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COVID-19 Mobile Applications: A Review

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A B S T R A C T

Health Apps Facilitate Rapid and Timely Response to COVID-19 Outbreak. There is, however, no site that gives a comprehensive overview of the various applications created to battle the epidemic. This paper aims to look at the features and usefulness of free mobile health applications accessible in the Google Play and App stores that were used during the COVID-19 epidemic. The article found 11 mobile applications which are Mawid, Tabaud, Tawakkalna, Sehha, Aarogua Setu, Immuni, COVID-19 Symptom, NHS COVID-19, COVID watch, and finally PathCheck. Different features are investigated such as contact tracing, personalized notes, educational resources, network tools (GPS and Bluetooth), security and safety. Various applications have been built for various activities such as contact tracking, appointment booking, and online consultation. Only a few applications, however, have integrated functions and features including self-assessment, consultation, assistance, and information access. The majority of the applications are supported with GPS and Bluetooth technology for monitoring and tracing people. There were no applications found with built-in social media functionalities. It is advised that most of the characteristics and functions examined in this study have been used to build and construct an integrated mobile health application.

1. Introduction

COVID-19 is a new strain that has never been seen in humans before. Hundreds of millions of people have been separated to prevent spread of this virus. The virus caused a serious respiratory disease that quickly spread over the world affecting more than 210 countries and territories. In comparison to past respiratory syndromes such as SARS-coV in 2002 and 2003, and Middle East respiratory syndrome (MERS) in 2012-2013, this new unexplained COVID-19 sickness is spreading at an alarming rate. MERS infected 1000 people in about two and a half years, whereas SARS took about four months [1]. COVID-19 is spreading quickly, it was officially declared a pandemic by the World Health Organization (WHO) on January 30 2020. Coronavirus has had a significant and negative impact on the global economy. The COVID-19 virus has shook the entire planet, and the infection is more serious than the Great Financial Crisis of 2007-2008. It impacted businesses, financial institutions, international and domestic trade, and global markets [2]. Therefore, it was essential to make applications for mobile phones to track and monitor people that are suitable for both operating system (i.e., IOS and android) to minimize spread of the corona virus [3]. Most the governments in the whole word have developed many applications to detect the regions that the virus hits people and take the right action for treatment and isolation [4]. Today, all smartphones are equipped with different types of sensors and features such as Bluetooth, GPS, Wi-Fi, microphone, and camera [5]. These technologies is vital in tracking and contacting people who are infected in COVID-19.

There is a need for many studies to determine how to increase the efficiency and using the technology to track people and secure their data and privacy. Based on that, the governments in different countries started to give these applications high attention that helps in doing the routine work and solve the complex problems.

2. Literature review

More than 45% percent of the world's population now owns a smartphone. Smartphones and Internet penetration help in the developed countries. At the same time, recent researches reveal that smartphones and Internet usage have increased significantly in many developing countries [6]. For example, Islamet at. el. [7] discovered that roughly 234 mobile health (mHealth) applications were created specifically for Bangladesh. Generally, healthcare facilities in developing nations are inadequate. As a result, COVID-19 might have a significant impact on these countries. Interactivity, visual and audio content, real-time data collecting, and social functionality may all be supported by mobile applications [8]. Given the increasing usage of cellphones in both developing and industrialized nations, there is a rising possibility for mobile apps to be utilized effectively in preventing, caring for, and managing the COVID-19 pandemic. In other hand, the authors in their review investigation [9] looked at the most important aspects or concerns that influence the end-user experience. They concluded that users choose apps with better dependability, performance, ease-of-use, supportiveness, usefulness, security, privacy, and flexibility. Nowadays, COVID-19 has minimized globally, research should look at what apps have been built and provide a synthesis to help guide future service development in case of returning the pandemic or appearing a new one in future. Therefore, this study carries out a review of the available smartphone applications that have been invented during the pandemic COVID-19 and gives recommendations for future aspects.

This study presented a detailed analysis of the existing mobile applications which were dedicated to COVID-19 in order to solve the aforementioned research gap. Therefore, this study aims to

i. Presenting the existing COVID-19-related apps in popular app stores.
ii. Determining the apps according to their associated features.
iii. Investigating the apps' platform (operating system), country-context for which the app was developed, and language.

There are various applications that are applied in the period of the pandemic, the next paragraph shows some of most popular applications.

- **Mawid appliucation**

Mawid is a mobile application provided by a ministry of Health in Saudi Arabia that allows patients to make, cancel, and reschedule appointments at healthcare centers [10]. It aids users in determining the danger of COVID-19 through entering users their symptoms, travel information into the risk assessment application test. It also assists users in raising awareness about COVID19 and the preventative actions that should be taken, in addition to providing information about the virus. The software allows users to arrange appointments for free at 2400 healthcare centers. In addition, the app has delivered over 500 000 consultations on various topics. Over 250 000 self-assessment tests have been completed using this application. As a result, the program can be a useful tool for not just for delivering healthcare services, but also for tracking and mentoring the app's usability. Figure 1 presents the assessment process by utilizing this application [11].

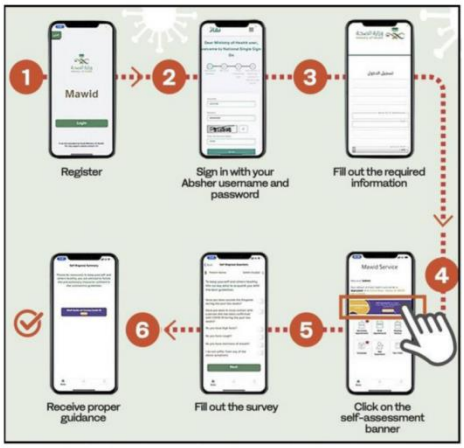

Figure 1. Self-assessment test for COVID-19 using Mawid application [11].

Figure 2. User's status of Tawakkalna application [15].

- **Tabaud application**

The application was developed by the ministry of health in Saudi Arabia as well to achieve the goals of health and safety and to prevent spread of COVID-19 [12]. One of the technical methods developed to track Coronavirus propagation is the Tabaud App. The app informs users if they have come into touch with people who have been proven to be infected with Coronavirus. It also provides proactive notifications to users if any verified cases are found using the App in the last fourteen days with keeping data privacy. The app follows the international Google and Apple guidelines on data privacy [13].

- **Tawakkalna application**

Tawakkalna is the subject of the official smartphone application approved by Saudi Arabia's Ministry of Health. The goal of this app is to give people such instructions to move out or stay at their home in case of emergency amid lockouts and curfews [14]. In addition, the application includes COVID-19 statistics, such as the number of infections in different areas in Saudi Arabia. The resident must use this app for travel permits in the event of a curfew emergency. Users are also alerted when they are near infected or polluted places by the application. It's a virtual version of a Chinese program developed by the Saudi National Information Center, which employs a color-coded QR to describe the user's status. The color green indicates that the person is safe and has the ability to fly. The color yellow indicates that the individual suspected of having COVID-19 is unable to travel. The color red indicates that the person is sick, unable to drive, and must be quarantined [15]. These status are showed in figure 2.

- **Sehha application**

This application represents one of the most application innovated in the kingdom of Saudi Arabia. This application was developed in 2020 to introduce electronic consultants through voice and video to people in their homes [16]. The application uses the artificial intelligence (AI) and the users can receives the medical information in a secure manner. In addition, this application uses in assessment process via asking users specific questions and based on their responses, the application is developed. This application is similar to Mawid application regarding booking appointments in the heath care centers, but it differ that it introduces a medical consultants in an easy way for the users [17].

- **Aarogya Setu**

This application is one of formal applications for mobile phones and created by the Indian government in 2020 and developed under supervision of ministry of health. The application is used to track and raise awareness in COVID-19 disease for Indian citizens. This application utilizes Bluetooth and GPS technologies to connect with near devices and for tracking people respectively [18]. In addition, the application is able to analysis the registered people within area between 500m and 10 km. this application also offers many services such as assessment tests, report tests, electronic authorized for travel, information about COVID-19, and medical consonants over the Internet [19]. This application helped in alarming more than 1.4 million people and created about 697 hot spots for COVID-19 around the country. However, there is some concerns about data privacy and people need a legislation to protect their data from breach [20].

- **COVID safe application**

COVID safe application is designed for smartphones and launched by ministry of health in

Australia in 2020, it represents the only application that certified from the government. The purpose of this application is to track people and determine whether they contact with others who infected in the virus and provide them with support and information. The application utilizes Bluetooth technology to connect with other devices, encrypts all the information and stores them in the mobile for 21 days. After this period, the user can delete these information, in addition the government destroys all the data in their servers [21].

- **Immuni application**

It is a tracker application that launched by the Italian government in 2020, this application is similar to other tracker applications that alarm a user if he/her is with contact with others who are infected with COVID-19. Also, this application uses Bluetooth technology which is low energy which keep the smartphones to work longer. This application overcomes the limitations that were mentioned in the previous studies regarding maintain a sensitive data such as names, birthdays, addresses and mobile numbers. The application also alarms users if they are near by the infected persons by using symbols not names. In addition, this application supports different languages which enables different nationalities to use this application in Italy [22].

- **COVID Symptom Study application**

This application is launched in 2020 in the United Kingdom by researchers from King's College London and with corporation with ST Thomas hospital and Zoe Global Limited Company for medical technology. The purpose of this application is to analysis the spread of COVID-19 virus, determines the regions with high danger, assesses the weaker people in the society and understands the symptoms of the virus. This application does not gives any information or recommendation about the virus, but it only collects data regarding the pandemic in the country. It collects two types of information from the volunteer people. The first type contains general information about the name, age, and medical heath status, while the second type includes data about the symptoms that appear on people. More than 4 million users contribute in this application from all the United Kingdom and helps in establishing active database that is used in analysis and study [23][24].

- **NHS COVID-19 application**

This application was launched in 2020 by the health office in the United Kingdom which uses Bluetooth and GPS technologies. This application has different services such as alarming people whether they are in contact with infected people or not, noticing the medical offices about their symptoms, and booking an appointment for the test. In addition, it permits users to track the remaining period of their quarantine and how to reach the information that they are need. The application has a merit that does not require any personal information such as name and birthday, instead, it collects data regarding the location and mail code for tracking and monitoring [25].

- **COVID Watch application**

This application was developed in 2020 by University of Arizona and supported by the medical administration in the Arizona government in the American United States. Similarly, the purpose of this application is to alarm users when they attach with other people who registered positive. This application utilizes Bluetooth technology and does not use the GPS. In addition, it does not collect any personal information; therefore it cannot determine the identity of the users and track them. Moreover, this application represents the first application that was launched and it is open source [26].

- **PathCheck application**

PathCheck application was launched in Feb 2020 in American United States to track registered people. This application was developed by the two companies MIT & Triple Blind that corporate to form not profit organization called PathCheck foundation. The purpose of this application is to merge people and medical administrations to prevent propagation of the COVID-19 via sharing the information. This application enables users to store their locations and their symptoms in the smartphones. Also, it enables users to choose the appropriate section to share their information and receive the right services [27] .

3. Conclusion

The article compiles a list of currently available apps in order to improve awareness of existing mobile apps, their features, and design characteristics regarding the COVID-19. The findings aid in taking the required steps to build new apps or update the current ones in order to get the most advantages from them during the pandemic. The apps must be easy to use, helpful, and respect the privacy. The apps should also be reliable and perform well in terms of the needed functions. This will also guarantee that the applications are relevant and supportive of the user's needs. Because security and privacy are crucial for many users at this sensitive period, they must be addressed properly. It is necessary to guarantee that –the design and development are responsive and versatile. The program should be simple to use so that it can be used by a variety of people.

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