MOBILE HEALTH – AN OVERVIEW | MOBIL EGÉSZSÉG – ÁTTEKINTÉS

SZŰCS Kata Rebeka[1]

Abstract

This article aims to provide an overview of the mhealth applications. They are getting more popular lately due to their potential to make professional and preventive healthcare more convenient, personalized and cost effective. This trend is supported by the growing number of users who care about health awareness as well. In the paper I describe the importance and forms of mobile health applications. I also mention the datafication trend which explains the value and potential of the data collected from these kind of apps. I also highlight the security and privacy risks and briefly explain how these kind of apps can be used in the current COVID-19 pandemic.

Keywords

mhealth, applications, security, privacy, health awareness

Absztrakt

Az alábbi cikk célja az mhealth (megészség) applikációk áttekintése. Az utóbbi időben ezek egyre népszerűbbek, mert képesek a professzionális és megelőző célú egészségügyi ellátást kényelmesebbé, személyre szabottabbá és költséghatékonyabbá tenni. Ezt a tendenciát segíti még az egyre növekvő számú egészségtudatos felhasználó is. Az összefoglalóban ismertetem a mobil egészségügyi alkalmazások fontosságát és formáit. Megemlítem az adatosítási trendet is, amely segít az ilyen alkalmazásokból gyűjtött adatok értékét és lehetőségeit is megérteni. Emellett kiemelem a biztonsági és adatvédelmi kockázatokat, és röviden kitekintek arra, hogy az ilyen típusú alkalmazások miként használhatók a jelenlegi COVID-19 járványban.

Kulcsszavak

mhealth, megészség, applikációk, biztonság, adatvédelem, egészségtudatosság

[1] szucs.rebeka@uni-obuda.hu| ORCID: 0000-0002-2965-6295| PhD student, Doctoral School on Safety and Security Sciences | doktorandusz, Biztonságtudományi Doktori Iskola

INTRODUCTION

Today, we can hardly imagine our lives without the latest technologies, the Internet and our mobile phones. The spread of mobile technology affects almost every area of our lives and also influences our behaviour and attitudes. We can hardly find a topic for which there is no mobile application yet. Nowadays, a datafication trend can be observed, during which a huge amount of data is generated from countless sources. This trend could bring about big changes in several sectors, including healthcare. There is a good opportunity for development not only because of the better usage of data, but the better use of mobile devices as well. Mobile-assisted health care is able to handle tasks related to more serious patient care, but it is also suitable for promoting health awareness, a trend that has become increasingly popular recently.

The aim of this article is to describe the importance and forms of mhealth (especially mhealth for health promotion), mapping the current situation and trends (such as the spread of mobile health and health awareness), while also covering data security and privacy issues. While there are many benefits to this tendency, there are risks involved as well. The topic is relevant because we spend more and more time with our mobile phones every day while there is an increasing emphasis on a healthy lifestyle in our lives. At the end of the paper I briefly touch the subject of COVID-19. It is a very hot topic at the moment, and although it can be considered a 'more serious' type of mhealth topic, there are many attempts to fight it with mobile technology.

PRESENT SITUATION

Nowadays, it's hard to imagine life without cell phones and the Internet. This trend is affecting not only business, but all areas of our lives. Part of the accelerated world is the need for data and services to be available anytime, anywhere. This is aided by mobile applications (apps), among others. It is difficult to find an area that does not yet have a mobile application to help. In the second quarter of 2020 users were able to choose between 2.7 million apps from Google Play and 1.82 million apps from Apple App Store. In the Windows Store a further 669 thousand, and in the Amazon Appstore 455 thousand were available. [1]

The mobile age is not only changing the lives of consumers, it is also having a major impact on the lives of service providers, companies and businesses. Because this technology is "sticky", everyone keeps their mobile with them, it is an excellent opportunity to reach our consumers, users and gain a deeper knowledge about them in an unprecedented way, to build a closer commitment. We can also easily track all their clicks within the legal framework. Examining the success metrics of apps, we can see how much data they can collect and provide about users. [2]

- Length of commitment: how much time the user spends on the application.
- Focused engagement: how much time the user spends on each screen, what grabs their attention for a longer period of time.
- User Preference: It comes from a comparison of the previous two metrics, showing where users like to spend time within an app.
- Click through rate: Shows how many users saw a link and how many clicked on it.
- Processing: examines how many people download the app and how many use it.

- Decline: how often the app is used as time goes on. This is because it is common for apps that people do not use with a certain frequency to be deleted.

The data provided by the users is really valuable, they give good tools to the service providers to influence and persuade. Of course, this is not necessarily a problem, some users don't mind seeing personalized ads, and they prefer it compared to having their Facebook timeline full of irrelevant ads, to give an example. This clearly improves reception, provides a more positive experience than a poorly targeted ad. For example, Google collects data about its users in three main categories according to its own privacy policy:

- User actions: this mostly covers data similar to the one listed above, when a user clicks on it, what it searches for, what pages you visit, what videos you watch, and also stores your IP address, location, and device information.
- User-created: emails that the user sends and receives, contact list, calendar events, images, videos, and documents that the user uploads.
- Personal information: name, date of birth, email address and password, gender, phone number, country.

According to the description, this data is stored to make life easier for users, such as helping to complete searches, offer music which better suit tastes, automatically fill out online forms, suggest better routes, and find more relevant answers to their questions. It is a useful tool, but in many places there is no open possibility to review the data we have already created. [3] In addition to officially acknowledged data collection, the company giant is often accused of collecting and then using, selling data about users, which only supports how valuable data is today.

According to Moatti, the mobile industry contributes an average of 5% to GDP in many countries. Nowadays, 90% of those who visit online services do so through an app rather than web interfaces. The cost of generating demand varies this way, as creating an app to run on all types of devices and platforms is a very costly activity, but then, once the customer has the commitment, less is spent on advertising and other more traditional marketing activities. It is important that the "mobile first" approach prevails in companies, they have a greater chance of success trying to reach their target audience with the help of mobile apps. Of course, this in itself is not enough, with the spread of health awareness described later, many other aspects must also be taken into account in order for a company to be successful. [4]

The above and the information society has created a huge amount of data that can still hide unknown values for many. Big data is a phenomenon in which new information is extracted from a large amount of data that has not been used before, and then the knowledge gained from it is incorporated into the business. It is important that the big data method is able to use not only structured but also unstructured data, so it can take into account information from the weather or social media sites, for example. The other differentiator is that while until now we could only rely on data from the past, today we can work with real-time data for even better results.

Datafication

Nowadays, a huge amount of data is generated from countless sources, datafication is a common term, which is "the representation and expression of phenomena, processes,

objects, events in the form of data". [5, p. 34] It is typical that we try to describe and follow all areas of our lives in the form of data. An outstanding group of supporters of this trend is the quantified self movement, who follow all areas of their lives with interesting experiments, trying to discover new links from a lot of self-collected data in order to get to know themselves and improve their lives. (These studies are available at quantifiedself.com.) Among other things, this group is supported by the applications described below. The advent of IoT, the Internet of Things, ie the connection of everyday devices to the World Wide Web, also adds to the resulting mass of data, and it also plays a major role in the field of health.

The processing and understanding of collected data may already exceed the limits of traditional data processing and analysis, to which problem big data may eventually be the answer. It should also be borne in mind that it is becoming increasingly difficult to filter out relevant data with real values from these data. However, thanks to more and more advanced technology, there are already better and more accurate methods for filtering, storage and analysis. As the phenomenon has started earlier, better statistical and specialized data mining methods, as well as a highly skilled workforce specializing in this, are also helping the process.

The primary source of the growing amount of data can be considered mobile devices and the applications downloaded to, but mobility, virtual life, online entertainment and cloud computing also contribute.

A data explosion can also be a problem for a company, but it also has countless opportunities to turn it to its advantage. It is well known that there are plenty of applications that collect data about us, such as the health and fitness apps that I will cover, but it is less obvious to users what happens to this data, what the purpose is with it. It may be reassuring, however, that regulations in this area are becoming increasingly stringent (e.g. GDPR).

Spreading health awareness

The development of mhealth today is aided not only by the spread of mobile applications, but also by an increasingly popular movement, for which one of the main aspects is health awareness. It is also remarkable that while health and wellness used to mean simply being healthy, today we think of a whole, holistic well-being when we hear this concept, which includes mental, physical and emotional health. In the age of social media, good sleep, training, and a beautiful appearance are luxuries that people like to show off, which they like to brag about. As Jack Ma, founder and CEO, said at the 2017 Alibaba Summit, people today want to be healthy and happy no matter where they came from. Moreover, this desire is much stronger than their object-related desires. It is characteristic of this approach that more and more users go to exercise, eat healthily, or pay attention to their sleep, for example, which is often supported by apps. [6]

The trend is also represented by a growing group of people, called the LOHAS (lifestyle of health and sustainability) consumer group, based on the segmentation model of the Natural Marketing Institute. Its members are more conscious and feel responsible for the environment and society. They usually belong to early adopters, committed to sustainability and authentic values. Instead of material goods, they focus on the soul, the importance of existence and health awareness. [7]1

It can be observed that the spread of health awareness is mainly related to one age group, the Y generation. According to a survey, 72% of millennials would spend more on experiences than material goods and it is part of their daily routine to care for their well-being. It also affects their shopping habits, such as preferring to wear sportswear for non-sports as well, or using smart devices to track their lifestyle. Sharing habits with friends is also an important part of their behaviour. [6] These changes need to be known to those who want to thrive in the market, because it has changed the way of reaching and convincing the consumer as well.

The health-conscious trend and its followers are characterized by: being proactive, preventively exercising, leading a healthy lifestyle, searching for happiness, desiring for healthy and natural, existing in groups, community, searching for belonging, searching for personalization and understanding the importance of sustainability (including their children's health). [8]. In summary, with the development of technology, the platform on which information is available, on which we live our lives has changed, and what is important to us is also changing, which are two important factors that ultimately led to the creation of mhealth.

MHEALTH

The development and spread of mobile technologies and apps, have had a major impact on healthcare, as well as countless other areas. The mobile health (mhealth) sector is a new, very fast-growing sector that connects health care and info communication technologies, including mobile applications for health-related services and prevention, which often process personal information. [9, p. 2] Mhealth may be well placed to reform current healthcare. Some of the services can be delivered to mobile devices, which increases convenience and quality, transparency, but can reduce costs. In a 2014 study by PWC, they argue that this method is unlikely to bring much innovation in healing, but rather in its means. On the other hand, by transforming large amounts of data into information and exploring connections, researchers will even be able to discover novelties. The new area can bring the greatest help in administration and overcoming distances. If patient data is stored in one place and can be accessed quickly at any time, there is no problem with substitution, making a better diagnosis, and getting to know the patient's history quickly. It can also be easier to make an appointment, write a prescription, and visit the services. In areas where medical care is more difficult due to long distances, technology can also be of great help, and distance care can also be useful. The most obvious benefit is a significant improvement in the flow of information, leading to a qualitative improvement in all areas. [10]

Switching to mobile devices more widely is likely to take time. In my opinion, with the aging of the digital native generation, it will become more and more common, as it would be difficult for a large proportion of older people who are now being cared for to switch to mobile apps, especially in less developed regions. As the newer generation ages and takes on leadership positions, it is increasingly likely that their novel views will spread to more areas of life, so mhealth can gain more ground. However, as I mentioned, we need to focus not only on caring for existing diseases, mhealth is also a good tool for health promotion and prevention.

In his book Whole, T. Coin raises an interesting idea. He argues that based on today's situation, disease care would be a more appropriate name for health care, as the goal

is not to preserve our health, but to cure our diseases. This can be interpreted as a call for change of mindset. It is known to us that, in general, the chances of survival and possibly avoidance of leading fatal diseases can be significantly improved by focusing on prevention, such as moving more, eating better, screening more often, and thus avoiding or detecting the issues in time.

Health promotion with mobile devices

Mobile healthcare has a role not only in more serious diseases that have already developed, but also in prevention. Given its popularity and availability, this article focuses on fitness and wellness-based prevention apps rather than more serious health apps. The aim of these is to help us achieve our goals in the chosen field, to stay motivated and to monitor our progress. They help us gather data from different areas of our lives, thus creating new values. With these apps, we voluntarily share our personal information in return for help and valuable information about ourselves. As I mentioned earlier, it is not a problem for digital natives in particular to share their personal information with others, including even with these apps. Many research materials refer to this phenomenon as prosuming, which consists of the words produce and consume, suggesting that users provide content and consume what others have produced at the same time. [11].

In the application stores, you can choose from numerous wellness apps that help maintain health and improve the quality of life. Since there is an extremely wide variety of such apps, without claiming completeness, let us look at a few areas:

- Food and weight: With these apps, users can track the amount of calories and nutrients in the food they eat and how their body weight is changing. The main purpose of these can be to reduce, maintain or increase body weight. There are also apps that come with recipes to help to follow a diet better.
- Workout tracking apps: Workout apps include applications that create a workout plan, teach exercises, or motivate users to exercise, for example, 7 minutes a day. The other large group is the group of post-workout apps that help measure activity. Challenges can be created in them, which the user can share with friends, which is an effective motivation.
- Diabetes apps: Users can add their measured blood sugar data, meals, quality and quantity of carbohydrates consumed, and activity to the app to see how their data is evolving. Medication reminders can also be set and the app can be connected to an insulin pump. From the data collected, the patient also receives statistics and summaries, and can join existing diabetes communities, which can help with motivation, development, and acceptance.
- Drinking apps: Many users have a problem consuming the recommended daily amount of water, these apps help with this. After calculating, adjusting the user's water demand, the water (or other liquid) intake can be logged. If the user needs it, they can also set reminders and keep track of their daily status.
- Sleep Assisting, Tracking Apps: These apps can help users fall asleep, follow sleep cycles, and wake up in a better, proper sleep cycle. Some apps are even capable of allowing users to log their dreams. Apps with help with relaxation sounds are also available.

- Smoking cessation applications: these are intended to help users quitting smoking. A user enters the habits they want to give up and then see, for example, how much they save by not smoking, how their health risks are reduced, how their life expectancy increases. When done well, users will occasionally receive badges that they can share with their friends. The app also has a quick help menu, the essence of which is that when the user quits or smokes, he can get motivation from good or warning cases shared by others.
- Mood tracking apps: these allow users to track their own mood. They can also write a comment for some mood types, so the data can show, for example, what makes a user sad or happy. The purpose of these is to improve the quality of life and avoid mood swings or make the user happier, for example. The data collected can be shared with others, including a therapist, who can extract even more information from the data.
- Women's health applications: such as female menstrual cycle tracking or fertility apps, which are also suitable for tracking sex life. Many apps have informational materials, built-in alerts, and mood trackers that are known to be affected by the cycle. This kind of app can also be useful for those who want to start a family, it helps to determine which days is the user most likely to get pregnant.

It can be observed that most of these applications are available in English, although we can find more and more solutions in Hungarian. It is characteristic of these apps that they work with easily readable, clear, well-visualized data, graphs, charts. This is also the result of an accelerated world, users (especially the younger generations) like to be able to identify the essential points on a screen right away, conveniently find the information that is important to them. The other main influencing factor for apps, of course, in addition to their features that are most important, is the sophisticated design which engages users even more.

Data protection, privacy

The spread of the internet and the development of technology have innumerable benefits, but it also has less positive sides. As we've seen before, there are a myriad of apps to choose from in each provider's stores, many of which are even free. At least we do not have to pay for it with money. With the low level of willingness to pay to download mobile apps, manufacturers need new business models that focus on well-targeted marketing on the one hand, and collecting and selling data from users on the other. Most of the time, users pay with their data and valuable information about themselves in the case of free apps. This allows for more targeted advertising, referrals, customer influencing, and research links between topics with more data.

In many countries, providers may legally sell users' data under certain conditions without their direct consent. Free service providers also need to find ways to make money from their activities. Interestingly, not only is the information we already share about us already available, but much more, because our actions (such as which writer we like on Facebook) allow marketers to deduce a lot (such as personality, political affiliation, etc.). The collaboration of psychologists and data scientists has also helped to observe patterns of behaviour, thus even discovering things about users that they do not know about themselves. Users only have limited amount of information about what the companies that collect their

data know about them, and they cannot really control how this data is handled. As Amanda Hess, a New York Times reporter, puts it, privacy has become a privilege for the rich and strong today. [12] However, the situation and transparency have been greatly improved by the GDPR regulation introduced in recent years, which clarifies, among other things, the legal framework for data collection and storage.

It is part of today's lifestyle that users also want to use their newly downloaded apps right away, with little time and attention to their privacy and security statements, even though this behaviour also carries risks. Therefore users' individual responsibility is also a must in this topic.

As Shoshana Zuboff, among many others, said in her book, The Age of Surveillance capitalism, numerous companies today thrive by observing users, gaining their data, then using and selling it. [13] Greenwald likens the Internet directly to Orwell's Big Brother, which, by observing us, can even be a tool of repression. [14] In my opinion, data sharing can be seen as a trade-off, we are forced to give up control of our data to some extent in order to enjoy the provided benefits.

Privacy means the right of the owner of the data (i.e. who it is about) to decide who and how can use or can pass on that data that is identifiable about them. This expectation seems particularly legitimate for health data, which should enjoy a higher level of security. Confidentiality is the expectation that those who access this data and information will treat it in accordance with the data protection requirements. The issue of security, on the other hand, is more about how, by what means (with technology, administration or from human side) we protect this information from unauthorized use or possible disclosure. [15] Based on these, the risks can fall into one of the following three categories in the following section:

- Privacy and confidentiality,
- Security,
- Other- that does not fall into any of the above categories.

We can already see that we are pretty powerless in the first category, we have to give our data to service providers in many cases if we want to take advantage of the opportunities they offer. However we can always make sure that the receiving party is trustworthy and we can read the terms and conditions of usage as well, so being conscious of the above can improve the chances of better privacy.

We also have a responsibility for security, and we can typically do more than in the previous category.

- Avoiding physical threats: physical risks include, for example, the security of mobile phones and servers, where the data itself is stored, it is important that they cannot be stolen, accessed by those who are not authorized to do so.
- Avoiding Technological Threats: These are technologies within the software that allow data to be inaccessible. This category includes, for example, widely used password usage, but also encryption or the usage of firewalls.
- Administrative side: it is about who has access to the available data, which should be carefully selected and given only to those who really need it.
- Human factor: the weakest link in security is usually people, machines make fewer mistakes in this area. There are countless tricks on how to extract valuable information from people, for example through social engineering. A good example is the

list of passwords written on a piece of paper, which turns technological protection into a technique that requires simple physical protection, since then the sheet must be protected from unauthorized persons.

In my opinion, data related to health promotion, which is also collected by the above apps (weight, height, activity…), is not considered by users as sensitive as their health data, so they can more easily build trust in apps. Obviously, as this information becomes more "serious," the user becomes more distrustful. It is important (and, of course, there are regulations for this) to keep the above-mentioned risks to a minimum in the case of sensitive health data.

One study found that data stored on cell phones is thought by Americans to be at least as much, but more personal than data stored on their computers. This is interesting because data is often collected unnoticed on mobile devices, to which users might not contribute to when asked on their own computers, for example. [16] It is well known that companies can monitor users' internet activity using cookies, which eliminates the need for individual websites alone to remember each click. Cookies give users a unique identifier that can then be recognised by websites, so we may see the same ads on every page. Not only cookies, apps used on mobile devices also constantly log user data such as location, calendar, or search history. Some apps, such as Angry Birds, logged users' phone's status even when they are not playing. In the words of Bruce Schneier, it is no longer the "big brother" who watches and sees everything, but "many gossiping little brothers". [17] Anyone can create an app with programming knowledge. This can easily spread innocently maliciously crafted apps with lower level of security, but can also be created with malicious intent on purpose, such as data theft. With this in mind, it is recommended to only download apps that come from a verified source. It's worth reading the opinions of other downloaders as well, although staying on the example of data theft, victims probably cannot even be aware of what is going on. Following the thought of Dr. András Keszthelyi, if our car is stolen, we can clearly know it, as it is no longer where we left it. In the case of data theft, however, the data is also retained on our own devices, so at first glance we cannot see if someone has made an unauthorized copy of it. [18] Lastly, if users have already downloaded an app, it is a good idea to monitor and install updates, as they are usually used to fix some previous bug. A good defence can be to carefully read the privacy statement when downloading the app, as well as critically evaluate app access requests. Be suspicious if, for example, an app wants to access your phone's camera, photos, for example, to listen to music. It is important that the basic settings of mobile devices also protect the user, so for example, trackers should be disabled and data collection should be explicitly consented to.

These factors lead to the already mentioned cessation of users' secrets and privacy. If the data is used for good purposes (cumulated, depersonalized) it offers countless possibilities, but they can be abused as well.

In some cases, we use multiple services from the same provider, such as using Google Android phones, emailing with Gmail, keeping our files on Google drive, and using Google to search the web with their own browser. The danger of this is that a service provider knows a lot about us. The more information we hold with a service provider, the more we are exposed to it. Greater data security and data protection can also be achieved by sharing our data between multiple service providers, so there is less chance of them being able to put the whole picture together. Naturally, as I mentioned the trade-off of using the

same provider is the convenience and better guesses from them to help our requests and needs.

Risks and opportunities of the mhealth trend

In addition to the above, there are a numerous of other threats to apps, and the mhealth trend itself. By allowing patients to look up their symptoms with the help of Google, for example, companies and products that offer fake, unusable treatments may gain ground. However, incorrect, bad information alone is a big enough risk. It is important that patients should accept advice from experts, not "hobby doctors". It can also be dangerous because it delays the time to see a doctor. There are a lot of diseases, such as cancer, that are more likely to be cured if discovered in time. If, on the other hand, the patient does not recognize his symptoms and sees a doctor late, his chances of recovery and survival can be significantly worsened. Therefore, it is important to use professional mhealth apps in healthcare that are reliable and allow for medical intervention. This aspect does not play a major role in health promotion applications.

It can also be a danger or inconvenience that data can no longer be deleted from the World Wide Web once it has been uploaded. It would be beneficial to be able to do this, at least in relation to health, personal leaked data, because this fact greatly increases mistrust and can therefore delay development. However, we do not need a leakage to get a huge amount of personal information about someone. Using big data methods today, for example, algorithms can be used to filter out social media activity from who is expecting or will be expecting a child or who is most likely to be depressed, who has a political or sexual orientation. These encrypted algorithms are sometimes used even in workforce selection, but this should be handled with great care in order to avoid morally incorrect decisions and negative discrimination.

In addition to the many risks and dangers, mhealth also has numerous benefits. As mentioned earlier, if we examine the huge amount of data cumulatively, not per person, it can greatly help to advance research and discover new knowledge and links. By combining wearable and fixed position sensors, it is possible to continuously monitor the subjects and collect data, and from this, for example, the factors leading to diseases can be filtered out. It is also possible to influence behaviour in real time, reducing risk. [15] This dynamic, real-time, yet machine-assisted method offers plenty of new solutions for healthcare. Mhealth and big data methods can help personalize treatments to an even greater extent, which is expected to increase efficiency. Healthier people mean more resources to the state for other areas, or just for improving existing health care. It also seems clear that mobile devices can reduce healthcare costs. In addition, it can increase the quality of care and bring more convenient care to patients and doctors. With the help of mobile devices, health services will become more accessible to a wider crowd, as there are few people today who do not yet use mobile phones and this statement will become more and more true as generations age. It also seems possible that, in combination with other technologies, it will be possible to reach healthcare in sparsely populated, remote areas where there has been no such coverage so far.

Fighting COVID-19 with apps

Mobile devices and smartphones have become an integral part of modern life, so it is obvious that they also have a big role in improving, solving and surviving crisis situations,

such as the current, COVID-19 pandemic. The main areas where solutions of the mobile and digital age can help are: slowing, controlling, curbing mass diseases, monitoring people in quarantine, informing the population, helping to work from home, studying and spending time at home compared to previous epidemics. As the topic of this paper is mhealth, I will concentrate on the solutions related to healthcare, but because the limitations of this paper, I will only mention the main topics.

Contact tracing is one of the hottest topics at the moment which could be improved with technology. This means that the infected patient is asked with whom they have spent longer time of late, with whom they have had close contact, as these people are more likely to have caught the virus. Once these exposed contacts have been identified, they should also be carefully observed and possibly quarantined. [19] This is originally a manual process which makes it more resource and time consuming and also error prone. Technology would make it easier by applications using Bluetooth to track lengthier nearby contacts between users, notifying them anonymously if they have positive contacts and if they should be quarantined. These kind of apps could also contain information and could also help doctors monitoring patients that fight the virus at home. There are now several applications which are capable of contact tracing (such as the Hungarian VírusRadar), but it is hard to enjoy their benefits to the fullest, because of low penetration. A study by Oxford University, for example, found that 60-75% of the whole population has to use these kind of apps for acceptable level of efficiency. [20] Giving up privacy and trusting that the data is well protected can be unattractive for users. The main question for these apps is to decide if the data is stored and processed in a centralized or decentralized way. In the decentralized solution, user's data can remain on the mobile device and it is only shared with authorities if it is needed. The other solution is to have data at one place for every user. The EU recommendation is a combined solution where data sharing is voluntary and data is collected anonymously for statistics and predictions but users still have control over theirs for the above mentioned reasons. [21]

Another area where apps could help is monitoring people in quarantine (for example the Hungarian Házi Karantén Rendszer, aka HKR app). Using location data could show that people are staying at home and not spreading the virus further, which can reduce the amount of workforce dedicated to monitoring this and it is more convenient for the users as well. These apps can also alert authorities when the user leaves their location. This type of app can also be used for giving or collecting information. Technology giants like Google, Apple, Facebook or Amazon are also trying to help with their collected data and services. For example Google and Apple are working together to create a common contact tracking solution operating with Bluetooth that would inform users when they encounter the virus and are planning to make it available to their users by mid-May. [22] There are also voluntary surveys, information sheets, etc. which are created to protect users and generate valuable statistics by these companies. I believe that cooperation and technology can help us in the current situation.

SUMMARY

The aim of the paper was to describe how mobile technology and the datafication trend has changed our lives, possibly healthcare and health awareness as well. There are countless available apps to choose from nowadays, several of which can help to make users healthier and happier. Mhealth applications can help in more serious health related topics as well as health promotion. Engaging, connecting and motivating users is easier in applications than ever before, but privacy and security must always be kept in mind from both provider and user point of view. Users have to be aware of the risks and trade-offs of these services. After explaining data explosion, I outline the spreading health awareness trend, which factors help the emerging mhealth sector. Then I present the security and privacy aspects of the topic and the risks and opportunities of the mhealth trend. At the end of the paper I also briefly mention the app usage to fight COVID-19, as it is a hot topic and there are several attempts to it.

REFERENCES

[1] Statista.com, „Number of apps available in leading app stores 2020," 01 11 2020. [Online]. Available: https://www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/.
[2] R. J. Sobhany, Mobilize, New York: Vanguard Press, 2011.
[3] Google.com, „Google.com," 04 11 2017. [Online]. Available: https://privacy.google.com/your-data.html.
[4] S. Moatti, Mobilized, An Insider's Guide to the Business and Future of Connected Technology, Oakland: Berrett-Koehler, 2016.
[5] G. Bőgel, A Big Data ökoszisztémája, 2nd szerk., Budapest: Typotex, 2015.
[6] D. Weinswig, „Forbes.com," 30 06 2017. [Online]. Available: https://www.forbes.com/sites/deborahweinswig/2017/06/30/wellness-is-the-new-luxury-is-healthy-and-happy-the-future-of-retail/#4d20b2d18323.
[7] R. Z. Reicher és G. Rácz, „LOHAS témák megjelenése az offline és online," in Gazdaság & Társadalom , Budapest, 2012.
[8] Consumer Lifestyle Trends, „Consumer Lifestyle Trends," 07 11 2017. [Online]. Available: http://www.bordbiaconsumerlifestyletrends.ie/health-and-wellbeing/.
[9] G. Buttarelli és EDPS, „Opinion 1/2015 Mobile Health, Reconciling technological innovation with data protection," European Data Protection Supervisor, EDPS, Brussels, 2015.
[10] PWC, „PWC," 20 03 2014. [Online]. Available: https://www.pwc.com/gx/en/healthcare/mhealth/assets/pwc-emerging-mhealth-full.pdf.
[11] G. Ritzer, P. Dean és N. Jurgenson, „American Behavioral Scientist," 07 03 2017. [Online]. Available: http://journals.sagepub.com/doi/abs/10.1177/0002764211429368.
[12] A. Hess, „NYTimes.com," 09 05 2017. [Online]. Available: https://www.nytimes.com/2017/05/09/magazine/how-privacy-became-a-commodity-for-the-rich-and-powerful.html.
[13] S. Zuboff, The Age of Surveillance Capitalism- The Fight for the Future at the New Frontier of Power, London: Profile Books, 2019.

[14] G. Greenwald, „Ted.com," 09 2014. [Online]. Available: https://www.ted.com/talks/glenn_greenwald_why_privacy_matters/up-next.
[15] S. Arora, J. Yttri és W. Nielsen, „PubMed," 01 04 2017. [Online]. Available: http://pubmedcentralcanada.ca/pmcc/articles/PMC4432854/.
[16] J. M. Urban, J. C. Hoofnagle és S. Li, „BCLT Research Paper Series," 02 04 2017. [Online]. Available: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2103405.
[17] B. Schneier, Data and Goliath, New York: W. W. Norton & Company, 2015.
[18] A. Keszthelyi, Szerző, Vállalkozás és Globalizáció, Vállalkozásfejleszés MSc, ÓE. [Performance]. 2017.
[19] WHO, „Contact tracing," who.int, 09 05 2017. [Online]. Available: https://www.who.int/news-room/q-a-detail/contact-tracing. [Accessed: 28 03 2020].
[20] L. Ferretti, C. Wymant, M. Kendall, L. Zhao, A. Nurtay, L. Abeler-Dörner, M. l Parker, D. Bonsall és C. Fraser, „Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing," Science- science.sciencemag.org, 31 03 2020. [Online]. Available: https://science.sciencemag.org/content/early/2020/04/09/science.abb6936.full. [Accessed: 10 04 2020].
[21] eHealth Network, „Mobile applications to support contact tracing in the EU's fight against COVID-19," 15 04 2020. [Online]. Available: https://ec.europa.eu/health/sites/health/files/ehealth/docs/covid-19_apps_en.pdf. [Accessed: 20 04 2020].
[22] P. Howell O'Neill, „How Apple and Google are tackling their covid privacy problem," MIT Technology Review, 14 04 2020. [Online]. Available: https://www.technologyreview.com/2020/04/14/999472/how-apple-and-google-are-tackling-their-covid-privacy-problem/. [Accessed: 16 04 2020].