customer, demonstrating differentiated services for customers of different types, increasing customers' perception, promoting satisfaction and loyalty of group customer, and finally, achieving the goal of double win of group customer and enterprise.

3. Grading of Group Unit and Group Member

(1) Grading of group unit

According to value assessment system on group customer, all groups are divided into A/B/C/D.

(2) Grading of group member

(3) Important member of group: important core member, important general member

Important core member means important leader and linkman defined in 138 System while important general member means general leader and informatization linkman defined in 138 System.

Table 8-1 Grading of Group Member

Attribute of group member in 138 system	Corresponding scope of group member
Important leader	Leader of group unit; leaders of financial, comprehensive, information/communication department
General leader	Leaders from other departments except for above mentioned（financial, comprehensive, information/communication）
Important linkman	Main linkmen in financial, comprehensive, communication departments
Informatization linkman	Main linkmen in information department
General full member	General employees of group
VIP customer	VIP customer defined according to VIP management standard
Non-full member	Families of group member or other non-group member
Mechanical member	Special M2M customers using WAP and SMS, such as Datacard

4. **Content of Layered Services for Group Customer**

Contents of layered services for group customer include basic service, value-added service and extended service. Different service frequency and qualified rate will be offered according to category of unit and attribute of member. Content of major services is shown in the following tables.

Table 8-2 Content of Layered Services (1) (Shown in Annexes)
Table 8-3 Content of Layered Services (2) (Shown in Annexes)

8.2 Credit Grading Strategy

1. Objective

For normalizing management work on credibility of group customers of China Mobile, through establishing credit grading management method for group customer, ensure the effective launch of risk control for group customer and offer differential services for them

according to this.

2. Credit Rating Classification

Table 8-4 Credit rating classification

High credit rating (A)
Medium credit rating (B)
Lower credit rating (C)
Dangerous credit rating (D)

Just as the table shows, group customers are divided into 4 credit ratings, including high, medium, lower and dangerous rating.

3. Standard for Credit Services

Offer different credit services according to credit rating of group customer and implement different way of risk control, just as following table shows:

Table 8-5 Standard for credit services

Credit Rating	Longest Payment Cycle	Special Payment Cycle	Maximal Limit for Indebting	Scope for Halt	Pre-deposited Amount
A	3 months	3 months	RMB 3000	Group Product Account	No Requirements
B	2 months	0 month	RMB 1000	Group Product Account	No Requirements
C	1 month	0 month	RMB 500	All Group Products	No Requirements
D	0-1 month	0 month	RMB 0	Al Group Products	Prepayment or Certain Pre-deposited Amount

Just as above table shows, group customer with higher credit rating could enjoy longer payment cycle, larger limit for indebting, narrower scope for halt and lower requirements on pre-deposited amount.

4. Principle for Crediting Grading

(1) Carry out dynamic grading on group customers based on their value rating according

to dynamic paying situation.

(2) Give group customers layered credit services such as different payment cycle and halt due to indebting according to credit ratings of group customers.

(3) Synchronously renew credit rating of customers at fixed cycle according to dynamic adjustment on value rating of group customers and adjust corresponding contents of credit services.

(4) For group customer requiring adjustment on credit rating, the process shall be transacted according corresponding examination and approving process and record down for consultation.

(5) Corresponding materials examined and approved shall be timely scanned and filed.

5. Classification of Credit Rating

Table 8-6 Score of Credit Rating

Group Credit Rating	Score of Credit
High credit rating (A)	[85,100]
Medium credit rating (B)	[75,84)
Lower credit rating (C)	[50,74)
Dangerous credit rating (D)	[0,50)

(1) **Calculation Method for Initial Credit Rating of Customer:**

Grading on indexes of type of group institute, operation scope, group scale, industry belonging to, time for netting in shall be accomplished according actual situation; grading on other indexes shall be accomplished according to type of group institute, operation scope, group scale, industry belonging to and grading on average value of classifications on basic attributes of classified group shall be accomplished according to the recent credit grading cycle. It shall be expressed concretely in this way:

Initial credit score= [Σ(score of each index* weight)]/100+item deserving bonus point

(2) **Customer with Netting-in Time Shorter Than 6 Months When Grading:**

Times for group indebting shall be graded according to classified average value; groups that have been assessed shall be graded according to actual situation, otherwise according to

classified average value; other indexes shall be graded according actual situation.

Credit= [Σ (score of each index* weight)]/100+item deserving bonus point

6. Cycle for Credit Rating Assessment

Carry out one time grading on credit and adjustment on grading of group customer per 3 months.

Once grading on all group customers accomplished within grading cycle, calculate average value of partial credit indexes in same industry, business scope and type of group institute.

Indexes requiring calculation of average value include: payment mode, times for group indebting and group level.

Classified calculation of average value is assorted according following 120 situations: 20 industries *2 operation scopes (local and trans-city, transnational and trans-provincial) *3 institute types (juridical entity, self-employed household, clustering customers) =120.

7. Configuration Cycle of Credit Rating

Offer dynamic configuration for weight, classification, grading of each credit index and corresponding credit rating of credit assessment, cooperating with changes on market strategy. Each variable after configuration will function in calculation of credit assessment and adjustment on credit grading in next cycle.

8.3 Other Strategies

1. Contest profit point of competitor

Most market leaders shall beat back competitor when are attracted rather than maintain passiveness when confronting with price cutting, promotion from competitor or marketing region is intruded. One of the effective counterattacks is intrude in attacker’s main area, forcing him to countermand forces for protection of camp. Another method is implementing low price strategy on certain products selectively, by making use of leading edge in total cost to reduce profit of competitor. In full service competition, China Mobile shall insist on its advantage in mobile communication market, focusing on key customers and core areas,

gathering key service resources in society and industry, responding to challenge launched by competitor in local. The company shall undertake the thought of "has things must be done and things must not be done", avoid the solid and strike the weak, adopting the policy of nibbling in advantageous region in telecommunication, and be skillful in making use of advantages of mobile to strike its core profit point.

2. Promote new product, satisfy different customer demand

Group customers from different industry or with different unit property have different requirements on communication services. Some groups are basically stopping on voice communication technology; some mainly rely on computer network while some others require all-round, full-service and vertical communication guarantee.

So, if you want to win in fierce competition in group customer market, you need to have an all-round understanding on demands from group, developing new types of practical and propagable products meeting with demand of customer, reducing unsubscribing rate of individual customer according bundling and other strategies, extending group customer's time for netting in, thus improving customer value.

Market could be expended by discovering and popularizing new functions of products. In the full-service operation age, China Mobile shall adjust its service architecture; change the situation that traditional voice services take up definite leading role, greatly developing mobile internet services, accelerating the bundling and integration between internet and mobile communication services (Zhao, J. Y., 2009).

3. Customer segmentation, offer solutions with industrial characters

In the age of 3G, data services for customers are developing. Mobile Company shall establish featured solution which meets with industrial demand by combining industrial background according to detailed demands from industry so as to achieve the goal of constructing application brand in the industry and establishing enterprise image.

Different industrial background, even difference customers in the same industry may have different and personalized 3G applications. We can segment group customers into 2 categories according to industrial background and application degree of 3G: customer group for simple application, customer group for deep cooperation. To customer group for simple

application, Mobile Company could wholesale similar personal service and to customer group for deep cooperation, Mobile Company could provide them industrial solutions.

4. Give play to the demonstration function of high-value customer as industry leader

High-value customer represents customer with optimal current value, potential value, social value or total value. There are fewer high-value customers, so, enterprise shall input more resources on establishing strategic alliance relationship with high-value customer and maintaining long-term close cooperation.

For example, electrical power industry with solid economic strength could be strongly demonstrative in informatization construction, so, Mobile Company shall strengthen its cooperation with electrical power industry, giving full function to its demonstration ability so as to shorten difference in industry value and increase the occupancy of high-value group customer in Mobile Company at the same time.

5. Develop medium and small groups

As the important constituent part of group customer market, medium and small groups have significant importance on market stability and income increase with giant development potential. After each operator carries out first round comprehensive contention on large scale group customer, medium and small groups have stepped into the focusing scope of each operator, becoming the mostly potential “new lighting industry” (Zhao, J. Y., 2009).

First is striving for government support, creating excellent environment for informatization development. During the informatization process of medium and small enterprises, governments of developed countries provide support to medium and small enterprise in way of providing excellent environment for informatization development for them; such support includes policy support and capital support. By making use of its own resource advantages, China Mobile shall also draw support from government, paying attention on cooperation with government, promoting cooperation with government or institution on key projects, such as cooperation on public security, traffic, taxation and tourism, pushing forward informatization construction of medium and small enterprises with guidance of government.

The second is to combine informatization construction with promotion of economic

benefit of enterprise. First, aiming at the group services of Mobile which are under popularization and according to its basic capability, because users to select independently according to its development situation and detailed service demand, combine them into a new product by Mobile. Second, marketing channel of industrial solutions of Mobile shall transfer to focus on service from with product as core, offering integrated scheme covering product, system, application and customer support, rationally taking customer as orientation, comprehensively satisfying demands from medium and small enterprises. Third, on the one hand, Mobile shall consider on reducing cost on current group service or construction of industrial solutions, making breakthrough in cost constraint of medium and small enterprises; on the other hand, simplify the whole process from consulting to scheme design and service implementation, causing the integrated and complicated implementation of informatization to be easy-to-use and easily accessible.

Chapter 9: Future Implications of the study

Customer value assessment and customer segmentation are the hot issues academia and business circles concerned. There is a lack of final conclusions on computational model of customer value and how to manage by use of customer value, which add challenge and enthusiasm to this field.

Certain limitation does exist in this thesis and future research could be deployed from the following aspects:

1. Construct a more comprehensive value assessment system

As costumer consumption data touch upon privacy, influencing factors collected in this thesis are limited. Dimension of current value of customer only contains “individual ARPU” while dimension of social influence only involves in “administrative level”.

On the basis of experts’ experience and research documents of predecessors, current value of customer shall take indexes such as group unified payment, individual bill income and information income while social influence shall consider industrial influence, income/ profit and tax ranking other than tier of jurisdiction.

So, in future research, we can collect more indexes and establish more comprehensive value assessment system. And increase sample capacity

While conducting a positive study on group customer value, we also reduced dimension by factor analysis, assessment on factor loading is dealt by way of PCA. Theoretically, data researched by PCA shall meet with normal distribution (Yang, N. F., 2010). But in this thesis, sample capacity is not so large, distribution of which may not comply with normal distribution, so it may result to certain degree of distortion on assessment results of group customer value. Hence, in future research, we shall expand sample capacity, improving authenticity and objectivity of assessment results of group customer value.

2. Find the most suitable K value

In this thesis, we chose K-means for customer segmentation. But owing to its defects, we can’t decide quantity of clusters in advance. So, in this thesis, we transformed K value,

digging out group customer cluster with typical features. In future research, we can dig out more valuable featured cluster by finding the most suitable K value.

3. Establish IT system for group customer value assessment

Assessment on group customer value must be objective and comprehensive. If we have IT system established, imbedded connecting with current BOSS system and BASS system, the whole assessment process would be simpler and research result would be more reliable. So, research on this aspect in this thesis could be expected to improve greatly.

4. Collect more information of groups

All groups studied in this research come from Sichuan province. And it cannot represent all conditions. Therefore, in future work, more information of groups from different firms or regions will be collected and analyzed. And conclusions will be generalized to the whole Chinese market or even abroad.

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Annexes

Figure 7-1 Variables of Factor Analysis

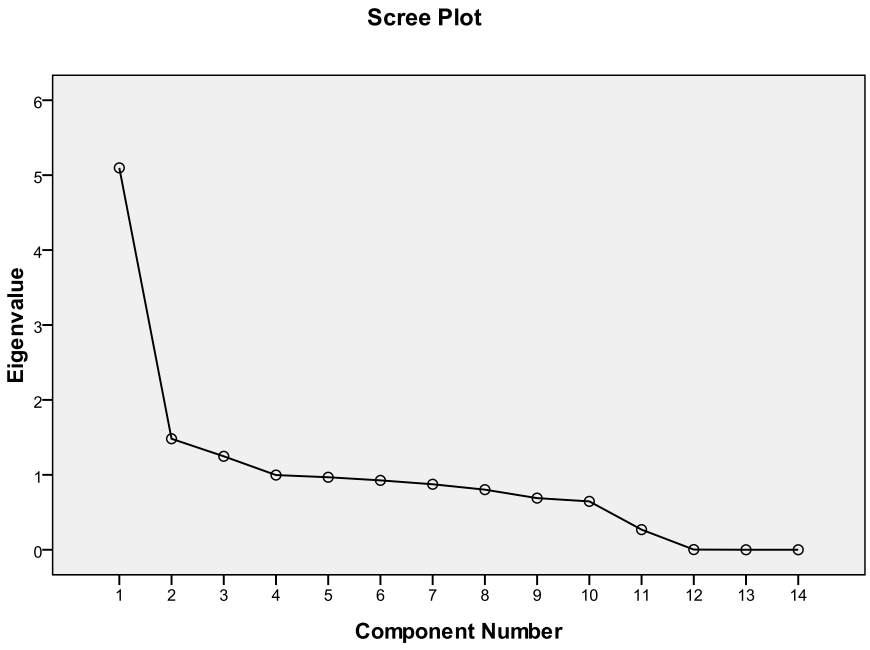

Figure 7-2 Screen Plot

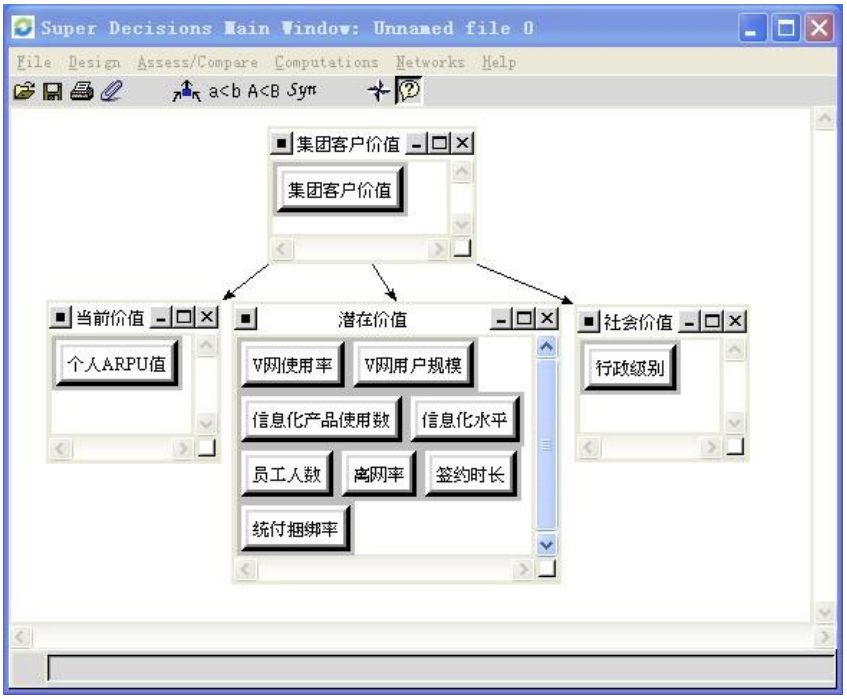

Figure 7-3 Group Customer Value Assessment Model

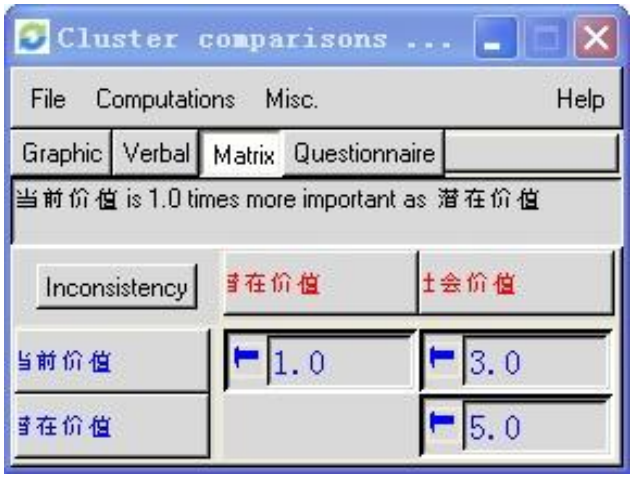

Figure 7-4 Comparison among Indexes on First Layer

Figure 7-5 Consistency Check of Indexes on First Layer

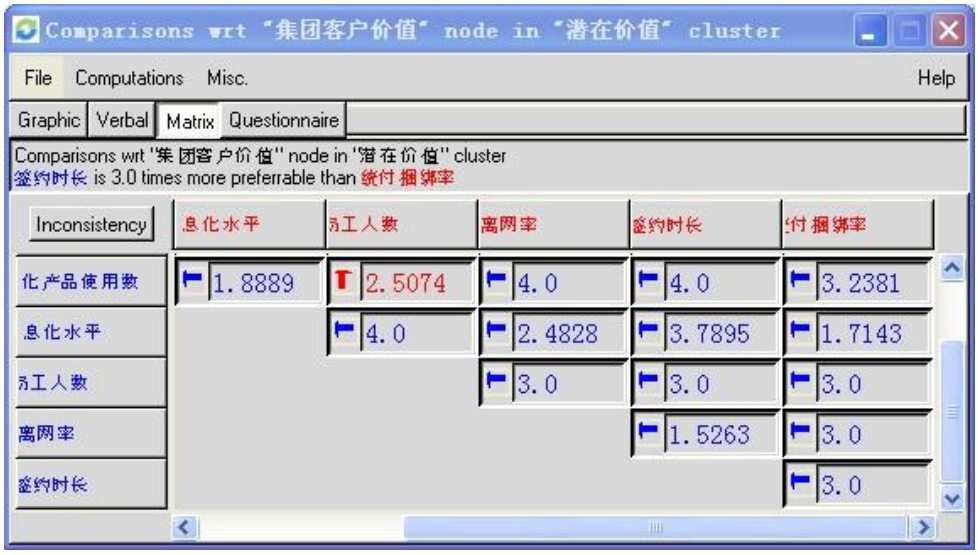

Figure 7-6 Comparison among Indexes on Second Layer

Figure 7-7 Consistency Check of Indexes on Second Layer

Figure 7-8 Comparison among Indexes on Second Layer (2)

Figure 7-9 Consistency Check of Indexes on Second Layer (2)

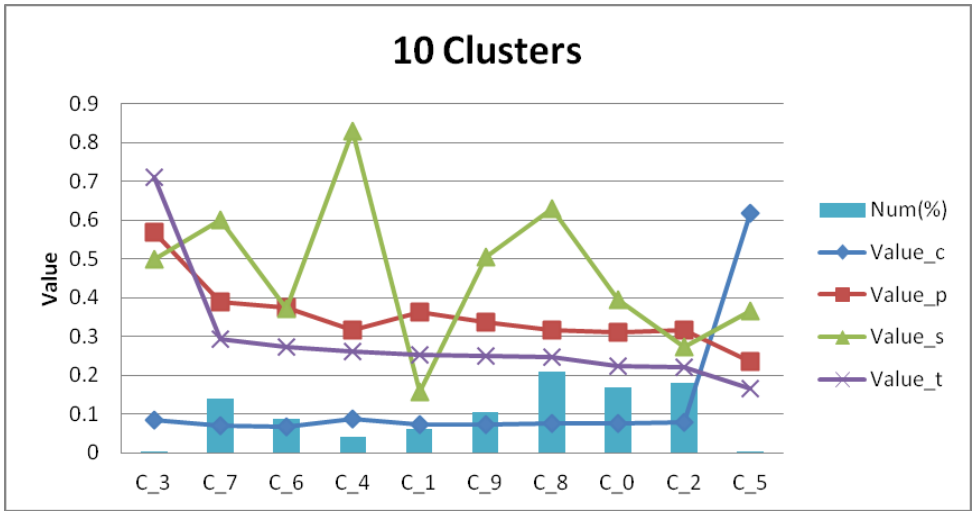

Figure 7-13 Cluster Results (K=10)

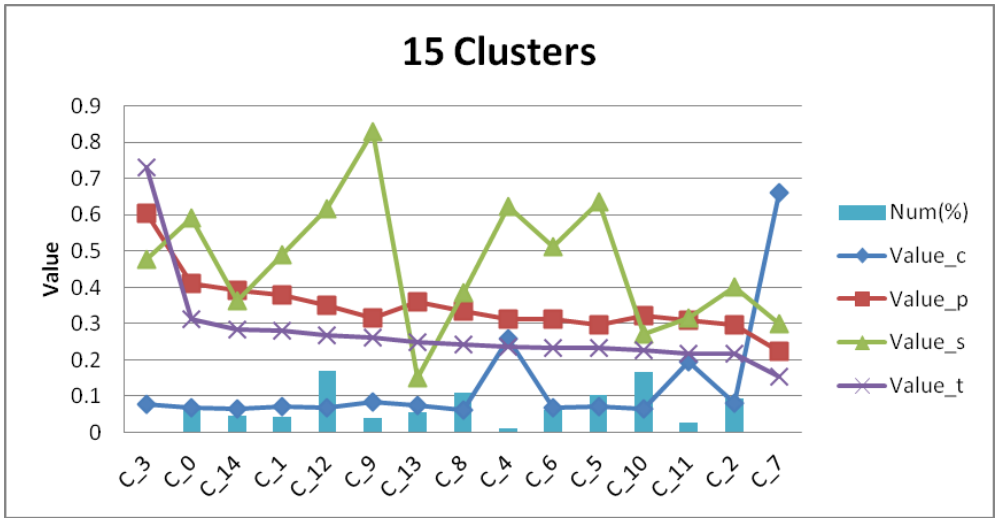

Figure 7-14 Cluster Results (K=15)

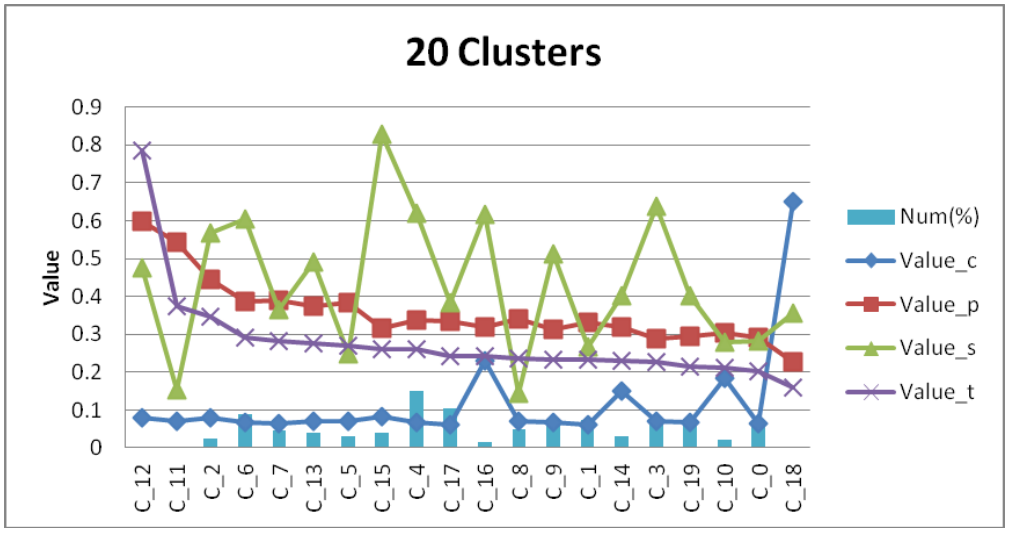

Figure 7-15 Cluster Results (K=20)

Table 2-1 History of China Mobile

Time	Affair
Year 1949	The Ministry of Posts and Tele Communication was set up, governing the General Administration of Telecommunications.
Year 1994	Mobile Communication Bureau and Data Communication Bureau were set up under the Ministry of Posts and Tele Communication.
Year 1997	China Telecom (HongKong) Co., Ltd. was listed at NYSE and HKSE.
Year 2000	China Mobile Communications Corporation was founded, with Zhang Ligui as the GM, and China Telecom (HongKong) Co., Ltd. as a wholly-owned subsidiary company.
November 2004	The three major basic telecommunication operators (China Telecom. China Mobile and China Unicom) went through top management changes. Wang Jianzhou, former President of China Unicom became President of China Mobile Group Co., Ltd.
May 2006	China Mobile (HongKong) Co., Ltd. was renamed China Mobile Co., Ltd.
May 2008	Ministry of Industry and Information Technology of PRC, State Development and Reform Commission and Ministry of Finance jointly issued a proclamation: encouraging China Telecom to purchase the CDMA sector of China Unicom, China Unicom combine with China Netcom, the basic telecommunication business of China Satcom merged into China Telecom, and China Tietong merged into China Mobile. After the restructuring, three telecom operators shall exist, namely, China Telecom, China Mobile and China Unicom, which shall respectively get a 3G-license issued by the government. Since then, the three operators stand parallelly in the telecommunication industry of China.

Table 7-2 Index Definition

Index	Index Definition
Personal ARPU	The so called ARPU is exactly the average revenue per user. What ARPU focuses on is all profits operator obtained within a period. Obviously, more high-end user, higher ARPU. During this period, from the operation status of operator, we can see that higher ARPU value represents better benefit.
Bundle rate of unified payment	In following 5 bundle methods, bundle quantity of group members is the total number of customers after eliminating the repeated. Bundle rate of group member= bundle quantity of group members ÷ mean of group member × 100%. Bundle methods are as following: 1) Bundle by presenting fee upon deposition, participating in presenting fee upon deposition within the group, including presenting fee upon group unified payment and deposition and presenting fee upon deposition for group members which would be transferred monthly and quantity of customers in validity at present; 2) Bundle by unified payment, group members could have multi-effective accounts (including individual default account and public account) in boss; carry out statistics on quantity of members in the group who have effective "public account"; 3) Quantity of group members (monopolizing the purchase of module 2425 operation through terminal and are still in effective bundle period) participating in terminal marketing; 4) Quantity of members in group whose individual fee in VPMN is time limited and paid monthly (boss3214 module, "monthly payment" doesn't equal to "0-> non-monthly

	payment"); 5) Quantity of customers whose items of messages up to any designated port (07718, 01828, 07123, 01717, 07733) shall be larger than 0 item/month within group members.
Number of VPMN short-call users	Means application number of short-call in group VPMN business
Number of informationized products users	Means quantity of group members using standard product (not including group VPMN) and SMI. (Means products and application standard recorded in BOSS within the assessment month), single product with monthly profit larger than RMB 0 shall be recorded as one item, each product is written down as 1 score, accumulating to the index of number of informationized products users.
Number of VPMN users	Means number of group individual customers (mean the value at the assessment month, including quantity of members using charging VPMN and objective VPMN, namely the group shall take a census of quantity of members using VPMN in group members) using group VPMN. Charging VPMN will not provide short-call and only offer bill discount.
Unsubscribing rate	Means the average unsubscribing rate of group individual customer in recent 3 months.
Subscribing duration	Means the subscribing duration between group customer and China Mobile.
Number of individual customers	Means the number of individual customers of China Mobile brought into group management at statistics.
Number of call users	Means the total quantity of calls used by group customer

Number of group vip	Means the number of group vip customers
Number of staffs	Means the number of physical group members (means the assessed number of that month) recorded in BOSS system
Informatization level	Means actual level of group customer in informatization application, mainly investigating LAN, quantity of computers, company website, and enterprise mailbox. ERP (CRM/MIS), switcher and whether internet is accessible, each piece of information would be recorded as 1 score, accumulating to the index value of informatization level of group.
VPMN using rate	Means the rate of number of customers using VPMN in total customers of group
Administrative level	Industrial customers with great social influence in municipal range (confirm items of awarded marks according to materials of social influence top 100 and administrative level of companies by Sichuan Mobile) will be distinguished by municipal companies and submitted to influence top 100. They can be divided into three grades--first 20, 21—50 and 51—100.

Table 7-6 Output KMO value and the result of Bartlett's test of sphericity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.782
Bartlett's Test of Sphericity	Approx. Chi-Square	58113.212
	df	91
	Sig.	.000

Table 7-7 Total Variance Explained

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.097	36.410	36.410	5.097	36.410	36.410	5.094	36.385	36.385
2	1.482	10.582	46.993	1.482	10.582	46.993	1.374	9.812	46.197
3	1.247	8.911	55.903	1.247	8.911	55.903	1.359	9.706	55.903
4	.997	7.121	63.025						
5	.968	6.913	69.938						
6	.926	6.615	76.553						
7	.874	6.244	82.798						
8	.802	5.731	88.528						
9	.689	4.922	93.450						
10	.646	4.613	98.064						
11	.269	1.918	99.982						
12	.002	.018	100.000						
13	1.379E-5	9.851E-5	100.000						
14	9.010E-6	6.436E-5	100.000						
Extraction Method: Principal Component Analysis.									

Table 7-8 Communalities (Seven Factors)

Personal ARPU	Initial	Extraction
Bundle rate of unified payment	1.000	.606
Number of VPMN short-call users	1.000	.976
Number of informationized products users	1.000	.976
Number of VPMN users	1.000	.652
Unsubscribing rate	1.000	.978
Subscribing duration	1.000	.969
Number of individual customers	1.000	.989
Number of call users	1.000	.979
Number of group vip	1.000	.979
Number of staffs	1.000	.765
Informatization level	1.000	.411
VPMN using rate	1.000	.971
Administrative level	1.000	.679
Extraction Method: Principal Component Analysis.		

Table 7-9 Communalities (Ten Factors)

	Initial	Extraction
Personal ARPU	1.000	.994
Bundle rate of unified payment	1.000	1.000
Number of VPMN short-call users	1.000	.988
Number of informationized products users	1.000	1.000
Number of VPMN users	1.000	.989

Unsubscribing rate	1.000	1.000
Subscribing duration	1.000	1.000
Number of individual customers	1.000	.990
Number of call users	1.000	.990
Number of group vip	1.000	.780
Number of staffs	1.000	1.000
Informatization level	1.000	1.000
VPMN using rate	1.000	1.000
Administrative level	1.000	1.000

Table 7-10 Rotated Component Matrixes

Rotated Component Matrix[a]										
	Component									
	1	2	3	4	5	6	7	8	9	10
Personal ARPU	-.076	.986	.035	-.063	.053	.023	.079	.015	.030	-.014
Bundle rate of unified payment	-.032	.052	.008	-.026	.997	.008	.023	.014	.014	-.002
Number of VPMN short-call users	.987	-.058	.006	.000	-.008	.012	.018	.025	.005	.097
Number of informationized products users	.025	.030	-.008	-.058	.014	.153	.006	.005	.986	.004
Number of VPMN users	.986	-.065	.008	.003	-.013	.014	.025	.024	.007	.105
Unsubscribing rate	.010	-.062	-.001	.994	-.027	-.030	-.043	-.021	-.056	.004
Subscribing duration	.024	.034	.998	-.001	.008	-.021	.046	.002	-.007	.023
Number of individual customers	.986	-.065	.008	.004	-.013	.012	.025	.023	.007	.105
Number of call users	.986	-.065	.008	.003	-.012	.012	.026	.024	.007	.105
Number of group vip	.864	.110	.017	.007	-.013	.006	.077	.004	.020	.121

Number of staffs	.439	-.018	.031	.005	-.002	.004	.063	.007	.004	.895
Informatization level	.053	.015	.002	-.021	.014	.003	.044	.997	.005	.005
VPMN using rate	.030	.023	-.022	-.030	.008	.987	.013	.003	.152	.003
Administrative level	.096	.079	.047	-.044	.024	.013	.987	.045	.006	.048
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.										
a. Rotation converged in 5 iterations.										

Table 8- 2 Content of Layered Services (1) (Shown in Annexes)

Service Attribute	**Service Category**	**Service Content**
Basic Service	Material Management	1、Health of Group Material
		2、Management of Group Competition Information
		3、Archive Management of Group Material /Agreements
	Daily Services	1、Business Consulting ,Acceptance
		2、Business Requirements Collection
		3、Relationship Maintenance
	Complainant Response	1. Quickly respond to problems group customers encountered in the use of group business, timely deal with various complainants (including complainant on fees, services and business) from customers, reduce negative impact caused by complainant
		2. During managing complainant, “prevention and control in advance, timely management during the matter and tracing after matter” shall be achieved, insisting on first inquiry responsibility system, do a good job in closed loop management on complainant process

Value-added Service	Visit the Chief	1、Spreading enterprise culture and establishing brand image, deepening understanding of group customer on group
		2、Through daily maintenance and public relations, achieving stability of group in competition
		3、Improve public relationship, promote satisfaction and loyalty of important group customer
	Birthday and Festival Greetings	1、For group: important anniversaries of important events, such as establishment of plant, being listed, etc; special festivals in this industry, such as Army Day, teacher's day, etc;
		2、 For individual: birthday, spring festival, mid-autumn festival and other important national festivals;
		3、In important anniversaries for group, birthday for important member, a drop-in-visit and present of gifts shall be accomplished and SMS/MMS, call or email could be used to express greetings in other festivals.
	Exclusive Preferential Service for Group	1、 First tryout of new business, and print & issue business experience/user’s guide
		2、 Launch presenting fee upon deposition, deposition for purchasing phone and other preferential marketing activities
		3、 Offer alliance of merchants, feedback of integral, rent of standby machine and other experiencing services
Extended Service	Party Activity	1、Organize investigation activity on informatization
		2、Organize competition, speech and other club activities
	Credit Services	1、 Delaying halt according to credibility
		2、unilateral halt service (offered before halt)

		3、international roaming time limit without security

Table 8- 3 Content of Layered Services (2) (Shown in Annexes)

Service Attribute	Service Category	Service Standard			
		A	**B**	**C**	**D**
Basic Service	Material Management	Healthy, Subhealthy			
		2 times/month	2 times/month	1time/month	Depending
					on market competition situation
		Available			
	Daily Services	2time/mon	1 time/month	1 time/month	1 time/3months
		At least one time of “visit”	1 time of “visit”	1 time of “visit”	1 time of “visit”
			as work pattern is required	as work pattern is required	as work pattern is required
	Complainant Response	1、Time limit for processing complainant : 8h	1、Time limit for processing complainant : 24h	1、Time limit for processing complainant : 24h	1、Time limit for processing complainant : 48h

		2、Quantity for complainants of single unite ≤2	2、Quantity for complainants of single unite ≤3	2、Quantity for complainants of single unite ≤4	2、Quantity for complainants of single unite ≤5
Value-added Service	Visit the Chief	once/half year			Depending on market competition situation
	Birthday and Festival Greetings	1time/3months			
	Exclusive Preferential Service for Group	Cooperate in the implementation of marketing activities of subsidiaries, at least 1time/half a year in principle			
Extended Service	Party Activity	1time/year			Depending on market competition
	Credit Services	Important leader, general leader, important linkman (informatization linkman) could respectively enjoy services with credit ratings including diamond card, gold card and silver card	Important leader, general leader, important linkman could respectively enjoy services with credit ratings including diamond card, gold card and silver card	Important leader, general leader, respectively enjoy services with credit ratings including gold card and silver card	Not Required

Questionnaire

Questionnaire about influence factors of group customer value

Dear experts:

Thank you very much for your participation in this questionnaire! In order to study factors of group customer value, we designed this questionnaire. Your answer is only for research and will be kept strictly. It will take you 3 minutes. There is no right and wrong answer, so please fill in this questionnaire truthfully. Thank you!

School of Management and Economics of UESTC

August, 2011

1.Judge the relative importance of A and B factors from "group customer value" perspective.

Factor A	**A extremely important**	**A strongly important**	**A obviously important**	**A slightly important**	**Equally important**	**B slightly important**	**B obviously important**	**B strongly important**	**B extremely important**	**Factor B**
(Please mark your evaluation with "Δ")										
Current value										Patient value
Current value										Social value
Patient value										Social value

2. Judge the relative importance of A and B factors from "group customer patient value" perspective.

Churn rate, binding rate, informatization level of information, the number of employees, product number information,

Factor A	**A extre**	**A strong**	**A obviou**	**A slightl**	**Equall y**	**B slightl**	**B obviou**	**B strong**	**B extre**	**Factor B**

	mely impor tant	**ly impor tant**	**sly impor tant**	**y impor tant**	**impor tant**	**y impor tant**	**sly impor tant**	**ly impor tant**	**mely impor tant**	
(Please mark your evaluation with "Δ")										
Scale of user										Time of signing
Scale of user										churn rate
Scale of user										binding rate
Scale of user										Usage rate of V network
Scale of user										level of information
Scale of user										number of employees
Scale of user										Use of number of information product
Time of signing										churn rate
Time of signing										binding rate
Time of signing										Usage rate of V network
Time of signing										level of information
Time of signing										number of employees
Time of signing										Use of number of information

										product
churn rate										binding rate
churn rate										Usage rate of V network
churn rate										level of information
churn rate										number of employees
churn rate										Use of number of information product
binding rate										Usage rate of V network
binding rate										level of information
binding rate										number of employees
binding rate										Use of number of information product
Usage rate of V network										level of information
Usage rate of V network										number of employees
Usage rate of V network										Use of number of information

										product
level of information										number of employees
level of information										Use of number of information product
number of employees										Use of number of information product