Telemedicine

Chapter 1

What Drives to Adopt and to Decline mHealth Services?

Sang HyunJo[1]; Hyeyoon Bae[1], Euehun Lee*

[1]School of business and technology management, College of business, Korea Advanced Institute of Science and Technology, Republic of Korea

**Correspondence to: Euehun Lee, School of business and technology management, College of business, Korea Advanced Institute of Science and Technology, KAIST Bldg. N22, 291 Daehak-ro, Yuseong-gu, Daejeon, Republic of Korea 34141*

Email: euehunlee@kaist.ac.kr

Abstract

In this chapter, we examine the characteristics of mHealth services and the antecedents to affect the intention to use the services. The mHealth services, which combine the characteristics of mobile communications and healthcare services, allow users to obtain their health data, physician consultations, and health information when they need at home or office. They do not have to go to a hospital. In particular, it is expected that the services will be more useful to the global aging phenomenon and well-being trend. However, as a variety of mHealth services are introduced to the market with high smart phone penetration and technological development, there are not many studies on acceptance factors of the service and continuous intention to use the service.

Based on empirical studies conducted on recognizers and experiencers of mHealth services towards various ages, we present several factors to affect the intention to use the service based on the service characteristics.

It is expected that the management of health through the services will be effective and convenient when people worry about health, but it seems that people think the current level of the service is not able to satisfy their expectation. Rather, it appears to be more intent on using it with curiosity about new technologies. One of the major factors affecting the use intention in relation to the characteristics of the service is that the service provides no barriers of time and space. Negatively, it appears people are worrying that their medical information may be disclosed to the outside world because the mHealth service is always connected to the network.

Keywords: mHealth service; Characteristics of mHealth; Usage intention; Continuous usage intention; Usage barriers

1. Introduction

1.1. What is mHealth?

As computers and the Internet have been widespread to houses as well as business since 1990's based on Information and Communication Technology (ICT), a variety of businesses have started to actively utilize the technology. A healthcare business also started to use ICT represented by the Internet. Hospitals have used electronic healthcare (e-Health) that assists healthcare or medical practices with the Internet and other ICT. e-Health helped to deliver or enhance health services and information using ICT, it contributed to improve healthcare locally, regionally, and in the world [1]. In the era, however, e-Health was basically known as personal health record (PHR), electronic medical record (EMR), and electronic health record (EHR). That is, e-Health was a kind of term used to describe electronic records of patients.

As the specifications of a Smartphone are close to computer's functions in terms of processing capability, memory, and stable connectivity, e-Health could be realized on Smartphones. We call this healthcare service as mobile healthcare service (mHealth service), which is provided by mobile devices, such as Smartphones and handheld devices [2]. Like this definition, some researchers indicated their own definition of mHealth service; Istepanian et al. [3] defined mHealth service by adopting ICT for healthcare, Mechael [4] argued that mHealth service was a part of e-Health service using mobile devices for healthcare services. Akter et al. [5] also highlighted the characteristics of mHealth services on using ICT.

Even though the definition of mHealth service includes different words and expression, they manifest that mHealth service is a medical service or information service that can improve a patient's health using mobile devices with the capability to create health data, save them in its memory, and deliver the data in real time. The Acceptance of Smartphones and mobile phones has skyrocketed since 2000's, healthcare professionals have paid lots of attention tomHealth services in that people can access personalized and interactive health services or search for health information with their own Smartphone at anytime and anywhere [5].There is a similar term with mHealth service, telemedicine. In contrast to mHealth services, it covers more variety of physician services to "leverage information technologies, video imaging, and telecommunication linkages to enable doctors to provide healthcare services at a distance" [6].

Most of mHealth services are being operated in the form of a mobile application, which is defines as a software application running on a mobile platform, such as Smartphones, tablet computers, or other portable computers [7]. FDA (Food and Drug Administration) classifies mHealth application * as a mobile application that either is intended "to be used an accessory

to a regulated medical device"; or "to transform a mobile platform into a regulated medical device" [7]. Even though FDA of the U.S. paid attention to a variety of mHealth services and their advantages and risks to public health, FDA did not have any guidance or regulation for the service run by mobile devices. FDA had a similar regulation, which is section 201(h) regarding health service, but most of mHealth services provided by mobile platforms did not satisfy the concept of a medical device under section 201(h). In 2015, FDA provided a guidance for Industry and Food and Drug Administration Staff regarding mHealth services.

According to their definition or classification to decide whether mHealth service is or not, intended use is a key word to determine if a mobile application service meets the requirements of mHealth application services. For an example, if a mobile application service making light emitting diode (LED) is intended to lighten the surroundings without any purpose for health relating function by a producer, then the LED mobile service is not a mHealth service. On the other hand, if a LED service operated by Smartphones, which is produced and promoted for healthcare service, is intended to use the light for ophthalmologist to clinically examine patients, the service meets the definition of mHealth service. Another example is an application connecting to a medical device, i.e. Glucose monitor, through wireless technology, such as Bluetooth, Direct Wi-Fi, and NFC stores and delivers the health data. Dexcom, American healthcare company, introduced a tiny skin patch as a continuous glucose monitor and mobile application that checks blood sugar every 5 minute and sends the data to the application in real time. Then, the monitor should be a healthcare device and the application should be a mHealth application service.

In this chapter, we discuss the characteristics and current status of mHealth services, and we suggest some factors of acceptance and obstacles for the services based on the characteristics. In addition, we review some factors of continuous use. Continuous use is critical to new healthcare paradigm, which detects diseases in advance with health data generated by mHealth services, but the biggest problem is that people do not use mHealth services consistently.

2. Characteristics of mHealth Service

2.1. Unconstrained Spatial and temporal Limitation: Ubiquitous, real-time, portable technology

The mHealth service is characterized by its ability to access the World Wide Web via wireless broadband on mobile devices. International Telecommunication Union (ITU), a specialized agency of the United Nations, generally defines mobile broadband with a download data rate of at least 256 Kbit / s using the Internet protocol and accesses the World Wide Web via the hypertext transfer protocol [8]. 2G, 2.5G, 2.75 G technology of Mobile broadband was the first digital cellular network with the speed.

As the development of technology, mobile broadband recently means 3G, Long Term Evolution and Long Term Evolution-Advanced technology [9], and the mobile broadband technologies are considered as a global standard. According to "GSMA Mobile Economy Report", global mobile subscribers are expected to reach 4.8 billion in 2016, and SIM connections reach 7.9 billion. 55% of the connections are connected by mobile broadband networks [10]. That figure accounts for nearly half of the world's urban population, Africa is the only region where less than 20 per 100 people are using mobile broadband [9].

The mHealth service uses mobile devices such as smart phones, which are handheld computers with powerful processing capability and wireless broadband network, so computing can be done anytime and anywhere. In other words, unlike desktop computing using a desktop computer, ubiquitous computing using smart phones can complete tasks and access the Internet whenever they want.

mHealth services can communicate in real time without delay in data transmission using mobile devices with powerful computing. Real-time communication means communication that allows users to exchange information with immediate or neglect able latency. Real-time communications include the Internet, land-line, mobile telecommunication, instant messaging, and video conferencing. With this characteristics, mHealth services can provide health data in real time to a hospital and users can have a feedback instantly.

Due to the powerful processing power, long batter life, high-speed network, smart phones boast high performance that is close to the performance of desktop computers. But smart phones are lighter and thinner. For instance, Galaxy S8 weighs only about 170 grams and it is 8 mm thin, even with a6 inch display. Smartphones are lightweight and can be put in your pocket. Smartphones are designed to take them anywhere, even a tablet with a bigger screen can be carried in one hand because it is very lightweight, yet not in your pocket.

The characteristics of mHealth services, Ubiquitous technology, real time communication, and portability, provide convenience value in that mobile telecommunication using smart phones offers benefits such as mobility. On the other hand, the traditional communication based on land line transmit signals or data via a network of cables. Mobile devices with processing capability as much as desktop computers remove the spatial constraints. Users of mHealth services are able to transmit their health data or to have a consults with a doctor when they need.

2.2. Personalized, Self- Healthcare

By using a variety of devices in mHealth services, it is possible to constantly measure the individual's health data in everyday life. Therefore, by analyzing the unique characteristics of each individual, it could predict diseases by individuals. Therefore, mHealth services can

implement advanced medical paradigm of the future than traditional population group based preventive medical paradigm. For example, personal health data from everyday life can be sent to a physician, the doctor are able to provide personalized treatment based on personal health information. For a case of diabetes, it is possible to predict the glycemic index response by analyzing the personal health data obtained from usual activities such as eating habits, health data, physical activity and intestinal microorganisms, and doctors can suggest a treatment way to regulate blood sugar through providing diets for individuals [11].

Self-service is effective to lower labor costs because the service operation could be done with the minimum number of employees from the point of view of providers. Even though consumers experience inconvenience, they can enjoy low cost from the self-service. However, if the quality of the self-service is below the expected level, the intent to use a self-service would drastically decrease [12]. For example, in the case of mHealth services, instead of regularly visiting a hospital and measuring blood sugar levels by a doctor, patients carry their own glucose monitors and measure glucose levels. Patients can adjust their diets or inject insulin with the measured data. The patient, not the doctor, has the initiative to control the disease on a day-to-day basis. Surprisingly, however, patients may find it a burden rather than a self-care service is advantageous [13].

3. Global mHealth market

The value of global mHealth market was US $ 6.7 billion in 2012 and is expected to grow from US$ 6.7 billion in 2012 to US$ 58.8 billion in 2020. The mHealth market is expected to gain significant revenue with increased awareness, improved quality of mobile-based medical devices and relaxation of regulations [14].

Mobile phone penetration in developed markets was already more than 100% and is expected to increase in developing markets such as Asia-Pacific, Latin America and Africa [15].

The mHealth device market is largely driven by blood glucose monitors and cardiac monitors, and blood pressure monitors are the most profitable segment in the market. Also, glucose monitors are the fastest growing segment. The cardiac monitor market is the third largest segment growing at 37.5% per year [16].

The areas of mHealth services are as follows: diagnostic services, monitoring services, treatment, prevention and wellness and health management. The global mHealth service market is expected to grow at an annual average of 32.2%due to increased sales in the monitoring services market. As the adoption of monitoring services for chronic disease management and senior citizens increase, the monitoring service market is growing. Diagnostic services and wellness and healthcare solutions are expected to account for the major shares of the market in

the future in that people have awareness of the service for fitness and well-being, and government do not strictly regulate the area [16-17].

North America will be the region where generate largest revenue in the monitoring services market, following Europe and Asia-Pacific. This is because monitoring services are primarily adopted in developed countries where telecommunications infrastructures and medical infrastructures have evolved. The Asia-Pacific region, particularly in East Asia, will generate significant revenue by 2020 [16].

4. Types of mHealth services

4.1. Health records

4.1.1. My Chart

My Chart is an app-based mHealth service that allows a user to record his/her or his/her family's health information. It gives the advantages of not only recording health information but also making healthcare easier by sending a message to a doctor, booking a hospital, and sending symptoms.

My Chart Medical App is a service used by patients and doctors to track a patient's health with medical test results. Unlike the basic My Chart, My Chart medical apps can be used like electronic medical records that patients also access to in a hospital.

My Chart can be synced with Health app installed on iPhones of Apple. Users of My Chart are able to import health data from Apple's Health app, and this synchronization allows medical teams to view detailed historical details from the synched health records.

4.2. Fitness/Wellness

4.2.1. Fitbit

Fitbit is a fitness and health service that tracks a user's all activities of a day including walking, exercise, food calorie, and sleep. If you wear a device (Fitbit), you can measure the number of steps per day, the calories you eat, the amount of calories burned off by exercise, and your heart rate. Even you can analyze the quality and quantity of sleep with a unique algorithm. The measured data automatically synchronizes with your smart phone through Bluetooth, then you can see the data on your smartphone or Fitbit dashboard on the Fitbit website.

The heart rate is generally measured by attaching a total of 10 electrodes, one on each limb and six on the chest in a hospital. However, AliveCor's electrocardiograph (EKG) allows you to measure your heartbeat with your fingertips. EKG of AliveCor is a mobile electrocardiogram analyzer that monitors electrical movement of heart and diagnoses arrhythmia. It can

measure the cardiac impulse by placing fingertips of both hands on the small electrodes. It is most commonly used to diagnose atrial fibrillation among the symptoms of cardiac arrhythmias. AliveCor received FDA-cleared automatic algorithm to detect atrial fibrillation and the sensitivity of the test shows 97%.

4.3.2. Natural Cycles

It is a contraception service to provide an information whether a user is fertile or not through measuring a body temperature. The menstrual cycle consists of follicular phase for 14 days and luteal phase for 14 days. The egg can survive in uterus for up to 24 hours and the spermatozoa for up to 6 days. Women can avoid if they do not have sexual relations for 24 hours after ovulation and 5 days before ovulation. However, it is hard to identify this period, so contraception should be done throughout the menstrual cycle.

The body temperature is lowered during follicular phase while increased progesterone hormone increases the body temperature by 0.2 to 0.45 Celsius degree during luteal phase. Natural Cycles noticed the changes of body temperature before and after ovulationday. If you measure your body temperature in the absence of any activity as soon as a waking from sleep for about 2 months, it provides accurate diagnoses whether you are fertile or not. It seems to have achieved an average success rate of contraception of 93%.

4.4. Medical Consulting service

4.4.1. Health Tap

It is a healthcare platform service that connects doctors and patients through remote video, voice, or instant messages to provide 24/7 diagnosis and medical information. Health Tap enrolls more than 100,000 doctors and has provided approximately 6.4 billion medical responses to patients so far. Recently, Health Tap introduced Dr. AI based on artificial intelligence. If you provide your symptoms, Dr. AI routes you to the right level of care at the right time by conducting an interactive conversation. You might be worrying the reliability of the mHealth services. Here is a recent study to indicate the quality of the mHealth service in the U.S.

The scale of mobile healthcare services such as Health Tap, which has medical consultants from a doctor through mobile devices, has been growing, but government regulations and industry standards depend on the quality of the service. A recent study showed the care quality and procedures of the service towards mHealth service providers with 67 trained patients [18]. The trained patients completed 599 virtual visits with acute conditions as follows: ankle pain, streptococcal pharyngitis, viral pharyngitis, acute rhinosinusitis, low back pain and recurrent female urinary tract infection. The patients got medical consultants via video conference, tele-

phone, and web chatting.

About 70% of service providers satisfied to ask health history questions and to perform physical exams based on guidelines of medical association. 458 virtual visits (76.5%) out of 599 virtual visits were correctly diagnosed while doctors of virtual hospital provided wrong diagnosis to 89 virtual visits (14.8%). The others failed to give any diagnosis. Considering correct diagnosis depending on condition and service provider, the results showed that service providers more varied diagnosis for viral pharyngitis and acute rhinosinusitis than for the other conditions. But there were no differences in adherence to guidelines by video conference, telephone, and web chatting.

The study has a limitation in that the results cannot say whether mHealth services are better or worse than traditional health services, which patients see a doctor in person. However, it shows that virtual visits have quite high accuracy with correct diagnoses ranged from 65.4% to 93.8%.

5. What makes consumers to adopt mHealth services?

5.1. Health stress/threat and Healthcare Behavior Attitude

Changes in major life events like health issue or even employment issue could play a role as stressors [19]. People also would likely to recognize these stressful life events as threats. To cope with the new situation when they are stressed out, living organisms activate sympathetic nervous system and endocrine system [20]. This response in the body, however, could be hurtful to the health because the response most likely causes of biological malfunction [21].

Stresses led by life events can have an adverse effect on health, including lowered immunity, unstable blood pressures and painful redness or swelling of a part of stomach [21-22]. Then, people might have needs, which people manage their health to prevent diseases. When people feel a threat or health stress looks severe, they would have a positive attitude toward healthcare behavior to cope the situation. For healthcare, people or family members will look for some ways to manage their health by helping people or using devices. As people perceive the severity of stress, they are willing to use technology in order to reduce the threat [23].

5.2. Quality Improvement

Utilitarian value, which is intangible rewards, motivates people to adopt information systems or device [24-26]. The main reason people use information systems or devices is to increase productivity and efficiency of their tasks [27-28]. If you expect a product or service to improve your job performance, you will use the product or technology [29-30]. Utilitarian value in mHealth service, which is a healthcare service using information technology, means

improvement of quality of healthcare. When mobile technology is used not only in the healthcare field but also in other fields (e.g. finance, e-commerce), the value of usefulness appears to play a very important role in the services [31-33]. Healthcare using mobile technology has shown that it is possible to improve the quality of healthcare by providing timely, real-time, interactive communication with healthcare professionals to obtain appropriate healthcare services [34].

5.3. Spatial and Temporal Coverage

People perceive convenience value in a product or service that can save their time and efforts in performing their work [35-36]. People tend to give high value to services that save time and efforts [37]. It is an important factor for users whether to adoptmobile technology or service [38-40] because mobile services provide on-demand services whenever they want. According to a survey conducted by Bain and Company [41], people do not have enough time to manage their health and maintain their shape, so they think mHealth services help them manage their health at anytime and anywhere. Convenience value in mHealth services is defined as the value of healthcare service that can save time and efforts without restriction of spatial and temporal coverage through mobile technology. Some studies show that it plays an important role in driving the intent to use mHealth services or mobile services [31,42]. In particular, this value is known to be important to people with limited time [35].

5.4. Reassurance Value

Reassurance value, mostly used in the healthcare field, mean show much a product or service reduces anxiety or pain of a patient, and improves the physical or emotional state [43]. Some studies have shown that simple telecommunication services such as telephone calls can provide reassurance value [44-46]. This is because phone or social network service allows people to check their family's condition even though they are away [47].

mHealth service, which is provided through a smartphone and a wearable device connected to a smartphone, can measures and transmits personal health data to doctors in real time. Thus, mHealth services are able to provide reassurance value to not only users but also caregivers. However, a recent study has shown that users are still not feeling reassurance value in mHealth services and it does not influence acceptance intention of mHealth services. However, it is considered that the quality level of mHealth services is not enough to satisfy consumers [31].

5.5. Saving cost

As more than 10% of household income has been spent on medical expenses [48-49], people who are having trouble to pay for healthcare are growing [50]. The most important ad-

vantage of mHealth services is self-service, which allows users to participate in the process of healthcare services, thus they can reduce medical costs [51-52]. Users could have rapid feedbacks and treatment from a physician in real time. Shortened treatment time can save healthcare costs because users of mHealth services do not have to see a doctor in person at a hospital [53-54]. The results of a study show that using mHealth services increases cost-effectiveness compared to direct face-to-face communication with physicians [53]. Monetary value, which people can save medical costs, would be a significant factor in adopting mHealth services.

5.6. Epistemic Value

In addition to the benefits described above, people would want to try mHealth services just because they are curious about the new technology. Some studies indicate that the major motivation to purchase a product or service may be curiosity about a new product or service [55-56]. You may want to try new services or products because you want diversity or knowledge seeking in your daily life. Epistemic values can have a significant impact on purchase intent as well as switching products or services. Richard [57] found that diversity-seeking behaviors in the field of information and communications technology could use new online services. A study found that people who seek new knowledge or technology were more likely to use mHealth services than people with health stresses [31].On the other hand, Pura and Gummerus [58] indicated that curiosity slowly faded after trying new services or product, and people would not continue to use the services if the main driver of using mobile services was curiosity.

6. Why do consumers discontinue to use mHealth?

When engineers and marketers start new product development process in mHealth products and services, they should consider user-centered design and understand major consumer segment, such as older consumers, care providers. Barriers to use the mHealth products as well as how consumers continue to use the mHealth services in their everyday live are the important factors [59]. Firstly, there are numerous causes to block the mHealth product usage that influence consumers' intention to use. The four representative barriers- privacy risk, technology anxiety, stigma and performance risk- would be explain done by one as follows. The influencing factors of continued use of mHealth will be followed in the motivational perspective.

6.1. Privacy risk

The rise of mHealth technology caused privacy and security issues [59]. Privacy risk means that the consumers feel at risk of having their personal data used improperly without agreement or having their information be disclosed to third parties [60]. The meaning of privacy is also related with having control over who is able to access, use, or share one's infor-

mation [61]. The literature on privacy online has suggested that Internet users are generally concerned about unwanted audiences obtaining personal information. 86 percent of Internet users are concerned that unwanted audiences will obtain information about them [62]. Thus, privacy concerns influence individuals' acceptance of technology, such as their intentions to purchase online [63-64]. When consumers use mHealth products or services, their personal health conditions are recorded and uploaded on the software program. The health records in mHealth product are communicated through the chain of greater number of actors such as, consumers, internet providers, telecommunication carriers, third-party vendors and it increase the risk of securing consumers' individual health information [59]. Control over the mobile technology products and ability to decide who sees the information in mobile device are important to consumers. Older consumers have lower willing to take risk especially in the case of technology adoption [65].

6.2. Technology anxiety and Stigma

Technology anxiety [66] defined as ''the fear, apprehension and hope people feel when considering use or actually using computer technology''. Lim and Lee [67] argue that technology anxiety is one of the most important psychographic variables and determinants of technology adoption. This anxiety is characterized by ''excessive timidity in using computers, negative comments against computers and information science, attempts to reduce the amount of time spent using computers, and even the avoidance of computers in the place where they are located'' [68]. Technology anxiety can be the huddle of various mHealth products and services. Mature consumers who are the major consumers of mHealth products especially have higher technology anxiety than do younger users [69-70]. Previous research [71] found that technology anxiety is negatively associated with perceived ease of use indicating that technology anxiety can reduce older users' adoption intention for health mobile services. Stigma is closely related with technology anxiety factors. It is the negative evaluation of a person as tainted or discredited on the basis of attributes such as mental disorder, ethnicity, drug misuse or physical disability [72]. There is no doubt that such prejudice has substantial negative social, political, economic and psychological consequences for stigmatized people [73]. Mature consumers who are experiencing the cognitive aging are easy to shown as low capability in utilizing technology product. This stigmatization process can create a situation in which older consumers are labelled as inferior people and decreasing older consumers' self-efficacy in using mHealth products and services.

6.3. Performance risk

The use of mHealth in smartphones, smart watches, wearable trackers, and new health applications has started a revolution in the healthcare system. Monitoring system for older people with dementia wandering away from home, alarming mHealth product which detecting

falls or sudden cardiac arrest improve security of consumers. However, despite widespread sales of these devices, there has been little evaluation of their use, accuracy, or precision. What is the likelihood that there will be something wrong with the performance of the mHealth product or that it will not work properly? What if the mHealth servers may not perform well and process payments incorrectly? Performance risk refers to user's perception about the possibility of the technology products malfunctioning and not working as intended or advertised, and thus being unable to provide the desired services [74]. The meaning of performance can be broken into three types, economic performance, temporal performance and effort performance [75]. In addition, the six dimensions of risk facets- performance, financial, opportunity/time, safety, social and psychological loss- in technology adoption comes from performance risk [75]. If consumers experience low accuracy of monitoring products or errors of fall detecting alarm at home, they become uncertain to use mHealth products or services. As a part of effective performance risk-reducing strategies, money back guarantees and continuous consumer satisfaction guarantees are the examples of countering performance based risk concerns [74].

6.4. Information efficacy

mHealth product and service have higher value when the user continuously utilizes the wearable health watch or checking physical condition regularly day by day. Thus, the intention to continuous use of mHealth product and service is more important factor to consider than the technology adoption antecedents. In contrast to rapid growth of the market, users tend to not use these kinds of application they downloaded continuously, but momentarily, even though the applications are providing services based on the embedded sensors measuring body information or quantity of physical exercise [76]. Impact of psychological factors are strong in the intention to continuous use of mHealth product and service. Information efficacy influences the intention to use through perceived ease of use and perceived usefulness [31]. Information efficacy refers to the 'Individuals' level of confidence in their ability to distinguish between high-and lower-quality health information [77]. It is also defined narrowly as 'the ability to seek out needed information and have found that it is associated with a willingness to search for information and use it to improve one's health [78-79]. If the mHealth user feels that it is effective to find necessary health information or track important health condition, consumers decide to use the mHealth product or service continuously.

6.5. Playfulness

Recently, Pokemon GO, an augmented reality game in which players search real world locations for cartoons characters appearing on their smartphone screen, is associated with a moderate increase in young US adults 'daily number of steps [80]. In addition, the virtual reality and interactive digital game technology is used to increase activities of young children who is suffered from obesity or rehabilitation of older people [81-82]. Anderson et al. [83] find

a playfulness of gamified mHealth platform, which allows competing to each other, could be indirectly affect participants to walk more. Furthermore, in the digital game setting, researchers find that players will play longer time if they compete with the player who has similar skill level [84]. With the technology acceptance model perspective, playfulness is defined as an individual's tendency to interact spontaneously, inventively and imaginatively with computers [85]. It has been widely included in the TAM model as a facilitating condition, influencing directly the extrinsic motivators. Lee and his colleges [31] found that playfulness influence intention to continuous use mHealth product directly as well as indirectly through perceived ease of use and perceived usefulness.

7. Literature Review

"Consumer choice of on-demand mHealth app services: Context and contents values using structural equation modeling" By E Lee, S Han, SH JO

7.1. Introduction

We would like to provide a study that indicated some variables to affect the intention to use mHealth services considering the characteristics of the services. The study was carried out towards Korean people over age 40. Men or women who are breadwinners of households are mainly responsible for supports for the elderly parents in east Asian countries like Korea, China, and Japan influenced by Confucianism. Furthermore, over 40's and 50's in Korea have at least one health risk behaviors, so they need health management. In addition, half of Korean elderly people are suffering from more than three chronic diseases [86]. That is why the authors chose the senior people over 40-year-old in that they are the primary source of support for the elderly parents and they need to take care of themselves.

7.2. Research Object

This study tries to find out which factors make the senior people have the intention to use mHealth services. Most of studies in the mobile services have dealt with young people. Even though mHealth services would provide more benefits to the old people, but there are a few studies toward the elderly people. In addition, this study tries to identify some factors to affect the use intention of mHealth services considering contextual and content related perceived values fitting for the mHealth services, while most adoption studies are based on technology acceptance model.

7.3. Theory Backgrounds

7.3.1. Perceived Value

It means the overall assessment of a consumer about a product considering benefits and

loss (payment) [87]. The value shows wide variations depending on persons, types of services or products, and use situations. For this reason, Childers et al. [88] argued that perceived value should be constructed of multidimensional values. Customers perceive values when they experience or use a product or service and the values affect whether they purchase or not [89].

Studies regarding mHealth services are based on traditional commerce, though mHealth services have difference roots with conventional services. This study provides a new theoretical framework reflecting context-and content-perceived values to figure out the factors to affect the intention to use mHealth services.

7.3.2. Contextual perceived value

Context is defined as "the set of environmental states and settings that either determines an application's behavior or in which an application event occurs and is interesting to the user [90]." In mobile service, mobile context means "any personal and environmental information that may influence the person when he/she is using mobile Internet [91]". Contextual values, such as time availability and mobility would influence the use of self-service [51,57,92].

7.3.2.1. Conditional value

It is defined as "an extrinsic utility come from its capacity to give social or functional value in the context of a specific and set of circumstances combined with the previous situation [56]."The definition conditional value in this study is adjusted in order to reflect the contextual characteristics of mHealth service, it is "Health stress". Hence, it is defined as "value existing in a specific context derived from circumstances that a person worries his/her health or care receiver's health [31]."

7.3.2.2. Epistemic value

It indicates curiosity or knowledge seeking by experiencing new technology, product, and service. Curiosity or variety-seeking would motivate to purchase [55-56]. This epistemic value might be important role for a user to purchase information services rather than entertainment services [93].

7.3.3. Content perceived value

7.3.3.1. Usefulness value

It is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance [94]. It is adjusted here as "the degree to which a person believes that using a mobile service(Mobile Healthcare Application) would enhance his or her health condition [31]". As people perceive usefulness value from a product or service, it is likely to adopt the product or service [30]. Several studies indicated that usefulness value

is a dominant factor in various mobile services [33,95].

7.3.3.2. Emotional value(Enjoyment)

It is defined as "The perceived utility acquired from an alternative's capacity to arouse feelings or affective states. An alternative acquires emotional value when associated with specific feelings or when precipitating or perpetuating those feelings [56]". People feel emotional value when they experience a product or service, and fun-seeking among emotional values would be the influencing motivation [47].

7.3.3.3. Convenience Value

It is defined as "the value placed on, and the active search for, products and services that provide personal comfort and/or save time in performing various activities[36]". Yale and Venkatesh [35] mentioned that time-saving would be the primary source to affect the intention to use information base mobile services out of six multi dimensions: time utilization, accessibility, portability, appropriateness, effort saving capability, and avoidance of unpleasantness[42].

7.3.3.4. Reassurance Value

It is defined as a degree to which a product or service is effective in reducing a patient's anxiety or psychological distress [43]. Previous studies argued that people use the telephone and pager service to perceive reassurance value because communication services would give an effective tool for identifying well-being of family or other people [44-46].

With the values above, the research adopts context and context values to figure out the factors that affect the intention to use a mHealth service.

7.4. Data Collection and Measurements

313 respondents fully completed questionnaires through online survey company toward 40-year-old Korean people. 40-year-old respondents were 131, 50's were 120, and over 60's were 62.

The scale items for conditional value and epistemic value as contextual perceived values were adapted from Sheth et al. [56]. The measurement items for emotional (enjoyment), and intention to adopt were developed from Davis et al. [96]. In addition, the items measuring reassurance were brought from O'Keefe and Sulanowski [44] and adjusted to this study. The convenience value was developed from Pura and Gummerus [58]. Finally, the measurement items for usefulness value were used from the Davis's items [97]. All of the constructs were measured with multiple items, each item was measured with a five-point Likert scale, ranging from "Strongly disagree (1)" to "Strongly agree (5)".

7.5. Analysis& Results

Exploratory factor analysis and confirmation factor analysis were conducted to test reliability and validity using SPSS 18 and LISREL 9. The results showed that the data satisfied the threshold of reliability, average variance extracted, convergent validity, and composite reliability. Furthermore, all of the fit indices of structural model were satisfied with the acceptance criteria.

7.6. Discussion

The results showed that health stress significantly influenced enjoyment, usefulness, convenience, and reassurance. It means that people with health problems are likely to perceive functions of mHealth service. Some studies showed that epistemic value might be an influencing factor, but his study shows that epistemic value also would have positive influence on information things such as mHealth services.

It also indicated that people would be likely to feel beneficial in that people could use the mHealth services when they want without temporal and spatial limitations. However, it does not seem that the enjoyment and reassurance value affect the intention to use the services. It means that people might think the general sophistication of the current mHealth services does not satisfy their expectation to manage health. In other words, people would recognize that mHealth services are able to help them manage their health, but the quality of the service is below expectations.

Practically, the results show the importance of understanding the reassurance value from mHealth services. The value should be a very dominant antecedent when people decide a healthcare service, but the current mHealth services do not give reassurance value and it does not have any effect on the intention to use the services. Hence, this results are beneficial for practitioners such as telecommunications, mHealth service makers, and even medical professionals. mHealth service providers should consider several approaches to make advanced mHealth services in order to satisfy consumers.

Finally, this is a leading study, in an academic perspective, in that it tried to find out the influencing variables to affect the intention to use mHealth services with the perceived values and consumption values considering mobile service and healthcare service, not just utilizing technology acceptance model. Above all, most of studies on the technology acceptance focused on the young people, but this study expanded the age group from 20-year olds to 70-year olds.

8. Figures

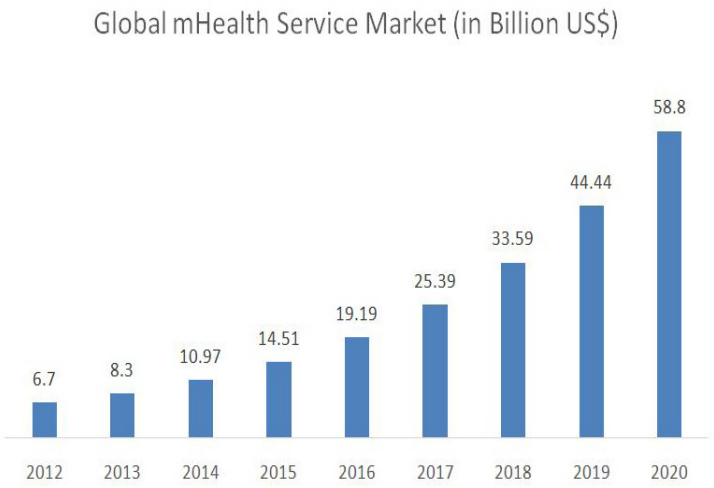

Figure 1: Global mHealth Market (Statista 2012).

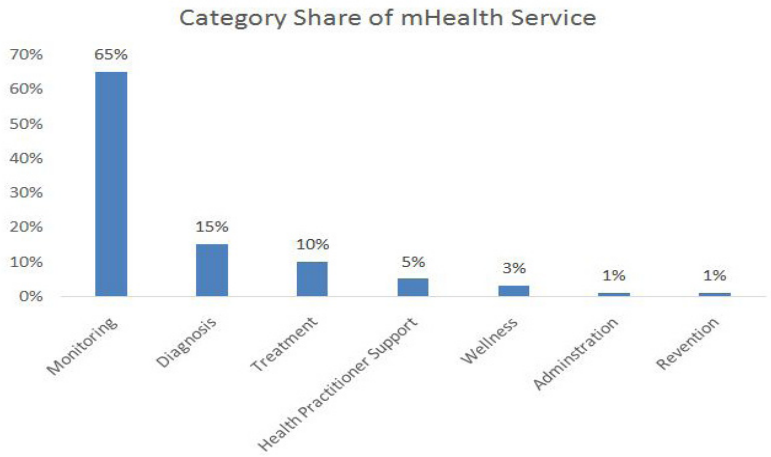

Figure 2: mHealth Service by service category (Statista 2017).

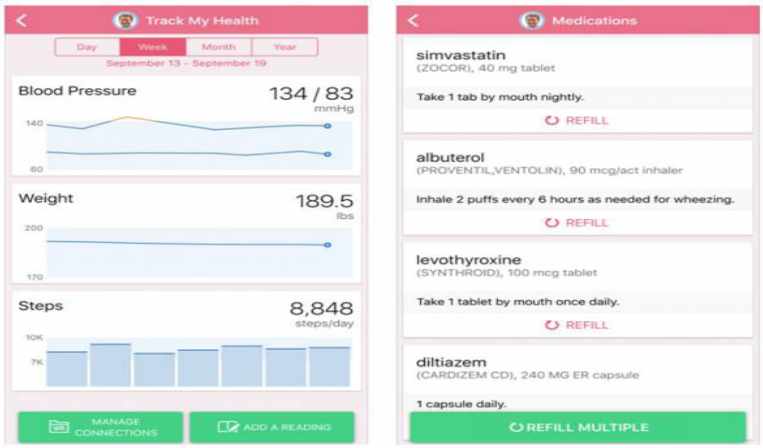

Figure 3: My Chart

Figure 4: Fitbit.

Figure 5: AliveCor.

Figure 6: Natural Cycles.

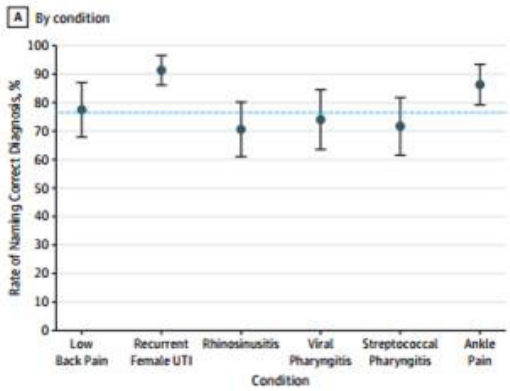

Figure 7: Percent of correct diagnosis by conditions.

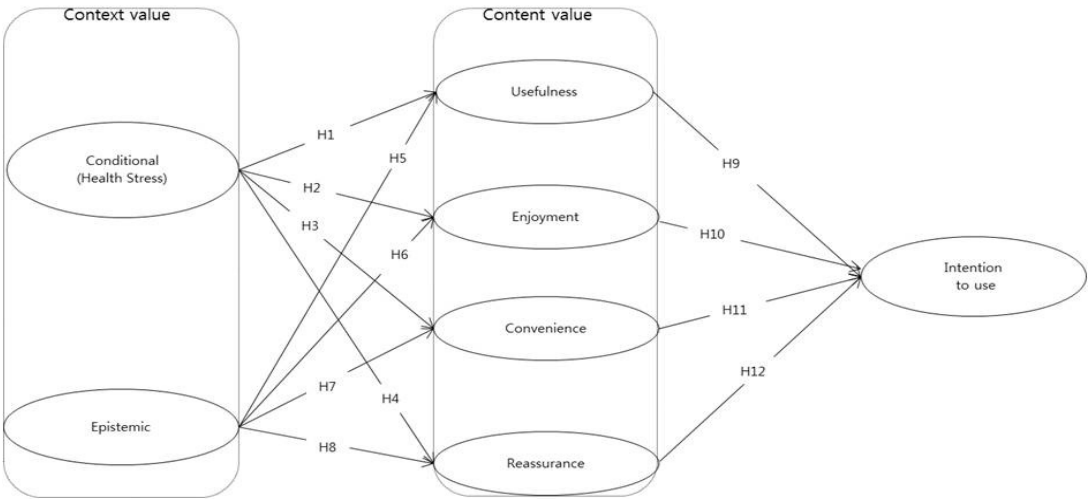

Figure 8: Research Model.

Hypothesis	Path Coefficient (p< .05)	t-value	Support
H1. Conditional Value(Health Stress) -> Emotional Value(Enjoyment)	0.22	2.83	Yes
H2. Conditional Value(Health Stress) -> Usefulness	0.21	2.73	Yes
H3. Conditional Value(Health Stress) -> Convenience	0.18	2.32	Yes
H4. Conditional Value(Health Stress) -> Reassurance	0.28	3.77	Yes
H5. Epistemic Value -> Emotional Value(Enjoyment)	0.70	12.71	Yes
H6. Epistemic Value -> Usefulness	0.77	16.46	Yes
H7. Epistemic Value -> Convenience	0.81	15.10	Yes
H8. Epistemic Value -> Reassurance	0.71	11.92	Yes
H9. Emotional Value(Enjoyment) -> Intention to use	0.08	1.09	No
H10. Usefulness -> Intention to use	0.38	4.17	Yes
H11. Convenience -> Intention to use	0.40	3.53	Yes
H12. Reassurance -> Intention to use	0.16	1.87	No

Figure 9: Results of Hypotheses.

8. References

1. Eysenbach G. What is e-health?. Journal of medical Internet research. 2001.3.

2. Liu D, Li X, Santhanam R. Digital Games and Beyond : What Happens When Players Compete? MIS Quarterly, 2013; 37: 111–124.

3. R.S. Istepanian, E. Jovanov, Y.T. Zhang, Guest editorial introduction to the special section on m-health: beyond seamless mobility and global wireless health-care connectivity, IEEE Trans. Inf. Technol. Biomed. 8 (4) 2004. 405–414.

4. Mechael, Patricia N. "The case for mHealth in developing countries." innovations 4.1 .2009. 103-118.

5. Akter S, D'Ambra J, Ray P. User perceived services quality of mHealth Services around the world. In the proceedings of the 18 th European Conference on Information Systems, Pretoria, South Africa, 2010.

6. Weinstein, R.S., Lopez, A.M., Joseph, B.A., Erps, K.A., Holcomb, M., Barker, G.P. and Krupinski, E.A., 2014. Telemedicine, telehealth, and mobile health applications that work: opportunities and barriers. The American journal of medicine, 127(3), pp.183-187.

7. FDA. Mobile Medical Applications. 2015.

8. ITU International Telecommunication Union. 2010. Mar, 2016-02-04.

9. ITU International Telecommunications Union Report. 2015. [2016-07-28].

10. GSMA Intelligence, The mobile economy 2017https://www.gsma.com/mobileeconomy/

11. Kim Jeong-Min, Yun Jun Ho, Kim Bong-Jo. Applications of precision medicine to overcome diabetes. KCDC, 2017. 10(31), 826-826.

12. Moscoso, Philip German, Alejandro Lago, and Marlene Castro Amorim. "Putting Your Client to Work: A Good Way to Achieve Great Service at Low Cost?.". 2011. SSRN Electronic Journal.

13. Kennedy, Laurence. "Self-monitoring of blood glucose in type 2 diabetes.". 2001. Diabetes Care. 24-6. 977-978.

14. Statista. mHealth industry market size projection from 2012 to 2020.

15. World bank, 2013. Global Mobile Phone Penetration.

16. Allied Market Research. (2015). mHealth Market Global Opportunity Analysis and Industry Forecast 2014-2020

17.Statista. Mobile Health market share worldwide in 2017 by service category.

18. Schoenfeld, Adam J., et al. "Variation in quality of urgent health care provided during commercial virtual visits." JAMA internal medicine 176.5. 2016: 635-642.

19. American Psychological Association. Stress in America. 2008.

20. Cannon. The wisdom of the body. 1932. New York. W W Norton & Co.

21. Starck, S.R., Tsai, J.C., Chen, K., Shodiya, M., Wang, L., Yahiro, K., Martins-Green, M., Shastri, N. and Walter, P., 2016. Translation from the 5′ untranslated region shapes the integrated stress response. Science, 351(6272), p.aad3867.

22. Mohd Don, Z., Yong, J., & Knowles, G. How words can be misleading: a study of syllable timing and "stress" in Malay. 2008.Linguistics Journal, 3(2).

23. Rogers, R.W., A protection motivation theory of fear appeals and attitude change1. The journal of psychology, 1975. 91(1), pp.93-114.

24. Park, J., Chung, H., & Rutherford, B. Social perspectives of e-contact center for loyalty building. Journal of Business Research, 2011. 64(1), 34-38. https://doi.org/10.1016/j.jbusres.2009.09.017

25. Shin, D. H., & Shin, Y. J. Why do people play social network games?.Computers in Human Behavior, 2011. 27(2), 852-861

26. Turrell, G., Lynch, J. W., Leite, C., Raghunathan, T., & Kaplan, G. A. Socioeconomic disadvantage in childhood and across the life course and all-cause mortality and physical function in adulthood: evidence from the Alameda County Study. Journal of Epidemiology and Community Health, 2007, 61(8), 723-730.

27. Shang, A., Huwiler-Müntener, K., Nartey, L., Jüni, P., Dörig, S., Sterne, J. A., . . . Egger, M. Are the clinical effects of homoeopathy placebo effects? Comparative study of placebo-controlled trials of homoeopathy and allopathy. The Lancet, 2005. 366(9487), 726-732.

28. Venkatesh, V., & Davis, F. D. A theoretical extension of the technology acceptance model: Four longitudinal field studies. Management science, 2000. 46(2), 186-204.

29. Sussman, S. W., & Siegal, W. S. Informational influence in organizations: An integrated approach to knowledge adoption. Information systems research, 2003. 14(1), 47-65

30. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. User acceptance of information technology: Toward a unified view. MIS quarterly, 2003. 425-478.

31. Lee, E., Han, S. and Jo, S.H., Consumer choice of on-demand mHealth app services: Context and contents values using structural equation modeling. International journal of medical informatics, 2017. 97, pp.229-238. https://doi.org/10.1016/j.ijmedinf.2016.10.016

32. Luarn, P., & Lin, H.-H. Toward an understanding of the behavioral intention to use mobile banking. Computers in human behavior, 2005. 21(6), 873-891.

33. Wu, J.-H., Wang, S.-C., & Lin, L.-M. Mobile computing acceptance factors in the healthcare industry: A structural equation model. International journal of medical informatics, 2007. 76(1), 66-77.

34. Free, C., Phillips, G., Watson, L., Galli, L., Felix, L., Edwards, P., . . . Haines, A. The effectiveness of mobile-health

technologies to improve health care service delivery processes: a systematic review and meta-analysis. PLoS Med, 2013. 10(1), e1001363.

35. Yale, L., & Venkatesh, A. Toward the construct of convenience in consumer research. Advances in Consumer Research, 1986. 13(1), 403-408.

36. Brown, Lew G. Convenience in services marketing. Journal of Services Marketing 4.1 1990. 53-59.

37. Colwell, S. R., Aung, M., Kanetkar, V., & Holden, A. L. Toward a measure of service convenience: multiple-item scale development and empirical test. Journal of Services Marketing, 2008. 22(2), 160-169.

38. Anckar, B., & D'incau, D. Value creation in mobile commerce: Findings from a consumer survey. Journal of Information Technology Theory and Application (JITTA), 2002. 4(1), 8.

39. Carroll, J., Howard, S., Peck, J., & Murphy, J. A field study of perceptions and use of mobile telephones by 16 to 22 year olds. Journal of Information Technology Theory and Application (JITTA), 2002. 4(2), 6.

40. Mick, D. G., & Fournier, S. Technological consumer products in everyday life: Ownership, meaning, and satisfaction. REPORT-MARKETING SCIENCE INSTITUTE CAMBRIDGE MASSACHUSETTS, 1996. 11-12.

41. Bain & Company. Growing business opportunities for healthy living. 2014.

42. Pihlström, M., & Brush, G. J. Comparing the perceived value of information and entertainment mobile services. Psychology & Marketing, 2008. 25(8), 732-755.

43. M.C. Hilary & M. Paul, Reassurance, Br. Med. J. Clin. Res. Ed. 1985. 290 (6474)

44. G.J. O'Keefe, B.K. Sulanowski, More than just talk: uses, gratifications, and the telephone, Journal. Mass Commun. Q. 72 (4). 1995. 922–933.

45. J.W. Dimmick, J. Sikand, S.J. Patterson, The gratifications of the household telephone sociability instrumentality, and reassurance, Commun. Res. 21 (5) (1994) 643–663.

46. LaRose, R., Herbert D., 1993. the telephone in daily life: A study of personal telephone use in the United States. In: Proceedings of the 12th Annual Meeting of the Pacific Telecommunication Conference, Honolulu, HI.

47. Leung L, Wei R. More than just talk on the move: Uses and gratifications of the cellular phone. Journalism & Mass Communication Quarterly. 2000 Jun;77(2):308-20.

48. Banthin JS, Cunningham P, Bernard DM. Financial Burden of Health Care, 2001-2004. Health Affairs (Millwood) 2008;27(1):188–95.

49. Cunningham, P. The Growing Financial Burden Of Health Care: National And State Trends, 2001–2006. Health Affairs, 2010. 10-1377.

50. May JH, Cunningham PJ. Tough trade-offs: medical bills, family finances and access to care. Center for Health System Change Issue Brief. 2004 Jun;85:1-4.

51. Meuter, Matthew L., et al. "Self-service technologies: understanding customer satisfaction with technology-based service encounters." Journal of marketing 64.3. 2000: 50-64.

52. Heinonen K. Time and location as customer perceived value drivers. Svenska handelshögskolan; 2004 Apr 29.

53. Newman MG, Kenardy J, Herman S, Taylor CB. Comparison of Palmtop-Computer-Assisted Brief Cognitive--Behavioral Treatment to Cognitive--Behavioral Treatment for Panic Disorder. 1997. SSRN Electronic Journal

54. Price M, Yuen EK, Goetter EM, Herbert JD, Forman EM, Acierno R, Ruggiero KJ. mHealth: a mechanism to deliver more accessible, more effective mental health care. Clinical psychology & psychotherapy. 2014 Sep 1;21(5):427-36.

55. Hirschman, Elizabeth C. “Innovativeness, novelty seeking, and consumer creativity.” Journal of consumer research 7.3. 1980: 283-295.

56. J.N. Sheth, B.I. Newman, B.L. Gross, Why we buy what we buy: a theory of consumption values, J. Bus. Res. 22 (2). 1991. 159–170.

57. RICHARD, Marie-Odile. Modeling the impact of internet atmospherics on surfer behavior. Journal of business research, 2005, 58.12: 1632-1642.

58. PURA, Minna; GUMMERUS, Johanna. Discovering value perceptions of mobile services with critical incident technique (CIT). Marketing theory and applications, 2007,

59. Atienza, A. A., Zarcadoolas, C., Vaughon, W., Hughes, P., Patel, V., Chou, W. Y. S., & Pritts, J. Consumer attitudes and perceptions on mhealth privacy and security: findings from a mixed-methods study. Journal of health communication, 2015. 20(6), 673-679.

60. Kang, Y., & Kim, S. Understanding user resistance to participation in multihop communications. Journal of Computer-Mediated Communication, 2009. 14(2), 328-351.

61. National Committee on Vital, & Health Statistics. Recommendations on privacy and confidentiality, 2006–2008. Hyattsville, MD: US Department of Health and Human Services. 2009. Retrieved from

62. S., Rainie, L., Horrigan, J., Lenhart, A., Spooner, T., & Carter, C. Trust and privacy online: Why Americans want to rewrite the rules. The Pew Internet & American Life Project, 2000. 1-29.

63. Stewart, K. A., & Segars, A. H. An empirical examination of the concern for information privacy instrument. Information Systems Research, 2002. 13(1), 36-49.

64. Malhotra, N. K., Kim, S. S., & Agarwal, J. Internet users’ information privacy concerns (IUIPC): The construct, the scale, and a causal model. Information systems research, 2004. 15(4), 336-355.

65. Mattila, M., Karjaluoto, H., & Pento, T. Internet banking adoption among mature customers: early majority or laggards?. Journal of services marketing, 2003. 17(5), 514-528.

66. Igbaria, M., & Parasuraman, S. A path analytic study of individual characteristics, computer anxiety and attitudes toward microcomputers. Journal of Management, 1989. 15(3), 373-388.

67. Lim, H. & Lee, H.J. Development of consumer techno segmentation and its application to international markets. International Journal of Consumer Studies, 2010. 34, 87–95.

68. Doronina, O. V. Fear of computers. Russian Education & Society, 1995. 37(2), 10-28.

69. Dyck, J. L., Gee, N. R., & Smither, J. A. The changing construct of computer anxiety for younger and older adults. Computers in Human Behavior, 1998. 14(1), 61–77.

70. Laguna, K., & Babcock, R. L. Computer anxiety in young and older adults: implications for human–computer interactions in older populations. Computers in Human Behavior, 1997. 13(3), 317–326.

71. Guo, X., Sun, Y., Wang, N., Peng, Z., & Yan, Z. The dark side of elderly acceptance of preventive mobile health services in China. Electronic Markets, 2013. 23(1), 49-61.

72. Goffman, E. Stigma: Notes on the management of spoiled identity. Simon and Schuster. 2009

73. Dovidio, J. F., Major, B., & Crocker, J. Stigma: Introduction and overview. 2000

74. Featherman, M. S., & Pavlou, P. A. Predicting e-services adoption: a perceived risk facets perspective. International journal of human-computer studies, 2003. 59(4), 451-474.

75. Cunningham, S. The major dimensions of perceived risk. In: D. Cox (Ed.), Risk Taking and Information Handling in Consumer Behavior. 1967. Harvard University Press, Cambridge, MA.

76. Lee Jin Wook, Kim Jong Deok, & Ji Arin. A Present Condition of Smartphone Health Applications. Korean Society of Design Science, 2010. 10, 210-211

77. Austin, E. W., Pinkleton, B. E., Austin, B. W., & Van de Vord, R. The relationships of information efficacy and media literacy skills to knowledge and self-efficacy for health-related decision making. Journal of American college health, 2012. 60(8), 548-554.

78. Basu A, Dutta MJ. The relationship between health information seeking and community participation: the roles of health information orientation and efficacy. Health Communication, 2008;23:70–79

79. Zhao X, Cai X. The role of risk, efficacy, and anxiety in smokers' cancer information seeking. Health Communication, 2009; 24:259–269.

80. HOWE, Katherine B., et al. Gotta catch'em all! Pokémon GO and physical activity among young adults: difference in differences study. bmj, 2016, 355: i6270.

81. Lange, B., Koenig, S., Chang, C. Y., McConnell, E., Suma, E., Bolas, M., & Rizzo, A. Designing informed game-based rehabilitation tasks leveraging advances in virtual reality. Disability and rehabilitation, 2012. 34(22), 1863-1870.

82. Rizzo, A. S., Lange, B., Suma, E. A., & Bolas, M. Virtual reality and interactive digital game technology: new tools to address obesity and diabetes. 2011

83. Anderson, I., Maitland, J., Sherwood, S., Barkhuus, L., Chalmers, M., Hall, M., ... Muller, H. Shakra: Tracking and Sharing Daily Activity Levels with Unaugmented Mobile Phones. Mobile Networks and Applications, 2007. 12(2-3), 185–199.

84. C. Liu, Q. Zhu, K.A. Holroyd, E.K. Seng, Status and trends of mobile-health applications for iOS devices: a developer's perspective, J. Syst. Softw. 84 (11). 2011. 2022–2033

85. Webster, J., & Martocchio, J. J. Microcomputer playfulness: development of a measure with workplace implications. MIS Quarterly, 1992. 16(2), 201–226

86. Jeong. Y.H, Ko, S. J, & Kim, E. J. A Study on the effective chronic disease management. KIHASA. 2013.

87. Zeithaml, V.A. Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence, Journal of Marketing, 1998. Vol. 52, July, pp. 2-22.

88. T.L. Childers, C.L. Carr, J. Peck, S. Carson, Hedonic and utilitarian motivations for online retail shopping behavior, J. Retail. 77 (4) 2002 511–535.

89. Bettman, James R., Mary Frances Luce, and John W. Payne. "Constructive consumer choice processes." Journal of consumer research 25.3 1998: 187-217.

90. G. Chen, D. Kotz, A Survey of Context-aware Mobile Computing Research Dartmouth Computer Science Technical Report, 2000, TR2000-381. https://www.cs.dartmouth.edu/~trdata/reports/TR2000-381.pdf

91. KIM, Hoyoung, et al. An empirical study of the use contexts and usability problems in mobile Internet. In: System Sciences, 2002. HICSS. Proceedings of the 35th Annual Hawaii International Conference on. IEEE, 2002. p. 1767-1776.

92. Michelle Bobbitt, L., and Pratibha A. Dabholkar. Integrating attitudinal theories to understand and predict use of technology-based self-service: the internet as an illustration. International Journal of Service Industry Management 12.5 2001: 423-450.

93. M. Pihlstrom, G.J. Brush, Comparing the perceived value of information and entertainment mobile services, Psy-

chol. Mark. 25 (8) 2008 732–755.

94. F.D. Davis, Perceived usefulness, perceived ease for use, and end user acceptance of information technology, MIS Q. (1989) 319–340.

95. WANG, Yi-Shun; LIN, Hsin-Hui; LUARN, Pin. Predicting consumer intention to use mobile service. Information systems journal, 2006, 16.2: 157-179. https://doi.org/10.1111/j.1365-2575.2006.00213.x

96. F.D. Davis, R.P. Bagozzi, P.R. Warshaw, Extrinsic and intrinsic motivation to use computers in the workplace1, J. Appl. Soc. Psychol. 22 (14) 1992 1111–1132.

97. F.D. Davis, Perceived usefulness, perceived ease for use, and end user acceptance of information technology, MIS Q. 1989; 319–340.