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Urban Elder Mobile Phone Users' Behaviour in China: A Study based on Aging Issue

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Abstract:

In the recent years, specific marketing research related to the elderly mainly focused on the fields of tourism, pension consumption, healthy products, however, information consumption still lagged behind others mentioned above. This paper starts with usage behaviors and preference of mobile phone of the elderly, researches on the big data, reflects the conducts of the elderly who use media, then analyses consumption features and preferences, and proposes strategy on database market. It will help to lay out future marketing strategy, to fill market demands more effectively, to improve the operator's efficiency and economic benefits, which is of dramatic significance. This paper is based on the ground of the description of the general statistics, using clustering and spatial statistics and grey model to deeply demonstrate the data owing to its particularity od data. In addition to this, it could inspire development and innovative design of APP, phone package and give references for related government, enterprises and research institutions.

Keywords: interpersonal trust, aging issue, mobile phone user consumption behavior, spatial statistics, grey correlation.

Introduction

Since the 1990s, the aging of the population on the economic and social development of various countries has produced a multi-dimensional impact, which has become the focus of attention. In the early 21st century, China officially entered the aging society. Under the vast circumstance of a worsen aging society in China，the proportion of the elderly will maintain a stable rising tendency therefore the elderly, as a consuming objective, is becoming to play an important role. According to the social trend of population aging and the expansion of the elderly population, some scholars began to focus on the economic consumption market of the elderly as a "gold mine to be mined", study the consumption behavior of the elderly, and put forward targeted marketing strategies to provide reference for enterprises to make marketing decisions. In the recent years, specific marketing research related to the elderly mainly focused on the fields of tourism, pension consumption, healthy products, however,

information consumption still lagged behind others mentioned above. This dissertation starts with usage behaviors and preference of mobile phone of the elderly, researches on the big data, reflects the conducts of the elderly who use media, then analyses consumption features and preferences, and proposes strategy on database market. It will help to lay out future marketing strategy, to fill market demands more effectively, to improve the operator's efficiency and economic benefits, which is of dramatic significance. In addition to this, it could inspire development and innovative design of APP, phone package and give references for related government, enterprises and research institutions.

Based on the literature research on the aging of population and the research status of the elderly, the interaction between the elderly and TV media, the interaction between the elderly and mobile media and other aspects, this paper explains the problems related to the consumption behavior of the elder mobile phone users. Taking the mobile phone user database of telecom operators as the original data, this paper makes a descriptive statistical analysis of the elderly's mobile phone consumption behavior, utilizing the spatial statistical analysis method grey model, and reveals the influencing factors and development trend of the elderly's mobile phone consumption behavior. In addition, combining the above research results, this dissertation points out the existing problems and potential business opportunities in the field of the elderly mobile phone consumption market by analyzing the findings of the interviews with marketing experts. Through the above research, this dissertation fills in the gap in the research on the behavior of elderly consumer groups in China, and shows the changes and influences brought by the aging society from a new perspective, providing new perspectives, research methods and research ideas for future research on the elderly.

Research Background

In the past twenty years, the domestic media environment has gone through dramatic change. With the emergency and popularity of new media such as the computer and mobile phone, people's using habits have greatly transformed. As the Internet society developed, the audience of new media has extended from teenagers to the middle-aged the elderly, which, as a new born consumption object, has great marketing value in the respect. However, media usage of the elderly especially the new media has not been paid attention even if the elderly market not only has increasing demands but also has the realistic consumption ability and sufficient time. Except for some fields as tourism and healthy products, there are not many products designed for the elderly. With the improvement of life quality of the elderly and spiritual pursuit, more elderly begin to use electronic products, in which way they could get more access to obtain information, and that is why Grey Market has became a vital potential market for mobile devices. However, it did not draw enough attention from relevant operators thus the current development of mobile phones is still limited to non-intelligent phones. While in the areas of smart phone application and phone package, it still lacks the appropriate products for the elderly and misses golden chance for improvement and modification.

When making marketing and strategic decisions, enterprise should take the factors like society development tendency and its corresponding impacts into consideration. While currently Chinese operators are more inclined to focus on middle-aged group, as the main income source of a family, and teenagers who spend more on recreation and therefore ignore the information consumption of the elderly and its value in the market. As for reasons, one is because of the operator's stereotype of the elderly as the consumer, another is in the process of making decisions, the operators fail to considerate Chinese aging society background and to stand at a strategic level.

Problem Statement

Since the 1990s, the aging issue has brought about the multidimensional impacts on economic society in many countries therefore drawn the attention of various fields. According to the figure of the fifth national population observation in 2000, it showed that the percentage of population over 60 was 10.33%, indicating that China has stepped into Aging Society since the beginning of this century. United Nations once predicted the global aging population would keep increasing at an annual average speed of 2.5% while this figure in China at the same period was 3.3%. As for the proportion of aging people of the total population, it has risen up from 6.6% in 1995 to 9.3% in 2020 while it nearly doubled during 25 years. Until 2020, the total amount of aging people over 65 will reach one hundred and sixty-seven million, which would occupy 24% of the overall global population of six hundred and ninety-eight million people. It means that among four elderly people exists a Chinese one. The national statistics department revealed that the scale of Chinese population over 60 would exceed two hundred and thirty million, taking up 16.7% of overall national population and deepening the aging progress. Under the vast circumstance of a worsen aging society in China，the proportion of the elderly will maintain a stable rising tendency therefore the elderly, as a consuming objective, is becoming to play an important role. The main research domains are focused on curing the diseases of the elderly, exploring the body functions, improving current medical care situation and researching on psychological features of the elderly. In the meanwhile, scholars began to keep their eyes on the elderly-oriented economic market, a gold mine to be mined，to research on consumer behavior of the elderly, to put forward segmented marketing strategy, and provide reference to help companies make marketing decisions. In the recent years, specific marketing research related to the elderly mainly focused on the fields of tourism, pension consumption, healthy products, however, information consumption still lagged behind others mentioned above. This is mainly due to the mixed influence composing of traditional values and data accessibility and there is still research gap to be filled.

Research Objective

This paper starts with usage behaviors and preference of mobile phone of the elderly, researches on the big data, reflects the conducts of the elderly who use media, then analyses consumption features and preferences, and proposes strategy on database

market. It will help to lay out future marketing strategy, to fill market demands more effectively, to improve the operator's efficiency and economic benefits, which is of dramatic significance. In addition to this, it could inspire development and innovative design of APP, phone package and give references for related government, enterprises and research institutions.

Research Significance

From current literature research, the point of view is that university students as well specific groups are the main research objects of mobile users' consumption behaviors. This is because university students are active consumers and have more access to obtain data, which is easier to launch research. As for the research on specific groups, research itself mainly demonstrates users' using conducts under the certain circumstances. In the respect of its drawbacks:

One is the lack attention to the elder consumers. Furthermore, the reasons for a limited amount of research are due to the high cost of collecting data and the low efficiency of research.

Another one is that the data is mainly from questionnaire of a certain region, which fails to provide sufficient data to some extent. What's more, when being interviewed, the elderly may not answer the questions in an all-round way because of their poor memory. Since this, the research may lose its objectivity to some extent and cause systematic deviations thus lead to inconsistency with research results and facts.

This study is mainly based on quantitative analysis，literature research and in depth interviews. The fact is originated from the data of mobile users and television users from Qingyang district, Sichuan. SQL is used for extracting relevant original data form operator's database. Afterwards, Excel will work by filtering and cleaning data. Combining with it, SPSS 20.0 is utilized for data analysis. The data analyzed in this dissertation is the statistical data from the operator's data system, which discards the systematic error caused by questionnaire and makes data with high credibility. In addition, it not only fills in the gaps in the behavior research of the elderly consumer groups in China, but also presents new changes and impacts brought by the aging society from a brand new perspective. Furthermore, this dissertation may be helpful for providing new ideas for the future research on the elderly.

Literature Review

Researches on the problems of the elderly

The aging tendency of population has given multi-dimensional impacts on economic and social development in various countries thus attracted their focus ever since 1990s. Different cultural circles have diverse definitions of the aged. According to WHO and some developed western countries, the elderly refer to people whose ages are over 65, while it is expressly stipulated by the government of PRC: "The elderly referred to in this Law are citizens at or above the age of 60". The data of the fifth Chinese National Population Census in 2000 showed that the percentage of aged population at or above

the age of 60 makes up a proportion of 10.33%, which indicated that China had entered the era of aging society at the beginning of 21 century.

The increment of the old signifies the expansion of old-oriented market, it weights the importance of discovering market of the aged people economically. In the light of the tendency of population aging, old people's demands for articles of consumption will increase accordingly. Market of the elderly brings not merely growing needs but practical consuming ability, as well. Despite that at present expenditure on their offspring takes up a great proportion of all the elderly's income, but with the social development and change in people's mindset, this situation is also altering gradually. Qiang Li (1991) predicted the existence of enormous consumption potentiality in market of the old and it has high development value. In his estimation, old people in urban areas expend 6000 CNY individually, accumulated to 270 billion in total which means one tenth of urban expenditure. His estimates are far from comprehensive. M Minkler (1989) suggested that the former fixed perspective commercial departments owned toward the elderly has shifted from an insignificant consumer cluster to a huge market with 500 billion dollors, he also noticed both positive and negative aspects of these newly emerged older consumer group. Guanke, Guo (1999) indicated that people over 50 have become the richest in France with 43% of French people's total income. Mary S. Furlong (2007) coined a marketing perspective of "shift of life stage". Furlong did meticulous study upon various aspects including health, housing, property, employment, daily life and future prospects respect to people between 30 and 40, he found out that the unstable factors and unprecedented changes were keen to succeed in the market of the old

Fangyan Yu(2017) studied on the concept and behaviors of consumption of the elderly. Her research results showed that tourism of the old generation had become a prosperous and promising market, but there were several problems existing, as well. Similarly, L Jiang (2011) summarized that tourism for the old should consider more on target group's physical condition, financial capability, time of leisure, degree of education, personal will and family conditions, these factors are highly connected to the personal traits of the old consumers. Economic & Trade Update (2016) appealed retailers to have their eye on the consumption group of the old: it's a giant consumption group amounted to over 100 million, whilst products of their needs have long been under satisfaction, and their spiritual-cultural life remains tedious.

Marketing Strategies for the Aged Market
On the grounds of a deepened aging society, the old have been playing an important role in consumption market, the aged market orients a new sphere for marketing innovation. The existing theoretical research of the aged market is inclined to two aspects: attributes & consumer psychology and marketing strategy for the elderly. As to the pragmatic research of the aged market, it is more apt to focus on tourism, old-age care, health care products and product fields of all kinds.

Shuying Yao et al. (2003) have done much research into the aged group together with consumer behaviors, they concluded the characteristics of the aged market as frugal,

rational, stable, practical, short distance and group purchasing. These scholars have also come up with some strategies based on those six characteristics discussed above, they are: production strategy, price strategy, distribution strategy, advertisement strategy, personnel sale, operating promotion strategy and so on.

Fang Wu (2005) took a further analysis toward consumption behavior and preference of the old on the shoulder of the past literature and resulted with founding that the consumption of the old characterized in custom, rationality, realism, health, convenience and recreation. Yun Liu (2013) pointed out that the sunset industry is classified conspicuously in some developed regions in China leading by the elderly's commodity market, service market and cultural entertainment market, however the society have insufficient and not discrete concerns on the aged consuming market. He also presented that old consumers are equivalent to people of pure consumption with a long-lasting consumption time.

On the basis of adequate investigation on the market traits and consumption psychology of the old, a hive of scholars came up with related marketing strategies. Xiaoyu Zheng (2018) studied the consumer behaviors of the old on commodities and services of their age, and found out the receivers of the products and services are major in two objects: the old and their children and the youngsters, notably there are extinguished features among them. On the ground of the above research results, Xiaoyu Zheng proposed the suggestions such as developing products proper to meet the demands of the old, the advertisement and promotion of commodities should reflect sentimental characteristics, design reasonable distribution channels, reasonably position the price, etc.

Yong Mei et al. (2014) inquired deeply into the ways of how to fulfil the old consumption market system from market layer. Yun Liu (2013) came up with marketing strategies aim at the elderly's consumption construction based on the research of their consumption traits: subdividing the aged market, separating the high-end user group from lower ones so as to develop and sell products respectively. Similarly, Shuoying Yao et al. (2003) elaborated their suggestions on six aspects of product strategy, price strategy, distribution strategy, advertising strategy, personnel sales and marketing promotion. Yunhua Luo (2013) echoed that the factors which influence the consumption construction of the aged containing both economic and social factors. Referring to economic element, with the rising of the income level, the proportion of food and medical expenditure in consumption structure of the aged have a tendency of downward, while the proportion of clothing and cultural entertainment is uprising, which is implying the multiplicity of the aged people's life has been increasing in step with the increment of their income. Higher the educational level and proportion of cultural entertainment consumption, lower the proportion of medical care and food consumption in total consumption construction.

Study on the Elderly's Behaviors of Utilizing Television
TV is an important constituent part of traditional media, watching television is also a significant leisure activity of the old thus they are one of the important TV consumers.

Current researches of scholars at home and abroad are mainly concentrating on the images of the old in TV programs, how the aged use TV, the impact of TV towards the old and television information service for the benefit of the aged group, especially the last two aspects.

The elderly's cellphone utilization behaviors

At present, scholars are doing their research mainly through research methods of questionnaire or interview, and the contents are concentrating on the influential factors and demand design on the elderly's utilizing of cellphones, university students' using behaviors and app preferences, utilizing behaviors of the drivers on cellphones. These studies are related to many subjects including computer science, engineering science, psychology, gerontics and so on. However, there are little studies on the status quo and preferences of the aged people's utilizing of cellphones, and researches on the actual cellphone usage of the aged using objective data are missing. As the deepening of aging degree in China, the proportion of aged population is greater and greater amongst the total, targeted research on the aged not only endows us diachronous meaning but also a research spot for the internet economy meanwhile.

Research on the mobile phone users

Deatrick (1997) argues that in addition to marriage, occupation and education background, age is to be considered as a significant factor in determining the use of Internet or not. While White (1999) demonstrates the opinion that comparing with age, education is a bigger obstacle for the elderly to utilize technology. O'hara (2004) believes that the technological communicators should check online communication needs for the elderly in view of demographic and social tendency. Based on the technology acceptance model, Van Biljon et al. (2008) propose an acceptance model of mobile phone for the elderly consisting of objectivity factors and procedural factors. The former factors involve perceiving usefulness, user context and intention and the other ones include completion of condition, trying, exploring and confirm its usefulness and difficulty for learning and using as well as the practical application. Omori et al (2002) mobile phone has become an important IT device, but there is barely research on the elder mobile users. The following research will analyze the elder users' reading performance by testing six different types of mobile phones.

Hashizume (2008) found that elder mobile phone users, especially those from rural area, lack the knowledge and motivation to solve technical problems by themselves, and are accustomed to traditional communication methods. Kubik (2009) researched on reasons why senior citizens living in central and western part of the United States use mobile phones. A survey of 100 elder users from 55 to 97 years old showed that regarding to the age, there were differences in the ways and reasons for elderly to use mobile phones. What is more, the main reasons for using mobile phones on the elderly are reflected in two aspects, namely the practicality and security of mobile phones.Combing with behavioral thoery, Conci (2009) found the acceptance model for the elderly, proving the security awareness, self-realization and enjoyment have

corresponding impacts on usefulness of perception, pleasure and accessibility of perception. Lin et al. (2011) the factors influence the information technology of elder mobile phone users is related to the fulfillment of their demands, perception availability, support availability and citizen acceptance. Stamato et al. (2012) found that compared to the female senior citizens, male ones prefer to use more sophisticated and innovative products such as smart phones while the elder women see mobile phones as ordinary communication tools.

Research on Grey system model

Research on social and economic activities cannot be achieved without information, but in reality, circumstances of incomplete information are often seen. N.w. iener in 1945 referred to the system object with unknown internal information as "black box". Later, the academia called the partially explicit and partially ambiguous information system Grey System. In 1982, Professor Julong Deng published two papers on Grey Control System in *Systems & Control Letters* and Journal of *Huazhong University of Science and Technology*, which marked the advent of Grey System Theory. In the era of big data, there are still a large number of uncertain systems of "small data" and "poor information" in the real world, which provide abundant research resources and broad development space for the development and application of Gray System Theory.

According to the theory of Grey System, random quantity can be regarded as grey quantity changing within a certain range. For the Grey System with poor information, the value of grey variable is very limited, and the data changes irregularly. Through the generation and operation of these gray variables, the gray prediction model makes the data change after processing have certain rules. Compared with the original data, the gray prediction model increases the certainty of data change. On the basis of the generated data, the gray system model is established for prediction. Grey prediction model is one of the most widely used models in grey system model. Naiming Xie et al. (2005) firstly put forward the discrete grey model and studied its nature. Chirwa (2006) used GM (1, 1) model to study the British and American data and estimate the risk of traffic accident. Xueyuan Zhang et al. (2006) used GM (1, 1) model to study the change rules of emotional state of robots, and proposed an emotional robot interaction system based on it.

Research on Spatial Statistical Model

The world is material, and material always exists in a certain space, which separates and connects things. No matter in nature or in human society, no matter in micro particles or in macro universe, things have their own spatial structure and ways of contact with the outside world on the corresponding scale. The universal law of things in time and space is one of the purposes of scientific research. In data analysis, space is an insight into data and an important perspective to reveal that law of thing or phenomena in the real world. And with the deepening of cognition, the space problem becomes increasingly important. When researching on methods and theories in geography, it should be analyzed from its geographical environment, social economic

background, philosophy and scientific basis so as to review the past and predict the future. Spatial statistics is a method of statistical analysis of spatial data. In the 1960s, French statistician Matheron G, who has went through a large number of theoretical studies, initiated the new branch of statistics, Spatial Statistics.

Owing to the interactions existing between the space, such as the different directions and different distance, the demonstration of geographical or space data is failed in meeting the basic hypothesis of traditional data analysis like the data of the normal distribution assumption. For this, the traditional methods of mathematical statistics cannot solve well the space selection of sample points, space value and that the relationship with more than two sets of spatial data. As a result, a new method, Spatial Statistical Analysis, emerged. Spatial statistics are based on the spatial interaction and change patterns of objects with geographic spatial information features, and integration of statistics and modern graphics techniques, and the reflection of distribution, patterns and interaction of the spatial data in an intuitive way.

Methodology

This study is mainly based on quantitative analysis，literature research and in depth interviews. The fact is originated from the data of mobile users and television users from Qingyang district, Sichuan. SQL is used for extracting relevant original data form operator's database. Afterwards, Excel will work by filtering and cleaning data. Combining with it, SPSS 20.0 is utilized for data analysis. The data analyzed in this dissertation is the statistical data from the operator's data system, which discards the systematic error caused by questionnaire and makes data with high credibility. In addition, it not only fills in the gaps in the behavior research of the elderly consumer groups in China, but also presents new changes and impacts brought by the aging society from a brand new perspective. Furthermore, this dissertation may be helpful for providing new ideas for the future research on the elderly.

Comparative Study：The dissertation selects TV as a representative of traditional media and as a comparative object with mobile phones. By comparing the usage of computer and mobile phone would analyze the possibility of alternation of traditional media, by comparing preferences of TV shows and app would show the differentiations on different social media platforms.

Correlation analysis: This dissertation utilizes Grey Prediction Model to analyze the latest five-quarters' monthly average usage time, usage flow and call duration of the elderly and to propose the predictive analysis for the next quarter. At the same time, Spatial Statistical Model is utilized to see if there exists spatial aggregation effect on elder users' behavior in Chengdu, namely spatial correlation effect.

Data and Concepts

The data in this chapter comes from the mobile phone users provided by an operator in Qingyang district of Chengdu city. In the early stage, the required data type was determined through literature research and matched with the actual data in the operation database of a certain operator. After matching, SQL was used to extract the

related original data from the database of a certain operator. A total data of five quarters were extracted from October 2017 to December 2018, which demonstrates the amount of data was enough for the Grey Prediction Model. We used Excel for data screening and cleaning together with SPSS 20.0 software for data analysis. The data analyzed in this dissertation are operational data extracted from the data system of an operator, averting systematic errors caused by questionnaire surveys. The data are highly reliable and objective.

Variable Selection

Based on the existing literature research results and combined with the existing data types and modes of the operator database, the following variables were selected as the research objects:

(1) User's age. The age information of users is obtained by utilizing the data of the operator's database, and divided into different age sections to form the age information of each section which the user belongs to.

(2) User's gender. Attaining the gender information of users through the data base of the operator.

(3) Region that the user resides. The regions where mobile phones are most frequently used are the areas for users. According to the administrative divisions, the areas were divided into rural and urban areas. Users are sorted to different blocks within the Qingyang district

(4) User's phone numbers. One user may have more than one mobile phone number, and the data generated by different mobile phone numbers were combined, and the main mobile phone number was perceived as the corresponding mobile phone number of that user. It is worth noting that in real life, the user's mobile phone number may be in the state of shutdown but keeping the number or other abnormal use, that is, it failed to produce effective raw data for analyzing. In this case, the data will be cleaned and screened, and such users will be deleted.

(5) User's phone models. In real life, the same user may have more than one mobile phone model, and the mobile phone model adopted in the research was corresponding to the user's major mobile phone number which was also used by the user most frequently, in other words, the mobile phone model corresponding to the mobile phone number with the highest activity was taken as the model of phone used by that user.

(6) Level of user's expenditure. Calculating the average value of mobile communication consumption of the same user in different quarters as the user's expenditure level of phone charge, and the range of fee of all users is divided to determine the section of expenditure level that the user belongs to, then regarding it as the mobile communication consumption level of the user.

(7) User's call duration. The average call duration of the same user in different quarters was calculated as the call duration of the user, and the interval of all users' call duration was hence divided to decide which interval the user belongs to and taking it as the evaluation of the phone call duration of the user.

(8) The frequency of the user's calls. The average call frequency of the same user in different quarters was calculated as the call frequency of the user, and the call frequency interval of all users was divided to determine their call frequency intervals, which was used as the evaluation of the phone call frequency of users'.

(9) The list of Apps installed by the user. Sorting out the APP list used by the user, classifying these Apps via their fundamental or major functions, they are mainly divided into social networking applications, life and consumption applications, online payment applications, query tools, map and navigation applications, beautifying and photo-taking applications, video players, news information applications, book reading applications, enterprise customizations and other types of mobile Apps, the study was carried out through these classifications

(10) Duration of App use. After classified the above Apps, user's average monthly use time of each type of App was counted as the user's App-using time.

(11) The App-using data traffic. After classified the above Apps, user's monthly average data usage traffic for each type of App was used as the traffic of user's App Usage.

(12) User's App usage frequency. After classified the above Apps, the monthly average use frequency of users for each type of App was adopted as user's App use frequency.

Analysis

The variables involved here are the basic variables of the study. In the original data sources of the operator, they belong to different databases. In this study, various aspects of user information are connected by user ID.

Table 3.1 Variable Definitions

Variable Names	Variable Types	Other Remarks
Gender	Dummy Variable	Female = 0, Male = 1
Age	Continuous Variable	80 and above = 0, 75-79 = 1, 70-74 = 2, 65-69 = 3, 60-64 = 4
Region	Dummy Variable	Rural = 0, Urban = 1
Phone Number	Continuous Variable	
Phone Model	Dummy Variable	IPhone = 0, Samsung = 1, Huawei = 2, Xiaomi = 3, OPPO = 4, vivo = 5, other Chinese brands = 6, other non-Chinese brands = 7
Phone Type	Dummy Variable	Non-smart phone = 0, Smartphone = 1
Level of Phone Charge	Dummy Variable	0-20 CNY = 0, 20-40 CNY = 1,40-60 CNY = 2, 60 CNY and above = 3
Call Duration	Dummy	0-1 hour = 0, 1-10 hours = 1, 10-20 hour = 2,

	Variable	20 hours and above = 3
Call Frequency	Dummy Variable	0 time = 0,1-10 times = 1,10-20 times = 2,20 times and above = 3
App List	Dummy Variable	Social Networking = 0, Life and consumption = 1, online payment = 2, query tools = 3, map and navigation = 4,beautifying and photo-taking = 5,video players = 6, news information = 7, book reading = 8, enterprise customization = 9, others = 10
App-using Duration	Dummy Variable	0-1 hour = 0,1-10 hours = 1,10-20 hours = 2,20 hours and above = 3
App-using Data Traffic	Continuous Variable	
App-using Frequency	Dummy Variable	0 time = 0,1-10 times = 1,10-20 times = 2, 20times and above = 3

Description and Analysis

The statistical analysis software SPSS was used to conduct statistical analysis on the database constructed above of the elderly in Qingyang district. Among the influences of demographic factors on the use of mobile Apps by the elderly, it can be seen that the proportion of women using mobile Apps was 8% lower than that of men, and there was a certain gender difference in the use of mobile Apps. Considering of historical reasons, the education level of elderly women is lower than that of elderly men, which result in a weaker learning ability of women in mobile App using than that of men. As the age grew older, the proportion of people who used mobile apps declines. 37% of people in the 60-64 age group use mobile Apps, while 7.6% of mobile App users were at the age group of 80 and above. With the growth of age, the learning ability of the elderly declined, as did their ability to learn and use APP.

As for the selection of mobile phone models, it can be found that at present, most of the elderly choose domestic mobile phones, and statistics showed that only 8.3% of the elderly choose mobile phones from non-Chinese brands. Among Chinese domestic mobile phone models, OPPO and vivo account for the highest proportion, which were 32.2% and 27.5% respectively, followed by Huawei, Xiaomi and other mobile phone models. Among the non-Chinese mobile phone models, Samsung, Apple and other mobile phone models have the highest proportion, followed by Nokia and SONY. Considering that Chinese brand mobile phones possess relatively perfect offline layouts and high advertising frequency, it can be considered that the selection of mobile phone models of the elderly is significantly affected by the offline sales policy. From the perspective of mobile phone type, there are conspicuous age and gender discrepancies in the choice of smart phones among the elderly. 37.2% of the elderly women choose smart phones, and most of them still use feature phones. In comparison, the penetration rate of smartphone amid the elderly men reached 57.4%,

much higher than females'. This suggests that the social and cultural needs of older men are much greater than those of aged women. In terms of age distribution, the proportion of mobile phone usage gradually decreased with the increase of age, and the proportion of female mobile phone use declined faster than that of male. The rate at which the percentage of smartphones use declined with age is particularly striking.

The place of residence also has an effect on the elderly's use of mobile phones. The higher the urbanization degree was, the higher the proportion of elderly people's using of mobile Apps was. Only 10.3% of the elderly in rural areas used mobile Apps, whilst nearly half of the elderly in urban areas (47%) used mobile Apps. In the author's opinion, the place where the elderly live is not only a symbol of social status but also a symbol of cultural level to some extent. The higher the urbanization level is, the higher the cultural level of the elderly in the place where they live is, and the higher the ability and demand of using mobile phones is.

Social support is manifested in the presence of relatives or friends who call at least once a month. If so, it is considered that they have family or friends to support them and vice versa. In terms of the influence of social support on the use of mobile Apps by the elderly, 27.3% of the aged population who made at least one phone call every month via mobile Apps. Among the elderly who did not make a phone call once a month, 52.5% of them used mobile Apps. This indicated that the elderly without social support were more dependent on mobile Apps, which were of certain positive significance in making up for the lack of social support and maintaining the formative connection between the elderly and the outside world.

In terms of APP types, elderly people in different regions had different habits. The elderly in rural areas used mobile Apps in a single way. The Apps with the highest usage rate were video and audio players (75.5%) and news and information Apps (67.4%), whereas the rest were rarely used, with usage rates no more than 10.0%. In urban areas the old people used relatively abundant types of mobile phone Apps, the ones with the highest utilization rate were video and audio players (84.0%), social networking applications (80.2%) and news information Apps (73.4%), followed by the life and consumption Apps (65.1%), query tools (54.7%), beautifying and photo-taking Apps (28.9%), book reading Apps (14.5%) are the least among them. This showed that the elderly's use of mobile Apps had strong regional characteristics. The higher the economic level of the region, the stronger the learning ability of the elderly, the demand for mobile apps, the ability to use mobile Apps, and the richer the types of usage.

The variables proposed in this paper were significantly correlated with the use of mobile Apps by the elderly (P<0.01). Except that the age was negatively correlated with the use of mobile Apps by the elderly, other variables were correlated positively.

Correlated Conclusions

Through the collection and analysis on data of new media usage status quo among the elderly, the study found that skilled contact and use of a mobile phone App by the

elderly has the following features in common: younger age, decent living area, and a higher level of cultural, economic conditions which made it possible for them to afford mobile phones, especially smartphones. The financial condition determines whether a family is likely to buy the latest or relatively newer model of mobile phones, and the new model of mobile phone has the significance of promotion. If the family possesses a mobile phone, the elderly will be more inclined to use the new phone. The functions of mobile Apps also have a direct impact on whether the elderly use those Apps. For the purpose of solving this problem, relevant manufacturers should develop more suitable interfaces and operating platforms for the elderly. The results of this study confirmed the significant influence of age and education level on the use of mobile Apps amidst the elderly. From the perspectives of social economy, environmental impact and psychological motivation, this study only supports the influence of economic conditions on the elderly's use of mobile Apps. The availability of hardware devices can also be regarded as a supporting viability, which is also a significant factor in the analysis. These two points confirm the fruitful findings of previous studies. According to the results of regression analysis, some variables, including age, have significant influence on whether the elderly use computers or not. Among these factors, age is the unchangeable factor, and the level of education among the aged over 60 can scarcely be improved. Therefore with this footing, there is room, then, for the elderly to improve both their finance conditions and mobile-phone hardware. The level of phone charge of the elderly represents their financial status, and the purchasing power of hardware equipment is directly related to it, as well. In that way, the improvement

Variable Name	B	S.E,	Wals	df	Sig.	Exp(B)
Gender	0.269	0.203	1.752	1	0.186	1.308
Age	0.183	0.091	4.005	1	0.045*	1.201
Region	0.390	0.173	5.072	1	0.024*	1.477
Phone Number	0.368	0.219	2.820	1	0.093	1.445
Phone Model	0.198	0.099	4.016	1	0.045*	1.219
Phone Type	2.613	0.481	29.514	1	0.000*	13.643
Level of Charge	0.032	0.187	0.029	1	0.866	1.032
Call Duration	-0.595	0.389	2.338	1	0.126	0.551
Call Frequency	0.258	0.127	4.118	1	0.042*	1.294
App List	-0.438	0.300	2.126	1	0.145	0.645
App- using Duration	0.220	0.491	0.201	1	0.654	1.246
App-using Traffic	0.144	0.254	0.321	1	0.571	1.155
App-using Frequency	-0.345	0.217	2.531	1	0.112	0.708
Constant	-4.819	0.863	31.192	1	0.000*	0.008

* indicates that the change is significant when the confidence is 0.95

Multiple linear regression model summary

Logarithm	-2Log Likelihood Value	Cox & Snell R-squared	Nagelkerke R-squared
1	614076[a]	.239	.355

Note: a. since the change of parameter estimation is less than.001, the estimation stops at 6 iterations.

Because of data limitations, the elderly's usage of the new mobile App in this dissertation can only be researched by this kind of single binary investigation, and for the elderly's use of new Apps' content and their attitude towards Apps and other aspects, the data was scanty, and these issues are the key to better understand the elderly use of mobile Apps. We are looking forward to have better data available in the future. Social progress in which the old population is neglected is much of an unreal progress. Technology development distanced from the elderly, is an incomplete development; the internet world without the participation of the elderly is also a defective world (Leiwen, Jiang, 2001).

Due to the limitations of privacy policies and technical conditions, only the most basic information of elderly users can be obtained from the operator, and other classification features of the interest to the author cannot be further portrayed. The lack of such data has a negative impact on the in-depth study of the mobile phone use habits and preferences of the elderly. Therefore, a natural idea is to construct relevant models to depict the user characteristics that the author is interested in through existing data. This chapter will study this issue from two aspects: user attribute mining based on mobile App installation list and user group discovery based on mobile App usage record. Thereinto, the former is used to supplement user characteristics and construct more accurate user portraits, while the latter is used to divide and classify users into different user groups to achieve a deep understanding of users.

Discussion

Coupled with the research discussed above, Jingying Wang (2016) and her coworkers analyzed the fluctuations of Weibo users' emotion during different seasons and period in a macro aspect using the means of internet big data. They unveiled the influence of time upon user's sentiment via the form and method of data mining. The study sampled 1.95 million Weibo users and downloading weeklong data of active users in each season, calculating the word frequency of words for positive emotions and negative emotions on weibo in this season depend on the "Chinese psychoanalysis system". The results show that: firstly, the two peaks of people's comprehensive emotions are at noon and 8 PM; secondly, although people's positive emotions on weekends are the same as those on weekdays, their negative emotions on weekends are significantly lower than those on weekdays. Thirdly, people's positive and negative emotions are the highest in summer and the lowest in autumn. Fourth, the emotional trend of the both genders is the same, but women have more emotional expression than men, in others words, women are more emotional and more sensitive. Gao Zhe (2015) et al. studied the interests of users based on the weibo content classification model. He put forward this model based on the text's attributes of sina weibo such as short-text characteristic, real-time and big volume, contents at will, proactivity and topicality; besides, he constructed the dictionary of users' interests and

hobbies, grasping more active weibo users regularly then categorizing through extraction of the user's weibo content, eventually matching and accumulating statistics of key words according to the interests and hobbies dictionary to certify the user's preferences.

This paper is written from a total innovative perspective. In the existing literature research, the main research objective mostly focuses on the young generations while the elderly, as the main focus on the research of affecting factors of mobile phone usage, the function and application of design strategy for the elderly lacks the attention to their behaviors of mobile phone. Hence, this paper is intended to fill the gap in this research field. Among the small amount of research on the elderly, questionnaire is mostly adopted as a common survey method and data source is mainly from a certain and limited area. For this, two drawbacks may exist as followings: On the one hand, the data source is small. On the other hand, when interviewing the elderly, the objectivity of figure would be greatly declined due to poor memory of the elderly. Also, using questionnaire may cause systematic error and deviations from the real situation. The figure in this dissertation is extracted from the operator's database and recorded in the real operation process. Thus the obtained figure could eliminate the error to a maximum caused by the subjectivity of the users and reflect the real behaviors objectively with a high credibility.

This paper can be on the basis of the description of the general statistics, using clustering and spatial statistics and grey model to deeply demonstrate the data owing to its particularity od data. It can provide new insights and thoughts, new perspectives, new methods and new paths for related elderly research by analyzing generality and individual characters of the behavioral activities of the elder cell phone users

Conclusion

This paper extracted, cleared and matched the mobile phone user data of a telecom operator in Qingyang district of Chengdu city in recent five quarters, and selected variables of data types of interest about the elderly such as the age, gender, mobile phone number, type, charge and Apps, forming a large collection of mobile phone use data of the aged. Descriptive statistical method was used to analyze the influence of demographic factors on the use of mobile Apps by the elderly, and it was found that different demographic factors had an influence on their use of mobile Apps, among which the influences of financial factors, gender and social support were obvious. In order to study the feasibility of mining the corresponding attributes of the elderly through the analysis of mobile Apps, a characterization method based on specific attributes was proposed to describe the characteristics of users, and the relationship between the list of mobile Apps and specific attributes was modeled, discovering user attributes by screening out the abovementioned data of middle-aged and elderly mobile phone users' mobile App installation list, thus intuitively reflecting users' interests, preferences and lifestyles from the data. The results showed that our approach was viable and could mine user attributes to some extent through the App installed and used by users. The usage information of mobile Apps also reflects the

life needs and habits of users in a way. Users with different life backgrounds have certain differences in the use of mobile applications.

This paper puts forward the idea of discovering different user groups through clustering. The user's application usage records were extracted from the data set and then classified into different application categories. Afterwards, we found different user groups through clustering on the basis of the similarity of users' using of mobile Apps. The research results justified our research assumption, indicating that it is feasible to reasonably divide the elderly into different user groups through mining the mobile phone use information of the elderly through the Apps they installed, and then putting forward some specific suggestions on design to help improve the user experience of mobile phones.

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