

Mobile Application Security

Kata Rebeka Szűcs

Business Development MSc, Keleti Faculty of Business and Management, Óbuda University

Szucs.rebi@gmail.com

Regina Zsuzsánna, Reicher, Ph.D

Keleti Faculty of Business and Management, Óbuda University

reicher.regina@kgk.uni-obuda

Abstract: Nowadays it's hard to imagine life without Internet or mobile phones. Mobile technology is affecting almost every aspect of our lives, including health. This article is about today's trend, mobile health, which aims to heal and promote health through mobile devices and infocommunication technology. After describing mHealth and security from various aspects we analyze a few questions from a survey we conducted in order to know our respondents habits regarding data security and mHealth applications.

Keywords: mHealth, mobile applications

1 Introduction

In 1848, James W. Marshall was building a sawmill on the American River when he found flakes of gold in the water. Although he tried to keep this a secret, word spread, triggering the California Gold Rush of 1849. (Beilharz, 2017) Finding the valuable treasure in useless mud seems to be a challenge today, 150 years later, as well. We could call data today's gold. Information society brought huge amounts of data which can hold high values if we know how to extract them. In the era of big data, we have to consider data as a resource with high value. Today's people can barely imagine life without mobile phones and the Internet. Mobile technology has revolutionized our world, affecting almost every aspect of life. This way data can be accessed very quickly and easily anywhere.

Mobile software applications, also known as apps are one of the most important elements of this trend. Apple's famous commercial, "There's an app for that" shows that we can't find a situation or problem in our lives without an app to help or track.

In July, 2016 Android users could choose between 2.2 million apps, while Apple users could download from 2 million apps. On the third place, Windows Store held 669 thousand applications, Amazon Appstore 600 thousand and BlackBerry users could find 234 500 apps in their store. 2 years ago, in 2015, more than half of the world's population were mobile users and the average daily time spent on accessing online content from a mobile device reached over 3 hours among youths. (statista.com, 2017) In December 2016 the most popular downloaded category were games (24.8%), followed by business (9.96%), education (8.55%), lifestyle (8.44%) and later on the list, health and fitness (2.97%). (statista.com, 2017)

2 MHealth

The Mobile health sector is a new, fast growing sector connecting healthcare and information and communication technology. "It includes mobile applications designed to deliver health-related services through smart devices often processing personal information about health. mHealth applications also process a large volume of lifestyle and well-being information." (Buttarelli & EDPS, 2015, old.: 2) Mhealth can also be used to promote the healthy lifestyle and to improve user's lives.

With the spreading use of Internet, people tend to look up their symptoms, share their conditions on forums and seek their fellows' advise on how to treat or live with their problems for example on sites such as PatientsLikeMe.com. This kind of information sharing is great, not only for patients but also for researchers who get insights from the site to help their work.

In his book, *The patient will see you now*, Eric Topol cardiologist argues that there are many changes in the field of healthcare which doctors and patient should know about. Along with many others he thinks patients should have access to their medical data which they own and be part of making the decisions affecting their own lives. He also thinks which I mentioned above that we should share our anonymous medical data for the benefit of humanity. Sharing data with others also can contribute to better treatment decisions. Medical data is usually used just for once, when it's created and analyzed. We can imagine the possibilities of using this huge amount of historical data to find the best treatments for a patient. For example, IBM Watson, with artificial intelligence, uses several patient's data and their treatment documentation to suggest treatment to a new patient suffering from cancer considering their status and comparing it to historical data of similar cases. The method enables patients to have the best personalized treatment available. This can bring patient and doctor closer together and save time for both.

This trend can also give a bigger responsibility, control and awareness to patients in their own healthcare and well-being, and can strengthen the emphasis on prevention instead of treatments. It also contributes to a better allocation of the

workforce. If there are less patients and more healthy people, the quality of healthcare can improve, it can be more effective and sustainable and cost less. It can also help professionals to collect data, to monitor patients and researchers to find out more about certain diseases and find the best treatments.

We don't have to just think about treating serious diseases when we think about mHealth. We also can include apps promoting a healthy lifestyle in this group. Before we go into this topic deeper, we have to remember today's phenomenon, datafication (Cukier & Mayer-Schönberger, 2014) which is a modern trend to turn many aspects of our lives into data and later transforming it into new valuable forms. (Cukier & Mayer-Schönberger, 2014) Many people use apps which help them tracking their calorie intake, their water intake, their sleeping habits or their sport performance. We share personal data with these apps willingly hoping we can improve the quality of our lives, our performance, health and fitness, and that it can help us achieving our goals. In the era of web 2.0, also known as "social web", we can connect to the Internet with our mobile devices (smartphones, tablets, wearable devices) from any locations, (Lupton, 2017), which helps to engage in datafication habits. Twitter, Facebook, Instagram, social media in general also enable us creating huge amounts of data. People tend to share personal information on social media. In many cases studies refer to the activity of producing and consuming contents at the same time as "prosuming" (Ritzer, Dean, & Jurgenson, 2017). Lastly, in this section explaining the leading factors of mHealth we have to mention the quantified self movement which means a group of people trying to improve and know themselves better by self-tracking and analyzing. There are several experiments which record data in order to achieve behavioral change and to understand what's effecting our bodies. (For interesting experiences see <http://quantifiedself.com/>.) Many of us become members of this group without even knowing about its existence.

Opening App store or Play Store or any other application stores and searching for health and fitness apps can be overwhelming. There are thousands of apps from which we can choose, several of them are free. Well, we don't have to pay for them with money, but we are paying them in a certain way. Without users' willingness of paying for these apps there are a few new business models with advertising in focus. We provide our valuable data and in return we get free apps with questionable privacy and data handling policies. Users probably don't know what exactly is their data used for and it seems regulators are not as fast as technology improves. Modern business requires collaboration and sharing of valuable sensitive information between participants. It's becoming common sense that traditional security measures such as passwords and firewalls are not enough to protect data. This attitude leads companies to be strict with their own data protection policies, a habit we could embrace in our everyday life.

Nowadays mobiles and apps can be popular because of their on-the-go nature. Users like to get things done quickly, which means not spending much time on registration using a service, getting to know the privacy statements and their data's

way between companies and institutions. This attitude can lead to a situation where users are necessarily unaware of possible privacy breaches. (Fife & Orjuela, 2017) Therefore users' individual responsibility is a must (and also considered as default from the app developers). We can easily understand that the era of big data and the Internet of things can reduce users' control over their personal data but users are not the only participants in this chain that have to act in a responsible way. Developers have to recognize their duty, as they are creating apps which are affecting people's health and treating users' personal data, they have to be responsible. IT knowledge is not always enough to create these apps, it's always good to consult with health professionals before issuing an app in this field. Regarding personal data handling, developers and governments have to be up to date and create regulations which protect these data. Transparency about data policy and data handling would also be welcome so users know exactly (or at least can look it up easily) what is done with their data.

There are quite a few types of apps from which we can choose in health and fitness section and lifestyle section is also worthy of checking. Here are a few examples of health promoting apps:

- Food and weight: with these apps people can track their calorie intake in order to gain, maintain or lose weight.
- Training apps: these can help people track their sport activities or even give them a personal training plan.
- Drink water: users who forget to drink their daily dose of water can set reminders and get healthier.
- Sleep tracker apps: these can analyze users' sleep and might wake them at the right state of their sleep.
- Smoking cessation apps which help users to quit smoking and gives them the motivation to continue their process.
- Mood tracker apps which can track users' mood and give a good feedback.
- Women's period tracker apps.

There are also a lot of apps effecting lifestyles? such as budget tracker apps or restaurant finder apps, but we don't have to go this far, dating apps are parts of this group as well.

3 Survey analysis

To understand the analysis better, we have to mention generations. A generation is a group of people born at the same time period which means they have to reach their important points of life (e.g. finishing education, getting married or having children). (Kolnhofer-Derecskei & Reicher, 2016) Although there are many articles and studies available in the field, we won't go in details here. There are X, Y and Z generations. The X generation is born before 1982 (and after 1961) which means

they are between 35 and 56 years. They are considered skeptical, self-reliant, risk taking and they supposed to have a better balance between life and work than the younger generations. The Y generation, also called as the millennials are born between 1983 and 1997. They (including myself) are the hopeful generation who want a meaningful job and know the technology well. (Kolnhofer-Derecskei & Reicher, 2016) They can also be referred to as digital natives because they were born into the world with the Internet and digital media while using this analogy X generation is called digital immigrants. (Palfrey & Gasser, 2008) Finally, Z generation is born after 1997. The rapid improvement of technology had a huge impact on their lives. They are the real digital natives in my opinion. With this kind of available technology and this speeding world around them, generation Z has their own challenges to live a happy life.

We conducted a survey to find out mobile users' relations to apps, app security and health promoting apps. We gathered 620 surveys back and after we filtered out the unusable ones we got a total of 554. In this article we won't have time to analyze the whole survey but just 4 questions to give an idea about a topic and to show that there is room for other surveys and further improvement of consciousness regarding security.

The majority of the respondents were from generation Y: 62%, 34% was from generation Z and the rest, 4% were from generation X.

"Do you share personal data on social media?" is the first question I'm going to analyze. Here are the answers:

Generation	Often	Rarely	Never	Total
X	0,36%	2,01%	1,82%	4,20%
Y	1,46%	40,88%	20,07%	62,41%
Z	2,37%	19,16%	11,86%	33,39%
Total	4,20%	62,04%	33,76%	100,00%

Generally we can see that the majority of the respondents don't share their personal data on social media. My hypothesis was that age (generation group) does not have a significant relationship with data sharing habits. After chi-squared testing, I found this hypothesis is right, which can easily be explained but let's see the other questions before we summarize the habits of the generation groups.

The second question which we analyze is "Do you read the privacy and data protection statements of the apps you download?"

Generation	Often	Always	Rarely	Never	Total
X	0,36%	0,36%	1,82%	1,28%	3,83%
Y	6,01%	2,00%	23,68%	30,42%	62,11%
Z	4,55%	0,91%	11,66%	16,94%	34,06%
Total	10,93%	3,28%	37,16%	48,63%	100,00%

Almost half of the respondents don't read these statements and the rest of the majority rarely does it. This shows that there is room for improvement in data security consciousness in general because we download apps and we fill them with valuable data but we are barely concerned about or aware of what happens with that data. My hypothesis for this question was that age (generation) and statement reading habits have a significant relationship. After executing the chi-squared testing, I found that the hypothesis is not right, there is no significant relationship between these.

The third question was related to the second one: "Do you know what happens with the data you upload into your apps?"

Generation	Yes	No	I don't care	Total
X	0,91%	3,10%	0,00%	4,01%
Y	16,21%	40,26%	5,46%	61,93%
Z	10,93%	19,85%	3,28%	34,06%
Total	28,05%	63,21%	8,74%	100,00%

We can see that the majority of the respondents is not aware of what happens with their data after they upload it into their apps but almost third of them are. The answers to this question indicate the need to more transparent data policies of the apps. After chi-squared testing, I found out that there is no significant relationship between age and data consciousness in this sense.

The last question which we analyze is about mHealth. "Do you use health promoting apps?"

Gender	Yes	No	Total
Male	7,35%	14,15%	21,51%
Female	37,87%	40,63%	78,49%
Total	45,22%	54,78%	100,00%

Almost half of the respondents use health promoting apps which is a good justification for us to choose this topic. Our hypothesis for this question was that there is a significant relationship between gender and the usage of health promoting

apps. We found that this is correct. In our survey we see that mostly women use these kind of apps.

4 Summary

In my opinion health promotion with mHealth apps is really popular nowadays and it's starting to be a trend in Hungary as well. With the spreading of such apps which require users to share their personal information comes great responsibility. Users, providers and government have to be aware of the risks and have to handle data while respecting privacy. Consciousness and transparency are the two key words to solve this in my opinion. We have to admit that beyond the risks there are plenty of opportunities of mHealth which we have to seize to make the world a better place and people healthier.

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