Discovery of Smartphone User Group Profiling Based on User's Motivations and Usage Behaviors Through Focus Group Interviews

Jimin Rhim, Seul Lee, and Young Yim Doh(✉)

Graduate School of Culture & Technology, KAIST,
291 Daehak-ro (373-1 Guseung-dong),
Yuseong-gu, Daejeon, Republic of Korea
{kingjimin, ardet, yydoh}@kaist.ac.kr

Abstract. Smartphone overuse is a growing social concern especially for adolescents and young adults. There has been attempts to mitigate smartphone overuse, however these trials mainly focused on curtailing usage time, disregarding users' various usage contexts. The objective of this research is to profile smartphone users by understanding their needs and goals of smartphone usages to suggest personalized guidelines to help develop healthy smartphone usage habits. Focus- group interviews were conducted on twenty (13 male, 7 female, M = 28.4, *SD* = 2.7) young adults. Five smartphone usage behavior indexes conveying users' needs and motivations (communication, entertainment, functional tool, information search, and life logging) were used as criteria for profiling user groups. As a result, three groups (Social Fun Seeking, Leisure Activity Seeking, and Information Seeking) were classified. Problematic smartphone usage behaviors for each group are defined and preventive guidelines for healthy smartphone usage are suggested.

Keywords: Smartphone · User profiling · FGI · Personlaized intervention strategies

1 Introduction

Smartphone, which is defined as handheld personal computer, is one of distinguishing evolutions of portable information and communication technologies [1]. Diffusion of smartphones in the US was 25 % and 14 % worldwide in 2009 [2]. According to "U. S. Smartphone Use in 2015" by Pew Research Center, 64 % of American adults own a smartphone and this phenomenon is especially high among young adults [3]. Another report shows that smartphone penetration was nearly 90 % in age between 18–34 in the U.S. [4]. Smartphone ownership has rapidly diffused in South Korea. Smart media penetration rate in Korea had increased from 31.3 % in 2011 to 78.6 % in 2014 [5]. According to Pew Research report in 2016, smartphone ownership rate in South Korea was 88 % in 2015, which was the highest among 40 countries [6]. In particular, the ownership rate was 100 % in the age between 18 and 34 [6]. Therefore, high rate of smartphone diffusion in adolescents and young adults created various social concerns in South Korea.

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Defining characteristics of smartphone is that it is a portable device, which allows persistent network connectivity and installation of various applications. It allows users to surf the Internet, watch videos, take pictures, and listen to music in addition to making phone calls and sending text messages. Because of these diverse functions, smartphones have the potential to produce various usage patterns among different users [1]. Due to these characteristics, many people rely on smartphones for various activities, thus smartphone overuse became a growing social concern especially for adolescents and young adults [1]. According to some researchers, possible problematic consequences of smartphone overuse include individual mental and physical health issues and social conflicts. Dried eyes, sleep pattern disturbance, carpal tunnel [7], musculoskeletal symptoms [8, 9] and forward head posture [10] are some typical symptoms due to smartphone overuse. Furthermore, one of distinguishing social problems caused by smartphone overuse is creation of interpersonal conflicts when it becomes a barrier to face-to-face interactions [11].

In order to determine smartphone addiction, Smartphone Addiction Proneness Scale (SAPS) was developed in South Korea to diagnose smartphone addiction levels. This scale is composed of four subdomains (disturbance of adaptive functions, virtual life orientation, withdrawal, and tolerance) [12]. However, since this questionnaire was developed based on scales that were used to diagnose Internet and mobile phone addiction before diffusion of smartphones, the scale may not completely reflect smartphone usage phenomenon nor include specific smartphone usage patterns. Another Smartphone Addiction Proneness Scale (SAPS), Kwon et al. developed the Smartphone Addiction Scale (SAS) in 2013 [13]. The scale is composed of six main factors (daily-life disturbance, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance). Furthermore, they made a shorter version of SAS for young children with ten questions from the original scale [12]. Some of shortcomings of these scales are that they evaluate users' addiction levels with uniform criteria which is composed of questions about usage time and phenomenological index of smartphone overuse. This does not concern psychological mechanism of smartphone overuse which include users' diverse needs and motivations. National Information Society Agency (NIA) in South Korea developed a 'Smart Media Addiction Prediction Index' which is consisted of questions about smart media burden index (usage time, used contents, user motivations) and smart media risk factors (social and psychological factors such as anxiety, loneliness, impulsivity and family interaction). This was a meaningful attempt that includes questions about individual risk factors and social context related to media addiction to subdivide the user groups and identify the subjects of smart media addiction prevention [14]. However, they did not concern how these different factors contribute to make a complex behavior patterns of individual users and how the user groups are subdivided by their usage characteristics. The limitation of this approach is that instead of considering diverse patterns of user groups and inventing personalized intervention strategies, they only identified the levels of severity in addiction level such as general group, potential risk group and high-risk group.

There have been several attempts to help those who are diagnosed as high-risk group of smartphone addiction. Although the media reports that rate of high-risk group is constantly increasing, it is still about 10 % of the entire smartphone user population [15]. Rather than trying to reduce the level of excessive user rate of

smartphone use on those who are already diagnosed as high-risk group, preventive intervention strategies should be available for broader user population to reduce overall problematic smartphone use. Such preventive attempts include educational programs in schools [15–17] and smartphone applications [18–21] that help people manage their smartphone usage times. Most of these applications record and show the names of smartphone applications that were used, and time spent on using those applications. Furthermore, some applications deny access of smartphones for certain period of time when ones usage time exceed the preset time limits. However, these applications does not consider individual user's complex usage contexts when providing preventive interventions. For preventive interventions of smartphone overuse to be more effective, instead of focusing on reducing absolute usage time, incorporating various usage patterns, needs, and motivations of users are necessary. Based on these interpretations, it is possible to construct personalized prevention strategies for different user groups.

2 Research Method

This study was designed to obtain qualitative feedbacks from users' smartphone usage patterns and motivations. The primary goal was to categorize distinctive user groups based on smartphone usage motivations and behaviors then characteristics for each user profile.

2.1 Study Design

We have conducted focus group interview to gather qualitative research data collection. Prior to the interviews, participants conducted an online questionnaire that examined levels of smart phone addiction using SAPS [12]. Questionnaire results were used as reference to evenly distribute participants with varying smartphone addiction levels into groups. One moderator led the interview sessions while the other researcher transcribed conversations, and the entire process took about 90 min. Each participant was rewarded with about US$15 gift certificate.

2.2 Participants

Possibly excessive use of the Internet or smartphone is more prevalent among university students, because often, they are highly Internet literate and use smartphones for many purposes; they have flexible schedules with little external control over their Internet or smartphone use [22]. A total of twenty university students (13 male, 7 female; average age = 28.4, SD = 2.7) participated in the focus group interviews. Five sessions of focus group interview consisting of four mixed gender participants were conducted. All participants were graduate school students of various majors including industrial design, computer science, psychology, biology and others. All the participants used computers and smartphones almost every day and owned their own smartphones. They rated their skill of using computers and smartphones as advanced.

2.3 Interview Questions

Researchers defined five smartphone usage behavior indexes (communication, entertainment, functional tool, information search, and life-logging) based on most distinctive smartphone usage activities as criteria for semi-structured interview. Interview session consisted of questions that seek users' general smartphone usage behavior related information (e.g., How long have you used smartphone? Which function do you consider as the most important when purchasing a smartphone?), communication activities (e.g., What kind of communication activities do you do with smartphone? How often and how long do you use smartphone for communication activities?), entertainment activities (e.g., What kind of entertainment activities do you do with smartphone? How often and how long do you use smartphone for entertainment activities?), functional tool usages (e.g., What kind of functional tools do you use with smart phone? How often and how long do you use a smartphone for functional tools?), information search activities (e.g., What kind of information search activities do you do with smartphone? How often and how long do you use a smartphone for information search activities?), and life-logging related activities (e.g., What kind of life-logging activities do you do with smartphone? How often and how long do you use smartphone for life-logging activities?). After discussing these questions above, each participant was asked to rank the five usage behavior indexes that he or she most frequently used, and then rank them in the order of personal importance.

3 Results

Three researchers analyzed self-reported answers from participants to gain further insight of how participants use such functions and perceive them using affinity diagram method. This method is effective in organizing large amount of qualitative data into sub-groups with similarities [23].

3.1 Smartphone Usage Behavior Indexes

Findings from participants' answers for each behavior index (Communication, Entertainment, Functional tool, Information search, and Life-logging) are described in the tables below. Descriptions are categorized into Main Activities, Reasons for Usage, Usefulness, and Potential Consequences of Overuse. Findings describe general characteristics of each behavior index. Table 1 describes details of Smartphone Usage Behavior Index for Communication. Table 2 describes details of Usage Behavior Index for Entertainment. Table 3 describes details of Smartphone Usage Behavior Index for Functional Tool. Table 4 describes details of Smartphone Usage Behavior Index for Information Search. And Table 5 describes details of Smartphone Usage Behavior Index for Life-logging.

Table 1. Smartphone usage behavior index: communication

Descriptions	
Main activities	KakaoTalk [24], SNS (e.g., Facebook, Instagram, Twitter), Blogs, Telephone, Text, Messenger, LinkedIn [25]
Reasons for usage	Because many people including family members and close friends use communication applications; The characteristics of digital media allows convenient and frequent communication
Usefulness	Allows quick, convenient, and economical communication
Potential consequences of overuse	Frequent notification checks (from SNS, applications etc.) reduce concentration level and inhibit workflow, and overuse may lead to unintentional time consumption. Furthermore, ease of communication tends to result in frequent usages and people sometimes feel pressure to promptly reply to the others. This may lead to reduction of frequency of face-to-face communication
Findings	Communication is most frequently used function and many users have experienced unintentional overuse at certain points of smartphone usage

Table 2. Smartphone usage behavior index: entertainment

Descriptions	
Main activities	Games, movies, TV, music, web-cartoon, e-book, shopping, web surfing, internet radio, user created contents (e.g., taking pictures, videos, producing music, drawing)
Reasons for usage	Provides convenient usage with less constraints in time, space and money for fun (e.g., killing time, use while commuting)
Usefulness	Fun, accomplishment, immersion, effective use of spare time, able to share links with friends, reduces stress and sense of loneliness
Potential consequences of overuse	Participants often spend more time on entertainment related functions than intended. Sometimes unnecessary monetary spending occurs due to immersion in certain contents such as mobile social games. Long hours of smartphone usage may cause health problems such as sleep disturbance, sore eyes, wrist-ache, and backache
Findings	Using entertainment related activities more than intended was core problem for many users

Table 3. Smartphone usage behavior index: functional tool

Descriptions	
Main activities	Camera, alarm, phone, memo, banking, calendar, record, dictionary, map, calculator, cloud services (e.g., google drive, drop box), e-mail, remote controller, to do list
Reasons for usage	To accomplish practical and functional tasks; various tasks can be done within one device

(*Continued*)

Table 3. (*Continued*)

Descriptions	
Usefulness	Do not have to carry many different devices because smartphone integrates many functional devices
Potential consequences of overuse	Using Functional Tool related functions itself is not threat for over usage nor have severe negative impacts
Findings	Since Functional Tool related functions are practical or productive, using such functions are not perceived as problematic in general. However, results from Functional Tool use can be lead into other smartphone activities with potential of overuse (e.g., after taking pictures and then uploading them into SNS)

Table 4. Smartphone usage behavior index: information search

Descriptions	
Main activities	Search daily information (e.g., path finding, job search, weather), web surfing (e.g., information, news, shopping information, scholar, dictionary), make reservations etc.
Reasons for usage	Characteristics of smartphone allow quick and easy search with minimal constraints in time, space and money
Usefulness	Searching for daily information including weather, bus time, directions and so on are convenient
Potential consequences of overuse	Information Search Function itself is practical, yet when spending too much time searching unrelated issues or when searching certain information leads into other unexpected activities may become problematic. Due to frequent searching, thinking process can be simplified or users may over rely on the searching devices
Findings	Many people use smartphones for simple information search in daily bases. Sometimes, when using portal sites, searching activities unintentionally leads to entertainment related activities

Table 5. Smartphone usage behavior index: life-logging

Descriptions	
Main activities	Taking pictures/videos, memo (e.g., ideas, gas ledger, household ledger, grocery-list), SNS (e.g., Instagram, Twitter, Facebook), health related recording (e.g., wearable devices, work out logging, sleeping cycle, menstrual phase calendar)
Reasons for usage	To check one's daily life cycles; To quickly record specific information (e.g., car repair record)
Usefulness	Digitalized logging information clearly shows accumulated data; Using smartphone allows easy sharing, automatic location recording, and convenient data logging using specialized applications

(*Continued*)

Table 5. (*Continued*)

Descriptions	
Potential consequences of overuse	Using smartphone applications for life-logging purpose itself is not perceived as a serious threat for over usage. However, excessively logging data without clear purposes can be a waste of time and cellular data
Findings	Smartphone allows quick and convenient life-logging. Using such function itself hardly leads to prolonged smartphone usage. However, results from life-logging can lead to other smartphone activities with potential of overuse (e.g., recording exercise logs and then uploading them into SNS)

3.2 Smartphone User Group Profiling

Participants (two participants who did not show significant patterns were excluded) were categorized into three Smartphone User Groups (Social Fun Seeking Group, Leisure Activity Seeking Group, Information Seeking Group) from self-reported smartphone usage patterns based on the answers from the focus group interview sessions. General descriptions and characteristics of each group are described below. The solid line is the average rank of frequency of each behavior index, and the dotted line is the average rank of evaluated importance of each behavior index in Fig. 1.

Social Fun Seeking Group. Six participants were categorized into Social Fun Seeking Group. Figure 1 shows general pattern of smartphone usage behavior of this group. Relative usage frequency of communication appeared to be the highest, and users in this group tended to use communication functions more than they considered it to be important. One of favored forms of communication activities for this group is talking with friends over social casual games, which also leads into conversations on SNS and communicative applications on the smartphone.

Leisure Activity Seeking Group. Seven participants were categorized into Leisure Activity Seeking Group. Figure 1 shows general pattern of smartphone usage behavior of this group. Relative usage time of entertainment function appeared to be the highest, yet users in this group tended to use entertainment functions more than they considered it to be important. Prominently used forms of entertainment activities are game, radio and YouTube. Participants in this group preferred to enjoy leisurely activities using smartphones by themselves to reduce stress.

Information Seeking Group. Five participants were categorized into Information Seeking Group. Figure 1 shows general pattern of smartphone usage behavior of this group. Relative usage frequency of information searching appeared to be the highest and participants in this group considered information searching to be most important. Search engines are frequently accessed for information searching. Participants searched simple information such as path finding, spell checks, timetable for transportation, and hobby related information using a smartphone. Participants in this group did not frequently use nor considered entertainment function to be important (Table 6).

Table 6. Smartphone user group profiling

Group name	Participant number (%)	Characteristics
Social Fun Seeking Group	6 (33.3 %)	Use Communication function the most and enjoy social activities with digital media
Leisure Activity Seeking Group	7 (38.9 %)	Use Entertainment function the most to reduce stress
Information Seeking Group	5 (27.8 %)	Find the importance of Information Searching function more than any other groups

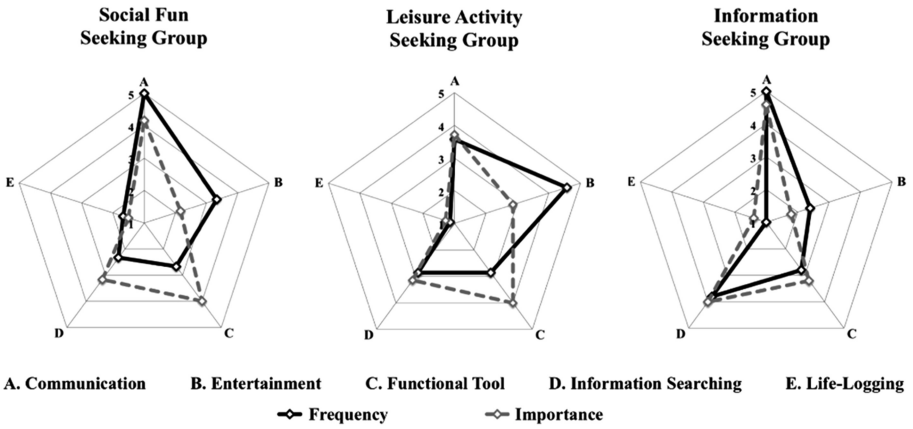

Fig. 1. Comparisons of smartphone user groups

4 Discussion

This paper presented categorization of smartphone user groups based on users' smartphone usage behaviors and motivations to gain further insights of specific user groups. Figure 1 shows comparisons of distinctive features of three smartphone user groups (Social Fun Seeking Group, Leisure Activity Seeking Group and Information Seeking Group). Discrepancies between actual usage frequency and considered importance can be observed. It can be inferred that different smartphone users have varying motivations and goals for smartphone usages with different smartphone usage patterns. This indicates that considering smartphone usage time without regarding usage contexts to determine smartphone overuse could be misleading. Ultimately, the findings of this study can be the starting point for further research on excessive problematic smartphone use prevention by providing practical recommendations for differing user groups. Despite exploring specific user motivations and usage behaviors or specific smartphone index and then profile different smartphone user groups with

distinctive characteristics, some limitations should be noted. First, only South Korean students participated in this study. Therefore the study finding may not be generalized to other cultural, age, or education-level groups. Second, this study was conducted in the form of self-report assessment. Therefore discrepancies between participants' actual and perceived smartphone usage behavior may exist. Third, the questionnaires covered participants' smartphone usage behaviors without specific duration nor particular contexts. In the future, more specific user contexts should be defined to gain understandings to form more robust user groups. Furthermore, based on user group's characteristics, differing mediation guidelines that are more specific to the user profile can be applied to form sustainable healthy smartphone usage habits. In the future, smartphone usage log data and comprehensive usage contexts should be integrated into software for more accurate and objective user profiling for instantaneous feedbacks to the users for more effective smartphone usage habit formation.

5 Conclusion

The finding of this study show that smartphone users have different intentions for smartphone usage with distinctive smartphone usage patterns. This point to the fact that when applying intervention strategies to prevent excessive smartphone uses, a single intervention method is not sufficient enough to help modify smartphone usage patterns. The findings therefore provide support to the core ideas that to help form sustainable healthy smartphone usage habits, different intervention strategies should be applied to different smartphone user group by considering specific usage motivations and behaviors. With the growing prevalence of concerns for problematic smartphone usage, it is imperative that more research on this topic is conducted. Furthermore, prevention techniques that are more specific to the user should be considered by institutions such as schools or universities to establish broader prevention.

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References

1. Oulasvirta, A., Rattenbury, T., Ma, L., Raita, E.: Habits make smartphone use more pervasive. Pers. Ubiquit. Comput. **16**(1), 105–114 (2012)
2. Falaki, H., Lymberopoulos, D., Mahajan, R., Kandula, S., Estrin, D.: A first look at traffic on smartphones. In: Proceedings of the 10th ACM SIGCOMM Conference on Internet Measurement, pp. 281–287. ACM (2010)
3. Smith, A.: U.S. Smartphone Use in 2015. Pew Research Center, Washington DC (2015)
4. Lipsman, A.: Teens and Older Demos Driving Gains in U.S. Smartphone Penetration. comScore Inc., Reston (2011)
5. Korean National Information Society Agency: A Survey on Internet Addiction. Ministry of Science, ICT and Future Planning (2014)

6. Poushter, J.: Smartphone Ownership and Internet Usage Continues to Climb in Emerging Economies. Pew Research Center, Washington DC (2016)
7. Shim, J.M.: The effect of carpal tunnel changes on smartphone users. J. Phys. Ther. Sci. **24**(12), 1251–1253 (2012)
8. Kim, G.Y., Ahn, C.S., Jeon, H.W., Lee, C.R.: Effects of the use of smartphones on pain and muscle fatigue in the upper extremity. J. Phys. Ther. Sci. **24**(12), 1255–1258 (2012)
9. Eom, S.H., Choi, S.Y., Park, D.H.: An empirical study on relationship between symptoms of musculoskeletal disorders and amount of smartphone usage. J. Korea Saf. Manag. Sci. **15**(2), 113–120 (2013)
10. Is, W.I.: Modern Life Alert: Forward Head Posture Can Damage Your Health (2014). http://www.foundationpilates.com/modern-life-alert-forward-head-posture-can-damage-health/
11. Tertadian, E.: The Smart Phone as a Conflicting Third Party in Interpersonal Relationships. Communication Studies Undergraduate Publications, Presentations and Projects, paper 14. University of Portland, Portland (2012)
12. Shin, K.W., Kim, D.I., Jung, Y.J.: Development of Korean smart phone addiction proneness scale for youth and adults. Korean National Information Society Agency, Seoul (2011)
13. Kwon, M., Lee, J.Y., Won, W.Y., Park, J.W., Min, J.A., Hahn, C., Kim, D.J.: Development and validation of a smartphone addiction scale (SAS). PLoS ONE **8**(2), e56936 (2013)
14. National Information Society Agency: Study of Internet Addiction Prediction Index Development. Korean National Information Society Agency, Seoul (2013)
15. Internet Addiction Prevention Center, 7 March 2016. http://www.iapc.or.kr/prev/guide/showPrevGuideDetail.do
16. Financial News: "Preventing adolescents' smartphone addiction with 'practice notebook'", 23 December 2015. http://www.fnnews.com/news/201512231351289893. Accessed 7 Mar 2016
17. Internet Addiction Prevention Center, 7 March 2016. http://www.iapc.or.kr/prev/guide/showPrevGuideMentoDetail.do
18. Application: "My Mobile Day", 7 March 2016. https://play.google.com/store/apps/details?id=com.mymobileday
19. Application: "BreakFree", 7 March 2016. https://play.google.com/store/apps/details?id=mrigapps.andriod.breakfree.deux
20. Application: "UBhind (How much time do you spend with your smartphone a day?)", 7 March 2016. http://www.rinasoftglobal.com
21. Application: "PhoneStop", 7 March 2016. https://play.google.com/store/apps/details?id=com.forple.phonestopexamversion
22. Turel, O., Mouttapa, M., Donato, E.: Preventing problematic Internet use through video-based interventions: a theoretical model and empirical test. Behav. Inf. Technol. **34**(4), 349–362 (2015)
23. Cohen, L., Cohen, L.: Quality Function Deployment: How to Make QFD Work for You. Addison-Wesley, Reading (1995)
24. "KakaoTalk." Wikipedia. Wikimedia Foundation, April 2012. Web 05 February 2015. http://en.wikipedia.org/wiki/KakaoTalk. Accessed 7 Mar 2016
25. "LinkedIn." Wikipedia. Wikimedia Foundation, 4 February 2015. Web 05 February 2015. http://en.wikipedia.org/wiki/LinkedIn. Accessed 7 Mar 2016