Gamification of Wearable Devices in the Healthcare Industry

Taeho Kim

ISE 210, San Jose State University, San Jose, CA

Committing to exercise regularly is not an easy task. Following evaluation investigate the adequacy of gamification techniques within wearable devices by analyzing the multiple aspects of gamification, wearable technologies, and the healthcare industry. Gamification is not about learning how to play a game; instead gamification emphasizes using game mechanics or elements in a non-gaming system to make it more fun and enjoyable. An analysis of the literatures found that having a gamified wearable device will motivate individuals to exercise willingly on regular basis, which can be developed to help the healthcare industry, especially for patients in long term rehabilitation. The feasibility of applying gamification into wearable devices to utilize them for healthcare industry are then discussed. A detailed discussion of how to apply gamification for wearable devices is beyond the scope of this paper, and will not be discussed.

INTRODUCTION

Exercising is often regarded as last priority, if at all, even though the importance of exercise in regular basis is well known. The obesity rate in the US, Canada, and many other developed countries is very high, and it decrease the quality of life. (Giabbanelli, P. J., Deck, P., Andres, L., Schiphorst, T., & Finegood, D. T., 2013). One study shows that gamification can motivate people to change an aspect of their way of exercise. According to Chou, human motivation in the process is the top priority concern when it comes to Gamification design. (2014) By promoting them a positive attitude to achieve, we can eliminate the some of reason and persuade people to exercise by improving the aspect of their way of exercise. Benefits of long-term exercise, in duration of 3 months to 3 years, are lessening the chance of cardiac mortality by 20% to 25%. (Merz, M., Bairey, C. N., Rozanski, M., Forrester, M., & James, S., 1997).

Numerous reports have showed that a gamified solutions approach can be implemented into any type of real-world problem. Many Content and media companies adopted game-like approach into their system; USA Network uses gamification to escalate the commitment to their TV shows. Verizon Wireless adopted gamification to attract customers to induce them to stay longer while browsing the website. Samsung created a social loyalty program for customers to rank them and compete with one another by their badges earned from exploring the Samsung’s product. (Pereira, P., Duarte, E., Rebelo, F., & Noriega, P., 2014)

As the average life expectancy gets longer, the growing number of elderly and frail people that depend on someone to take care of them became a nation wide issue. According to Brauner, P., Valdez, A. C., Schroeder, U., & Ziefle, M., this dependency rate will grow and eventually many elderly people will need higher support by others, which will cause higher demand in the health and welfare system in many societies. (2013) This can avoided by increasing the physical activity of elderly people.

A detailed discussion of applying a gamification solution for wearable devices is beyond the scope of this paper.

BACKGROUND INFORMATION

A study shows that people start to lose muscle and function at some point in 30s, a condition known as sarcopenia. For those who do not exercise regularly can lose up to 3–8% of their muscle mass per every 10 years after 30. Especially physically inactive patients will lose more muscle. The primary treatment and way to prevent for sarcopenia is exercise to increase strength of muscle and endurance. To maximize the benefits with minimal risk of injury, it is crucial to have the proper number, intensity, and frequency of resistance while exercise. (Paddon-Jones, D., & Rasmussen, B. B., 2009)

The term Gamification is defined as adopting any game elements into non-gaming system, which will accommodate user experience as well as user engagement. (Deterding, S., Dixon, D., Khaled, R., & Nacke, L., 2011) Gamification does not necessarily mean the creation of a game. A persuasive system will change the behavior of users; such as motivating people to develop new skills, increasing brand loyalty, and so on.

Gamification can boost engagement of particular activities. A recent study shows that the popularity of health and fitness applications has increased as a result of gamification. The availability of various health and fitness applications in application stores of iOS and Android is the proof of this. (Lister, C., West, J. H., Cannon, B., Sax, T., & Brodegard, D., 2014)

Wearable technologies are an uncontested market place with significant potential in healthcare industry; Smart watches, smart glasses, gesture controllers, health monitors, activity trackers, and many more. (Zhao, Z., Etemad, S. A., & Arya, A., 2016) Activity tracking exercise-recording wearable devices with wireless-enabled technology, such as Jawbone up, fitbit, Nike+, and many others, can easily measure physical activity data such as the number of steps walked daily, quality of sleep, steps climbed, total mount of energy burned, sleeping patterns and many other personal metrics. Some of these devices even support connections to Apple iPhone, iPad, and
any Android devices via Bluetooth Low Energy (BLE). Today is is very easy to extract quality cumulated data from these mobile devices at a low cost.

A study done by Gartner, Inc. found that 70% or more of Global 2000 organization will be using gamified-solution by 2014, and within the next half decade gamification will be adopted to general pubic. (Pettey, C., 2011)

**GOAL OF THIS PAPER**

Positively enforcing people to enjoy rehabilitation by giving them positive experiences which will lead to promote individuals to actively participate with own will, which eventually benefit their health and wellness. (Pereira, P. et al., 2014)

By integrating gamification into wearable devices, patients can wear wearable devices all the time and keep track of their goals and achievements, which will help to motivate them to participate willingly on a regular basis. According to Zhao, Z. et al., gamification of health and fitness can benefit a user range of novice to professional users, and time range of short-term to long term. A study also shows that there is an overlapping area of digital games and gamification, health and fitness, and wearable technologies which is indicated in white area of Figure 1 below. (Zhao, Z. et al., 2016) The general tangibility, limitations and potential effect of this overlapping area will be evaluated.

**GAMIFICATION, WEARABLE, AND HEALTH**

Along with positive affects on the individual’s health as well as expenses, gamification consummating wellness and/or healthcare activities by enhancing people’s (e.g., consumers, patients, healthcare workers, etc.) fun, engagement and compliance. Gamification helps participants to overcome negative experience or sometimes helps to turn them into positive experience while participating and collaborating with others, which can be lead to improve social skills such as leadership and collaboration. (Pereira, P. et al., 2014)

**Gamifying Software**

A study shows that interest in computing devices, including mobile devices, wearable devices, etc., is no longer bound to just computer scientists, but also physicians and psychologists. It is a huge trend to analyze the use of system, and want to see how these technologies can positively affect anybody’s physical activity. In addition, as the technology advances the data is no longer tied to just hardware or software. The data from self-tracking exercise devices can be gathered by secure software into chunks of logged data, which are then uploaded to the web. Individuals can then sign into private web site to retrieve the analyzed fitness data. User can then view these analyzed data trends and metrics and can use to set new objectives and goals to enhance their performance. By signing into a private web site these data can be retrieved for further analysis, and help persuade many individuals to focus and enhance their performance. (Giannakis, K., Chorianopoulos, K., & Jaccheri, L., 2013)

**Wearable Technology**

With the technology advances, physicians can now collect quality “quantified” data from each patient. And the data even came out in data by itself from the device. For example, small connected wristbands like fitbit can document your vital signs and hypertension, and some contact lenses keep track of your blood sugar levels. (White, C., 2015)

Wearable technology is also very useful to someone who needs to be in intensive care or controlled amount of exercise, such as sarcopenia patients which, again, is defined as a natural muscle loss by the aging process, to keep track of their activities. (Pereira, P. et al., 2014) As the technology advances, wearable devices will include many sensors and chips to accommodate different types of activities; The accelerometers and altimeters can be used to calculate overall physical activities including distance and speed of your workout. The devices can also calculate calorie that you burned. Moreover, they can even observe your health rate, sleep cycle, muscle activity, body’s hydration, and much more. (Zhao, Z. et al., 2016)

The majority of wearable manufacturers support application programming interfaces, also known as APIs. Any third party developers can use these APIs to develop a customized application for either Android or iOS. For instance, these APIs will allow access for user resources, notifications, scheduling the system, or synchronizing the data directly or over the web. Furthermore, some manufacturers even support software development kits (SDK). Which is a collection of tools for third party developers. (Zhao, Z. et al., 2016) As a conclusion, someone like experienced physical therapist, trainer or physician can use these applications, whether it is provided from the wearable device manufacturers or third party developer, to collect quality data of their patients.
Gamification in Fitness, Therapy, and Rehabilitation

The World Health Organization (WHO) uses the term active gaining to define the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age. (World Health Organization, 2002) Some research shows that individual who is involved in regular basis exercise can extensively reduce the chance of heart disease or other chronic illnesses. By encouraging diabetes patients to maintain a healthy weight, the chances of developing type 2 diabetes may be forestalled. (Force, U. P. T. 1996).

One study indicates that engaging some sort of gamified solution will allow participants to endure more pain while exercise. Furthermore, gamification will distract the participants by making them actively gauge their performance, it diminishes some pain. (Brooks, A. L., & Brooks, E. P., 2013).

DISCUSSION

The obesity rate in the US, Canada is very high, and it decrease the quality of life. The main reason individuals fail to maintain successful weight loss is self-management. Based on analyzing many state-of-the-art gamification solutions, the gamified software on wearable devices, comparing the research of wearable technology in healthcare industry, and more, this paper indicates that adopting gamification, gamified elements, or gamified application in wearable devices may be very effective in promoting individuals to engage any kind of exercise and/or fitness.

LIMITATIONS

By the nature of this paper, further detailed research in conducting prototype testing was beyond the scope of this paper and was not performed.

FUTURE RESEARCH

Existing gamification researches in wearable devices are preliminary, and further research is necessary to integrate with healthcare industry. Furthermore, factors such as different activities, social network/media sharing, competitiveness, short-term vs long-term and more should be carefully counted for detailed study. There is also a trade-off of increased anxiety and disorientation which needs to be considered.

Gamification may lead to a productive movement, but it is not a perfect treatment. (Deterding, S., 2012) Even so, it is more than just a new trend of word. By conferring rewards, it engrosses participants to compete with peers and transcends the limits. (Cook, W., 2013) A study shows that generalizing users might not be good idea, because some times one size does not fit all. As an illustration, depends on the participants’ experience over gamified solution or product, it could drastically reduce the motivation over it. (Reynolds, L., Sosik, V. S., & Cosley, D., 2013) By all means, it is very important for these gamified wearable devices to work for each individual with different preferences and experience, as they become popular. (Spillers, F., & Asimakopoulos, S., 2014) Therefore a consideration over those who do not get motivated by such devices is necessary.

CONCLUSION

In a majority of cases, the focus in gamification of wearable devices has been how to attract more people to use a product. This paper utilizes gamification of wearable devices in growing healthcare industry to deal with promoting individuals to engage in exercise, fitness, and even rehabilitation.

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REFERENCES


