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## Conference Paper

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# **When, where and why we use the mobile app? A study on the use contexts for the mobile APP**

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## **Abstract**

Mobile APP develops very rapidly, while, different from some fixed contexts using traditional products, people can use the mobile applications anytime, anywhere. This paper combined the reference literature with the current situation of APP market, built a model of using mobile APP named "context-APP-gratification". Referred to context, referring to relevant literature, the contexts of using mobile APPs are divided into 7 categories by the two-step clustering: the "family leisure group", the "outdoor activity group" and the "office work group". Referred to gratification, five types of gratification using mobile APPs are summarized by using the grounded theory in the pilot study and verified by factor analysis in the main study. In a further study, the relationships among the contexts of APPs, the types of APPs, and the gratifications of APPs are studied. In addition, for different types of APP, this paper also propose management recommendations combined with the market analysis.

**Keywords:** Context; APP; Uses and gratifications

## **1. Introduction**

In 2016, the revenue scale of the global mobile application market exceeded \$35 billion, and the annual growth rate reached up to 40%. China had become the world's highest-paid market of IOS. With the large scale of the economy, China also had a solid mobile app user base. As of June 2016, China's mobile phone users reached 656 million <sup>[1]</sup>. With the new round of technology changes, mobile terminals are rapidly updating, which brings the update of mobile apps. As a result, people rely more and more on mobile apps.

In the past, due to practical limitations, products were used in a few fixed time or

space. However, the development of mobile technology has broken the limitation of time and space, which makes it possible to use mobile app anytime and anywhere. As a result, more and more mobile apps are applied to different contexts<sup>[2]</sup>. Therefore, it is very meaningful to study the use of mobile app in different context. The context has always been considered as one of the key factors affecting the human-computer interaction process: in a certain context, people use the mobile app due to some motivations, and the interaction process with the mobile app makes people get a variety of gratifications.

## **2. Theoretical basis and research model**

### *2.1. Mobile APPs*

Mobile APPs can achieve a variety of functions through the Internet in almost any wireless environment. Since the popularity of mobile phones in the world, people have been using the mobile APP anytime and anywhere. At the same time, many companies have provided services on mobile APP and web and trained more and more mobile APP users. In the global market, the mobile application downloads is 138.89 billion times in 2014. The preliminary estimate suggests that mobile application downloads will reach 150 billion times in 2016<sup>[3]</sup>. In Chinese market, market scale of mobile APP reached 57.59 billion yuan in 2013, the chain growth rate of 91.6%. Driven by the intelligent terminal and mobile Internet users' scale, mobile APP maintains a rapid development momentum. It is expected that China Mobile APP market size will reach 251.84 billion yuan in 2016<sup>[4]</sup>. Scholars both at home and abroad also launched a study of all aspects of APP. It is found that APP can be divided into five types: intention of use/intention of purchase, loyalty/continuous use/recommendation, privacy and self-disclosure, the design or test of APPs, the effects of APPs.

Mobile services are more and more popular, and people can use it almost anywhere. Different from other forms of products, the mobile phone APP is the main feature of usage contexts. The usage contexts can be analyzed and described based on mobile usage scenarios factors, such as user location and other special use contexts<sup>[6]</sup>. In fact, usage contexts has always been a potentially important factor for APP, which deserves further investigation. But the usage contexts of APP is still less in the previous literature on APP. Therefore, this study attempts to further explore the relationship between the type and the context of using APP.

### *2.2. Context*

In Information Science, one of the earliest and more comprehensive definitions was proposed by Schilit et al<sup>[7]</sup> in 1994: the context contains more than just the location of users, because other things are moving and changing. A context includes lighting,

noise level, network connectivity, communication costs, communication bandwidth, and even social conditions. For example, you are staying with your manager or with your colleagues. Ryan et al. in 1997<sup>[8]</sup> defined context as "location, identity, environment and time". In 2001<sup>[9]</sup>, Dey et al., through a more extensive survey based on context calculation, also made a definition: "any information that can describe the entities, typically, position, person's identity and status, groups, computing and physical objects." According to the definition of context, a context links environment, users, specific tasks, equipment and application, combined with previous related literature study<sup>[8]</sup>, the context factors mainly reflected in five aspects of environment, users, tasks, equipment and application.

In 2005, Inseong Lee and Jaesoo Kim <sup>[10]</sup> from Korea divided the context into individual related contexts and environment related contexts when studying Korean mobile Internet services. In individual related contexts, some are related to personal emotion (motivation, pleasure), some are about personal time (whether at work, whether at leisure), and some are about personal movement state. In environment related contexts, there are physical contexts and social contexts. Between them, the physical contexts include location, interference and congestion; social contexts include interpersonal interaction and privacy. In addition, they found that the contexts not always are same when users use different mobile Internet services. So, in terms of smart phone APP usage contexts and APP types, the following hypothesis was proposed:

**H1:** Users prefer different types of APPs in different contexts.

Mobile Internet makes it easy to access the world-wide-web through a mobile terminal, which makes it more and more popular. With the development of mobile Internet, people can use it in different contexts at any time and place. In 2012<sup>[12]</sup>, on the mobile Internet services, Yang et al. found that consumers receive or not depends on usage contexts, and in the process of utilitarian value (perceived mobility, perceived usefulness) and hedonic value (perceived interestingness, attention concentration) affecting consumers' willingness to accept, the usage contexts play an intermediary role. Research by Lee et al.<sup>[10]</sup> found that people using mobile Internet services were severely restricted, and participants used mobile Internet in only a few key contexts. In a research on mobile communication service made by Karnowski and Jandura <sup>[13]</sup> in 2014 in Germany, Latent Class Analysis (LCA) was used to divide usages contexts into three contexts of using mobile services at home, on the way, together with friends outside. Further study found that in the three variables of the demographic variables, the mobile communication service types, and gratification achieved in this usage contexts, some variables are significantly related to one of the three contexts, when users use mobile web services, the gratification achieved in different contexts is somewhat different. Therefore, in terms of the usage contexts and use gratification of mobile APP, and the following hypothesis was proposed:

**H2:** Users obtain different gratifications by using APP in different contexts.

### *2.3. Uses and Gratifications*

Uses and gratifications theory, proposed by Katz, Blumler, and Gurevitch <sup>[14][14]</sup> in 1973, explores the reasons for the use of mass media by audiences and the reasons why these media satisfy the audiences. In the information age, in 2000, Papacharissi and Rubin <sup>[15]</sup> identified the main motivations for using the Internet: seeking information, entertainment, convenience, killing time, and interpersonal effectiveness. In 2000, Tewksbury and Althaus <sup>[16]</sup> found gratifications obtained from using the Internet, including: seeking information, entertainment and recreation, searching and researching, and building relationships. In 2000, Leung and Wei <sup>[17]</sup> summed up four motivations for Internet use: interesting pursuits, social networking, triage / escape, surveillance / information gathering. In 2001, a study of Flanagin and Metzger <sup>[18]</sup> showed that compared with the traditional means of interpersonal communication, Internet communication with computers as intermediary better satisfies users': information retrieval, learning, entertainment, leisure, social relations, relationship maintenance, problem solving, status, and personal insight. In addition, in 2003, Ozcan and Kocak <sup>[19]</sup> found that mobile use motivation included new dimensions: status symbolism, mobility, and instant access. In 2012, Zhang and Zhang <sup>[11]</sup> studied the use gratification of computer multi task (i.e., using two or more computers at the same time), used exploratory factors, analyzed and found three types of gratifications: social / emotional / relaxed gratifications, convenient / easy / instant gratifications and control /habit gratifications. Previous studies have shown that all factors of gratifications were significantly related to various types of computer multi tasks, however, the study of Zhang and Zhang <sup>[11]</sup> found that only one or two gratification types were significantly associated with a specific type of task. Thus, in terms of APP types and use gratifications, and this study proposes the following hypothesis:

**H3:** Users obtain different gratifications by using different types of APPs.

## 2.4. Research Model

Based on the literature review about the smart phone APP, usage contexts and usage gratifications literature review, this research establishes an independent model about contexts -- APP -- gratifications, as follows:

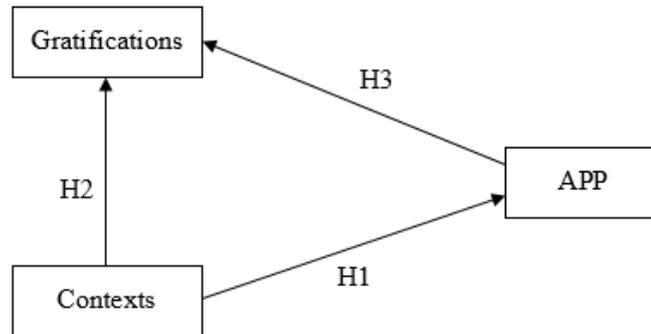


Figure 2-1 Research Model

In this model, the context is the smart phone APP usage context, and APP is the actual APP type used by the user, the gratification is people use a particular type of APP to obtain the extent of different gratifications.

## 3. Research Design

### 3.1. Pilot Study

The pilot study hopes to explore what types of gratifications users will get when using the mobile APP. A questionnaire survey was conducted for two weeks from December 7, 2015 to 20. The questionnaire uses multiple open questions to ask each user about the gratification or experience of using a smart phone APP in a previous context. A total of 610 questionnaires were received, including 517 valid questionnaires. The sex ratio of the survey sample is quite equal, respondents mainly are young people between 18 and 25 years old, and more than 90% of the respondents are college students and above.

The grounded theory<sup>[20]</sup> is used to analyze the gratifications obtained by APP users when using APP. A total of 3 people as different encoders respectively and comprehensively determine the gratification type each user obtained when using the smart phone APP through a number of open-ended questions in the questionnaire. For the records which encoded different by 3 persons, the final coding result is determined according to the original meaning of the record, the rules of coding at all levels and the reference of the previous literature. Through the first step of open coding, the original meaning of each questionnaire was studied, and merge the same meaning, forming 48

codes. In the second step of relational coding, merge sentences which have similar statements or same type, forming 17 relational encoding. Finally, 17 relational encoding were studied, merge these encodes which have same logical category, and finally merge into 5 kinds of core coding, that is, the initial consumer gratification type of using APP.

Through the open questionnaire, the encoding of grounded theory, the pilot study found that there are five gratifications users obtained when using smart phone APP: leisure gratification, tool gratification, habit gratification, information access gratification, social gratification. This is in line with previous findings regarding the use gratification research.

### **3.2. Main Study**

An 18 day questionnaire was conducted between June 13, 2016 and June 30th, taking into account the randomness of the context, and questionnaires were collected online. A total of 650 questionnaires were received, including 604 valid questionnaires. The questionnaire asks respondents the APP name they've recently use and some details when used (the context and the degree of gratification obtained). In the survey sample, the proportion of women was slightly more than that of men, the age was mainly between 18 and 30 years old, more than 95% of respondents were college students and above, and the occupation was mainly enterprise staff and full-time students.

For the classification of APP, the classification standard of TESTIN LAB <sup>[20]</sup> was adopted in this paper, APP is divided into eight classes of social communication, entertainment, living financing, system tools, office or study, tourist travel, video images, news reading, a total of 170 APP were in the sample, social communication APP and living finance APP takes a larger proportion. Based on the early literature studied on the context dimensions, and the features of smart phone APP, the contexts on this paper were divided into 7 dimensions, namely working state, movement state, position, interpersonal interaction, network, mobile phone system, mobile phone size. About the classification of gratifications, according to the pilot study results, through the core encoding of grounded theory, the gratifications people obtained when using APP were divided into five categories: leisure gratification, tool gratification, habit gratification, information access gratification, social gratification; in addition, the 17 items of the relational encoding as the measure term foundation, and combining the measure criterion of the previous literature, a measurement scale for the type is designed.

## **4. Methods and Data Analysis**

### **4.1. Reliability Analysis**

In this study, the overall Cronbach's Alpha of the questionnaire was 0.897, which

indicated that the data were reliable.

The five latent variables of gratifications were carried out the Cronbach's Alpha test, and the results showed that the correlation between the item of each measurement items and the total is greater than 0.5, and Cronbach's Alpha of each factor was greater than 0.7, indicating that the measurement items of each factor shows very good consistency. The results of combination reliability were good, and the combination reliability of each factor was higher than 0.7. To sum up, the data of the questionnaire showed very good reliability.

#### *4.2. Factor Analysis*

This study first carried out KMO test and Bartlett sphericity test for 17 items of gratifications, KMO test level is 0.882, significantly less than 0.001, so validity test was adopted and can be further carried out factor analysis.

Further carries on the factor analysis, Eliminate a measurement item with a smaller factor load (0.520), there are five factors whose eigenvalues are greater than 1, after the orthogonal rotation of Kaiser, the factor loadings of each measure are higher than 0.5, and the explanatory variance of each factor are all higher than 10%. The highest was leisure gratification (19.831%), the lowest was tool gratification (13.844%), and the cumulative explanatory variance of the five factors was 78.695%. This also validates the coding results for the five categories of gratifications in the pilot study.

#### *4.3. Smart Phone APP Usage Contexts Analysis*

##### (1) Situation in each dimension of usage contexts

The research on situation in each dimension of usage contexts found that over half of the smart phone APP users were at home or in the dormitory; meanwhile, users at rest, or at a standstill were also more than half; nearly half of the people played alone; more than half users played with Wi-Fi, also the majority of users used Android mobile phones; and about mobile phone size, 4 inches to 5 inches are still mainstream.

##### (2) Cluster analysis

In view of location, movement state, interpersonal interaction, network state, work state, mobile phone size and mobile phone system, twostep clustering analysis is carried out for these 7 context variables. The BIC coefficient of three clusters is smaller than that of a cluster or two clusters, and has a bigger distance measurement ratio(1.724), according to statistical algorithms, combined with BIC coefficient and the measurement distance ratio these two indexes, the optimal cluster number is three.

In cluster 1, position has the highest importance among the predictor variables, "home /dormitory" in position have the highest proportion, 99.06%; the second is

interpersonal interaction, usually are alone (accounting for 41.69%) or with family (accounting for 38.56%); the third is work state, most are at rest or at leisure (accounting for 85.27%); in addition, their movement state usually are at standstill (accounting for 92.79%) , network status is generally connected to Wi-Fi (accounting for 73.98%). Therefore, cluster 2 can be defined as "family leisure group".

In cluster 2, position has the highest importance among the predictor variables, 87.50% users of the cluster are on the way; for movement state, 76.14% users are athletic not standstill; for their network state, more than half of them are connected to Wi-Fi (accounting for 70.45%); they usually are alone(accounting for 54.55%), off working state(accounting for 93.18%). Therefore, cluster 3 can be defined as "outdoor activities group".

In cluster 3, position has the highest importance among the predictor variables, users in companies or classrooms up to 97.46%; and they are usually with colleagues (accounting for 53.30%); users in the working state is also the majority (accounting for 59.90%); and the vast majority of the state is still (accounting for 95.94%). Therefore, cluster 3 can be defined as "office work group".

### (3) Hot contexts analysis

Clustering analysis shows that the mobile phone system and mobile phone size are of few importance to the clustering prediction variables, therefore, after excluding two variables of the mobile phone system and mobile phone size, the records of same context dimension in the 604 records are counted, and the first 5 frequent contexts are as follows:

Figure 4-1 Simplified hot contexts

Location	Work state	Movement state	Interpersonal interaction	Network state	Frequency
Home/dormitory	Rest/leisure/entertainment	Standstill	Alone	Wi-Fi	91
Home/dormitory	Rest/leisure/entertainment	Standstill	Family	Wi-Fi	78
Company/classroom	Work/study	Standstill	Colleagues	Wi-Fi	47
On the way	Rest/leisure/entertainment	Athletic	Alone	4G	27
Home/dormitory	Rest/leisure/entertainment	Standstill	Friends	Wi-Fi	26

We found that users will focus on some hot contexts when using smart phone APP. For example, there are 91 users who are staying alone at home with Wi-Fi; similarly, there are 78 users in a similar situation, but they are accompanying the family; of course, we also found that 47 users are working with colleagues in the company or classroom with Wi-Fi.

#### *4.4. Analysis of Influence of Contexts on Smart Phone APP Usage Type*

Based on the chi square test of mobile APP type and contexts, we can see that there are significant differences in APP types used in different contexts (  $p < 0.001$  ) .

We further want to know what type of APP users prefer in what kind of context. Thus, the three categories of contexts are used as independent variables, and eight APP types are used as the dependent variable to establish 8 logistic regression. In the model fitting information of the 8 logistic regression models, the linear relationship between the explanatory variables and the generalized Logit P is significant, and the model selection was correct; moreover, the 8 likelihood ratio test results shows that the explanatory variables significantly contribute to linear relationship of the generalized Logit P.

##### (1) Family leisure group vs. office work group

We found that the family leisure group were more inclined to video images and system tools APP, while the office work group preferred office learning, travel and social communication APP. And users in the family leisure contexts, the use willingness of video image APP significantly higher than social communication, life finance, office learning and travel APP; users' willingness to use the system tool APP in the family leisure context is significantly higher than that of social communication, office learning and travel APP. In addition, users' willingness to use office learning APP in office work contexts is significantly higher than life finance, system tools, video images, news reading APP; the willingness of users to use travel and social communication classes in office work contexts is significantly higher than system tools and video images APP.

##### (2) Outdoor activities group vs. office work group

We found that social communication, life finance, system tools, office learning, news reading, the use orientation of these five types of APP have significant differences with the travel APP. It can be seen obviously that users are significantly inclined to use travel APP in outdoor activities contexts.

##### (3) Family leisure group vs. outdoor activities group

There is a significant difference in the propensity between travel APP and the other seven types of APP. We found that when compared to family leisure contexts, meanwhile, users are significantly inclined to use travel APP in outdoor activities contexts.

Thus proves H1: Users prefer different types of APPs in different contexts.

#### *4.5. Analysis of Contexts on the Use Gratification Influence Function*

##### (1) Influence function test

When three contexts are as groups, the homogeneity of the 5 classes were tested.

Leisure gratification, habit gratification and tools gratification have homogeneity of variance, they were analyzed by single factor analysis of variance, and found that leisure gratifications people obtained were significantly different ( $p < 0.001$ ), however, the habit gratifications and tools gratifications people obtained had no obvious difference.

While social gratification and information access gratification have heterogeneity of variance, it is not suitable for single factor analysis of variance, therefore, nonparametric tests were considered. Using the Kruskal-Wallis test in nonparametric tests, the context as a subgroup variable, and the results showed that the effects were not significant ( $P > 0.05$ ), which showed that there was no significant difference between social gratification and information access gratification in different contexts.

#### (2) Multiple comparisons

S-N-K multiple comparisons were carried out for the leisure gratification with homogeneity of variance. The results showed that the three contexts were divided into 2 sub-groups under leisure gratification, in which the family leisure group was significantly different from the other two groups, that is to say, the leisure gratification degree of people in the family leisure contexts was significantly higher. There was no significant difference between the office work group and the outdoor activities group, and the degree of leisure gratification was not as high as that in the family leisure group.

Thus proves H2: Users obtain different gratifications by using APP in different contexts.

#### *4.6. Analysis of Smart Phone APP Types on Usage Gratification Influence Function*

##### (1) Influence function test

When smart phone APP are as groups, the homogeneity of the 5 classes were tested.

It was found that there was no significant difference in the variance of observation variable population under tool gratifications, and it was suitable for single factor analysis of variance. Using single factor analysis of variance, the effect of APP type factors on tool gratifications was analyzed, and it was found that different APP types had significant influence on tool gratifications ( $p < 0.001$ ).

There was significant difference of leisure gratification, social gratification, information access gratification and habit gratification in variance, therefore, nonparametric tests were considered. Using the Kruskal-Wallis test in nonparametric tests, the APP type as the subgroup variable, and the results showed that there was significant difference of these four kinds of gratifications when using

different types of APP( $p < 0.001$ ).

In conclusion, different APP types have significant influence on these five kinds of gratification. In the case of multiple comparisons at the next step, multiple comparisons are made by the S-N-K method because the variance of observation variable population under the tool gratifications had no significant difference. In addition, leisure gratification, social gratification, information access gratification and habit gratification have heterogeneity of variance, therefore, the Games-Howell method was considered to compare the APP types used by these people in pairs under these gratifications.

#### (2) Multiple comparisons of tool gratification (S-N-K method)

The APP types were divided into 4 subsets. People obtained most gratifications when using office learning APP and travel APP (harmonic mean are 0.79 and 0.71, respectively), followed by system tools APP (0.28) and life finance (0.15). While using several other types of APP, the tool gratifications are relatively low and below average level, especially when using entertainment APP, they obtained the least tool gratifications.

#### (3) Multiple comparisons of leisure gratification (Games-Howell method)

When using the entertainment APP, people obtained the highest level of leisure gratification (1.21), and had significant differences with the 6 types of APP except for audio-visual reading APP; the level of leisure gratification when people use audio visual APP is next to that of entertainment APP, between the entertainment and news reading, and there is a significant difference with the 5 types of APP except for these 2 types of APP; the leisure gratification people obtained by using news reading, social communication, life finance APP were also above the average level; the leisure gratification people obtained by using travel APP is the second lower, and had no obvious difference of system tools, office learning APP, had significant difference with the other 5 types of APP; of course, when people use office learning APP, people get the lowest leisure gratification (-1.56), which is significantly different from the 6 types of APP except travel APP.

#### (4) Multiple comparisons of social gratification (Games-Howell method)

As expected, social gratification obtained by using social communication APP (0.68) was far ahead of other APP, and was significantly different from other types of APP. In the remaining 7 types of APP, the social gratification of life financial APP is relatively high, and significantly higher than office learning, entertainment APP; under the office learning APP, the social gratification degree was lower (-1.00), not only significantly lower than the social communication APP, but also significantly lower than the life finance and system tool APP; people get the lowest social gratification when using entertainment APP (-1.06), and significantly lower than social communication, life finance APP.

It is worth noting that, in addition to the social communication APP, the social gratification from the other 7 types of APP were all below average.

(5) Multiple comparisons of information access gratification (Games-Howell method)

When using the entertainment APP, people get the least information access gratification (-1.39), and significantly lower than the other 7 types of APP. While in the remaining 7 APP, there were no significant differences of information access gratification people obtained, from the mean, the information access gratifications obtained from news reading APP (0.44) and office learning APP (0.26) were relatively higher.

(6) Multiple comparisons of habit gratification (Games-Howell method)

Social communication APP (0.21) and news reading APP (0.13) get the highest level of habit gratifications, and both had significant difference with travel, office learning these two types of APP. The degree of habit gratification from life finance APP was relatively middle, only had significant difference with office learning APP. There was no significant difference of the habit gratification of video images, entertainment, system tools these three kinds of APP with other than 7 APP except for themselves. When using travel APP (-0.57) and office learning APP (-0.72), people get the lowest level of habit gratification, and they are significantly different from social communication and news reading APP.

Thus proves H3: Users obtain different gratifications by using different types of APPs.

## **5. Conclusion**

### *5.1. Conclusion and Discussion*

Based on the use and gratification theory, the definition, classification and correlation of APP usage contexts, APP usage types, and APP usage gratifications were discussed in this paper. Among them, cluster analysis was used to reduce the 7 dimensions of the contexts into three groups, namely family leisure group, outdoor activities group, office work group, and further found that users will focus on some hot contexts when using APP. In this paper, the grounded theory was also used in pilot study to divide the gratifications obtained by using APP into five categories. Based on this design scale, the classification results were also verified in the main study. In terms of the relationship of APP type, contexts, and use gratifications, the following conclusions are drawn:

(1) Users prefer different types of APP in different contexts.

When comparing the family leisure group and office work group, users were more inclined to video images and system tools APP under the family leisure contexts, while

users preferred office learning, travel and social communication APP under the office work contexts. And when comparing the outdoor activities group and other two groups, the use willingness of travel APP was significantly higher than other types of APP under the outdoor activities contexts.

(2) Users obtain different use gratification by using APP in different contexts.

This study found that people's leisure gratification (0.16) in family leisure contexts was significantly higher than outdoor activities contexts (-0.11) and office work contexts (-0.22).

(3) Different gratifications are obtained by using different types of APP.

For tool gratification, the most helpful for users to solve the problem is the office study APP (0.79) and travel APP (0.71), the tool gratification obtained from entertainment APP are minimal (-0.85). For leisure gratification, people obtained leisure gratification was highest (1.21) when using entertainment APP, followed by audio and video images APP (0.66), news reading APP(0.26); when using travel APP (-1.01) and office learning APP (-1.56), people get leisure gratification below average.

For social gratification, as expected, what satisfy people's social needs most is social communication APP (0.68); among the remaining 7 categories, the relatively high was life finance APP (-0.21); the two lowest social gratification APP were office learning APP (-1.00) and entertainment APP (-1.06). For the information access gratification, news reading APP(0.44) and office learning APP(0.26) better satisfy the needs of people's access to information, when people use entertainment APP, the information obtained is lowest (-1.39), and was significantly lower than the other 7 types. For habit gratification, we found that the most popular smart phone APP were social communication APP(0.21) and news reading APP(0.13); while people obtained the lowest habit gratification when using travel APP(-0.57) and office learning APP (-0.72).

## *5.2. Implication*

This study explored contexts and gratifications from the perspective of APP, revealing the actual performance of context studies as well as use and gratification theory at the APP angle. The usage contexts and the user's requirements are important considerations for APP design and updating. Based on this, this study tries to put forward the following management suggestions:

(1) Travel APP and office learning APP should be more concerned about outdoor contexts and user stickiness

We found that people's willingness to travel APP in outdoor activities contexts was significantly higher than in family leisure and office work contexts, combined with the user context, the outdoor contexts can be reinforced by using a concise interface

highlighting the common functions and personalized recommendation of the LBS function. In addition, the study of user gratification shows that the tool gratification by using travel APP are high, while habits gratification are quite low. This shows that travel APP needs more tool usage and can solve the problems on hand when needed, can immediately go after using it, without such high dependence. This requires us to optimize this kind of APP, to increase some user stickiness design, such as sign in and send points, irregular lottery or discounts and so on. Of course, the office learning APP also has the same problems in obtaining gratification, also can refer to the above suggestions.

#### (2) Entertainment APP can try to break through in education and socializing

The degree of leisure gratification enjoyed by entertainment APP is undoubtedly the highest, however, in terms of information access gratification, game entertainment APP is significantly lower in the other 7 types, it also reflects the current entertainment APP emphasis on entertainment and ignore education, users using such APP are difficult to obtain valuable information, then increasing the elements of education or information flow will be a powerful breakthrough point in the future game entertainment APP design. In addition, in social gratification, there is a very large room for the entertainment APP to be tapped, in fact, there have been some successful cases of game + social models, such as Tencent games company bind the social account in some games, which can interact with friends, and brought great success, it is worth learning.

#### (3) Life Finance + social development potential

In social gratification, in addition to social communication APP, the life finance APP is relatively high, it also tells us that life finance + social design has a certain potential for development. In addition, habit gratification obtained from life finance APP is also good (the third highest), this shows that their users are also accustomed to viewing the APP in their free time, which adds to the design foundation of life Finance + social design.

#### (4) The content of entertainment and leisure is very important in news reading APP

There is no doubt that news reading APP can best satisfy people's access to information, what's more surprising is that this type of APP is also good at habit gratification (the second highest) and leisure gratification (the third highest). This shows that this kind of APP can not only gain information and acquire knowledge, but also successfully attracted users to read as spare time because of its entertainment and leisure content, and obtain leisure gratification. Then besides headline news and other important information of the content location in news reading APP, entertainment and leisure content cannot be ignored.

#### (5) A solid user foundation benefit the development of APP

As expected, social gratification is highest when people use social communication APP, and at the same time their habit gratifications are the highest. This shows that the existing social communication APP not only realize its own value well, but also makes people rely on them very much, which have a strong user stickiness and high user loyalty. Next, the kind of APP can extend its capabilities based on its original functionality and its solid user foundation, such as social + finance (WeChat, red packets), social + news (Tencent news push in WeChat) and so on.

(6) Video image APP should pay more attention to family leisure context

In contrast to office work contexts, people are more likely to use video and image APP in family leisure contexts. In addition, the degree of leisure gratification obtained by using the video image APP is also the second highest. This shows that the design of this kind of APP should pay more attention to family leisure context.

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