

Chances and Challenges of Gamification in Mobile Health Applications

Chancen und Herausforderungen der Gamifizierung von Gesundheitsapps

Bachelorarbeit

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1. Introduction

The 9th January 2007 brought a disruption for the everyday life for humanity which weighed only 135g. It was the day when Steve Jobs announced the first iPhone. True, it was not the first smartphone, but it was the first mobile device that combined mobile internet access with a completely new level of user-friendliness. Initially only 16 mobile applications (apps) were pre-installed (e.g. calculator, weather-app, Maps), but an online appstore didn't exist yet. This changed on June 10th 2008, when Apple launched the App Store with initially 500 Apps. 15 months after the launch of the App Store it was equipped with 85.000 apps with in total 2 billion downloads (Fröhlich, 2018). Nowadays, the two major stores, Apples' App Store and Googles' Play Store provide millions of apps (Statista, 2020). For many users, these apps represent entertainment possibilities for their leisure time like games, streaming platforms, dating, social networks. The spectrum ranges from apps for professionals to standard apps (weather, maps, timer). Moreover, in the last years a growing trend towards healthier lifestyles occurred. With that trend, a myriad of apps for healthier nutrition and fitness entered the app stores. There are also apps which were designed for certain illnesses to help the user in its treatment. Those apps are commonly known as *Mobile Health Apps (MH Apps)*. This field of application can be either support for chronic or acute as well as physical or mental diseases and health issues. Apps offer the opportunity to handle things smart, are portable and facilitate tracking, generating and exchanging useful data for treatment. At first sight Mental Health Apps seem useful. However, for such an app to be effective, the user must be encouraged to use the app permanently for constant treatment engagement. A potential tool to attain a sustainable engagement level is *gamification*.

Gamification represents a trend which gained more and more importance over the last decade. Points, badges, level systems are only a few examples of **game elements**. Their use can be observed in various fields and contexts. This may be in the reality, in the form of stairs in a piano design, making noises promotes the use of the stairs instead of the escalators, or in the digital world, in the leisure time or at the workplace. The intention behind the gamification of a certain context is to make usual and dull tasks more appealing. Most diabetics see in testing and recording their blood glucose level a nasty task. But how about checking the blood sugar and getting a badge for endurance) or receiving points. These points will be added to a list of other users in a leaderboard. If you would continue checking or doing 30 minutes of sport, you will get even more points and move up in the ranking. In short, you can quickly change your daily routine from a boring activity into a motivating competition. The results are fun and supports well-being.

The following elaboration will set the focus on the health domain. Many illnesses need the documentation of several data. As seen in the previous example, diabetics have to track constantly their blood glucose level and the amount of carbohydrates in their diary. Another example are people suffering from anxiety disorders who keep records of their mental mood in different situations. Gamification can promote a constant documentation which enables a more effective treatment because the doctor has a larger data base to adjust medication or give advice.

Developers of gamified MH Apps have to consider many aspects from data safety to user experience. Today there exist several criteria catalogues respectively guidelines for the development of mobile health apps and gamification. Though there is a criteria catalogue missing which advises developers how to design the combination towards a gamified mobile health app. From the users' perspective, such criteria catalogue can be used to figure out which app fits best to the own needs.

Research question: *What are the Chances and Challenges of Mobile Health Applications?*

The present bachelor thesis deals with the additional value and the undesirable side effects as well as the difficulties of the creation of a gamified MH App. Based on a self-made compiled criteria catalogue for gamified *Mobile Mental Health Apps (MMH Apps)*, two apps will be assessed for their development. This is concerned on the implementation of gamification in MMH Apps. In the course of the following eight chapters, the focus will be put on the mental health domain. The next chapter provides the theoretical bases that are important for the understanding of the topic. Chapter three is about the research design, which informs how the criteria catalogue is going to be developed. The main part, chapter four, represents the implementation of gamification while regarding two gamified mental health apps and comparing them with the developed criteria catalogue. The discussion, referring to the research results and findings of other researchers, takes place in chapter five. In chapter six practical recommendations will be presented. Chapter 7 explains the limitations of this work. Eventually, chapter 8 provides a conclusion of the essentials of this work and gives implications for further research.

2. Theoretical Bases

2.1. Mobile Applications in the Health Sector

Nowadays, the mobile healthcare apps sector is equipped with thousands of apps (Lister et al., 2014:p.2). On the one hand healthcare professionals use apps for drug reference, diseases diagnoses, medical training and education, as well as clinical communication tool in clinics and medical practices. On the other hand, many MH- Apps are designed for patients to support self-treatment by educating the users and promoting behavioural change. They are less intended to replace the traditional way of medical treatment, rather MH Apps are meant to complement it. For example, the apps enable a better documentation of medication use and its effects. Henceforth the doctor has a broader basis for further treatment advice and telemedicine, which facilitates treatment without the restrictions of time and location. Both will be more time- and cost efficient. It could be of particular importance that the patient has now better tools for self-managed treatment, which may also reduce the frequency of professional advice by doctors (Fleming et al., 2017: p.2; Mosa et al.,2011:1,13f.).

In their Bibliometric Analysis Peng et al. (2020) filtered out the trends and the general knowledge structure concerning MH Apps. The amount of published research papers increased since the new century. Especially in the last five years the amount of new published papers increased rapidly. Today, the majority of the most cited papers (3/4) concerning mobile health app research have been published after 2011. Three major research directions have occurred: The transformation of human behaviour in a healthier manner, the evaluation of the efficacy and the worth of MH apps. MH Apps are used in many areas and are supported by portable wearables. like fitness watches and other sensors measuring certain body or nutrition figures (e.g. calories consumed, heart rate, respiratory rate, physical activity, etc.). Constant tracking promotes and induces behavioural change for a more conscious and healthier lifestyle. Simultaneously the probability of diseases like obesity will be reduced. The highest usage of MH Apps are in the areas of *mental health* and chronic diseases like diabetes, hypertension, and asthma, in which the focus by the most researches have been recognized (Martínez-Pérez et al., 2013: p.13). Studies revealed that 29% of the population struggle with mental illnesses during their lifetime. 55% of those affected people do not receive the necessary support they need. By the use of MMH Apps concerned sufferers benefit from the instant treatment support, easier and cheaper access, enhanced equity of mental health resource allocation, anonymity, customization. Applications may facilitate easier and continuous self-management, so that the users deal more with their disease, gain more knowledge and understand ulterior mechanics of the disease. Further possibilities may be lower costs and a better accessibility to medical support through the different social stratum and in developing countries. For the latter geographically and institutionally provision often lacks. This is especially crucial due to the fact that 60 % of the global diseases are chronic diseases. MH Apps can enhance the patient's

strengthened by promotion of the positive test results. To achieve this, health care professionals, among others, must be more involved in the development process (Sardi et al., 2017: p.41).

6. Practical Recommendations

The conducted study in this thesis provides assistance in the implementation of gamification specifically for MMH apps. Existing guidelines from the different areas (Mental Health Apps, Gamification in MH Apps, General gamification) were collected, compared and used in a new criteria catalogue. The result can be used as a guideline for developers to support users with mental health problems. The situations and types of users have to be considered. Since many users with mental problems struggle with low self-esteem, competitive and reputation-oriented elements are more harmful than helpful. The established criteria catalogue was tested on the two MHH apps eQuoo and Happify. It was found that the catalogue is applicable for a strongly narrative approach as well as for a gamification approach that is based on mini-tasks and self-reflection. One pillar for effectiveness is the user experience. To achieve a good experience, all built-in elements must be fully thought through and available in an appropriate variety. Thus, eQuoo has integrated avatars and coin rewards but the benefit of these elements for the player is small. Happify on the other hand, operates with too many point systems, which makes it difficult to make a comprehensive statement what they are meant for and how they distinguish each other. Taking up the various topics in guidelines can lead to the support and implementation of healthier behaviour in MHH apps in the preventive area.

7. Limitation

The health area is a broad field. Due to this versatility, the integration of MH apps could only be analyzed in general terms with regard to its opportunities and challenges. The potential as an aid for the specific areas and its form as prevention, adherence, initial motivator could not be offered due to the fragmented and still low level of research in the sub-areas, as well as due to the diversity of disease patterns and their therapies.

The comparison of the two MMH apps with the specially created criteria catalog could only detect the implemented game elements and evaluate their integration. A statement about the effectiveness of the MHH apps could not be made due to the limited observation period of a few days. Furthermore it is not possible to conduct a meaningful study about effectiveness without a bigger sample and control sample. Especially Happify, which is designed for long-term engagement with restrictions for the daily use, prevented to exercise a full program, so that possible additional features could not be observed. Also, since the content is more tailored to users who actively seek help, the support measures provided could not be evaluated as well by myself. A larger selection and analysis of MMH Apps could provide information about the most common and effective types of game design elements.

8. Conclusion and Implications

In conclusion, we return to the research question posed at the beginning of this paper, where the opportunities and challenges of gamifying health apps lie. Health applications have been increasingly associated with game elements in recent years. Studies have shown that positive effects have resulted. The application is possible in the most diverse health areas. Some apps serve as support and education regarding healthier nutrition or as a motivator for more physical activity. Mental support can be provided to better perceive psychological problem patterns, to find out their reasons, and to provide solutions. This was especially illustrated in the case study. Patients with chronic diseases can be reminded of their continuous treatment by gamified tools. The entry and observation of health-relevant values (e.g. blood sugar level) is encouraged. Users receive positive reinforcement through immediate feedback and progress indicators, if they behave in the right way. Consequently, the motivation of users can be further

increased by means of rewards for better health behaviour. Gamification has the potential to support health care professionals and make treatment more enjoyable.

However, in order to be considered as an effective supplement of the general treatment, mature concepts must be available. Gamified apps require more research and must be tested more often and over a longer period for their effectiveness and side effects. If this is guaranteed, the confidence of the users in the app will increase. In addition, the integrated game elements have a more motivating effect and the success of the measures becomes apparent more quickly and has a longer lasting effect. Weak points (possibilities for cheating or unclear formulations) in the implementation of gamification can quickly reduce the willingness of the users or even cause wrong or unintentional behaviour patterns. The development of demonstrably effective MH apps requires a lot of capital. In the design process, therefore, attention should be taken to ensure that the investors involved do not manipulate the user.

Gamification can be an encouraging element in MH apps, training users to develop and maintain better health habits by satisfying their need for competence, relatedness and autonomy. Future research should focus on how users remain adherent to such habits in the long run. It must also be critically observed whether users develop a dependency on playful content under which they are only willing to behave in a healthy way. More research is needed to shed light on such risks. Criteria catalogues and general, independent certifications should also be established in order to strengthen the reputation of gamified MH apps in the population as a eligible tool to support treatment