

# Survey on Mobile Applications Related to Pharmaceutical Industry and Healthcare

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**Abstract**—After 70 years of freedom, people have been entirely plugged in to world of Internet and wide varieties of facilities provided by it, the most essential one that shows list of available medical care amenities offered on stream .Mobile phones have progressed to a rapid entrance into many parts of the earth, due to drastic penetration rate rising in mobile applications over past few decades. The Pharmaceutical industry is a global sector that affects manufacturing and supply chain process which has grown immensely over the last few decades. For pharmacy technicians, mHealth managing framework display a favorable time to ameliorate the health of patients by securing a way to achieve a more essential part of their medical care team. While there has been an increased focus on the use of apps in medicative care, retail pharmacies are now awaiting for new ways to use technology developments to address the changes in care delivery in the community setting. Druggists are finding that many apps can be practiced as professional tools for themselves and as aids they can recommend to their patients. On the basis of rise in the health care applications and increase in their availability, 500 million patients may access such apps in the upcoming years.

**Keywords**—Mobile Application, Pharmacy, Medical Prescriptions, Smart Watches, Healthcare, Drug Requisition, Pharmacy Stock and Inventory Management

## I. INTRODUCTION

The mobile Health field i.e. mHealth has evolved as a sub-section of the medical care practices supported by electronic processing and communication also known as eHealth [4]. Due to its high-speed developing market section, has enabled users to easily access the required mHealth apps and other medical services. This global market is reckoned to reach \$23 billion by 2018. The growth of mobile phone technologies allows an opportunity for several mobile health monitoring projects enabling the patients requirements to be collected and exchanged. The working of these applications usually involves collecting data from patients, researchers and other health care service providers. With larger access to mobile phones across the country, including rural regions, the decrease in information and transaction costs for delivering healthcare has improved. Several oppositions are been faced by medical care in order to provide efficient method for the benefit of the patients to select correct health care services The use of mobile applications and Smartphone technology has emerged as a way for specialty pharmacy and medical information, along with tools for improving compliance and overall health. In the yesteryear, the healthcare and life science industries were focusing more on manufacturing, customized medical equipment and devices for hospitals and doctors. . However, nowadays they have switched over to custom-made mobile apps that are increasingly smarter, rich in functionality and easy to use.

The objective of these solutions is to cut the health care costs and to provide better experiences to patients.

## II. RELATED WORK

From the year 2015, about 500 million smart phone users across the globe have been using online medical applications for ordering medicines and make appointments. Around 85% of healthcare professionals use mobile phones and 50% of applications are based on clinical care. Nearly 10,000 applications are available under the medical section of app store and 3,000 on goggle play store [6]. This survey paper gives an overview of some of the android based mobile applications, web platforms and wearable devices deployed for the pharma industry.

### A. Integrated IoT Medical Platform for Remote Healthcare and Assisted Living

The aging population is growing at an unprecedented rate across the world, to provide a persistent healthcare and remote health monitoring that ensures active and independent lifestyle for such aging citizens without the aid of personal assistants. The Internet of Things (IoT) is an enabling technology that has gained significant attention in our era due to its numerous capabilities and application domains. The concept of Internet of Medical Things (IoMT) emerged as an enabling technology to provide an advanced remote healthcare and telehealth through integrating IoT-enabled devices with medical equipment. The IoMT paradigm guarantees:

- 1) Accurate remote real-time health monitoring with reduced errors.
- 2) Reduced medical management costs.
- 3) Enriched patient experience and satisfaction.
- 4) Time-efficiency through the elimination of pains taking wait and redundant doctor visits especially in rural areas.
- 5) Better disease prediction, prevention and management.
- 6) Improved treatments outcomes via enhanced drug management.

In order to accomplish the above mentioned needs, cloud-based IoMT platform that promotes ambient assisted-living (AAL), alleviates the need for unnecessary doctor visits and cuts down on hospital stays and re-admissions whenever possible [6].

The proposed system monitors the patient's physical vital conditions such as the body temperature, and heartbeat as well as some environmental attributes such as the room temperature, the light condition, and the location of the patient with the ability to infer if he/she has fallen.

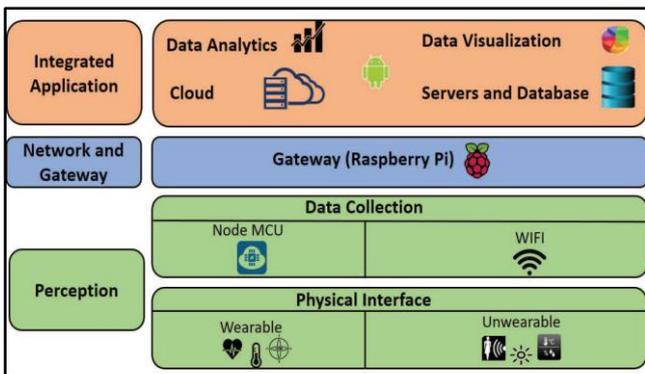


Fig. 1: Proposed cloud-based IoMT architecture

The proposed platform follows a layered architecture that is composed of three layers as shown in fig 1:

- 1) The perception layer which contains the sensors that collect all the medical information of the patient and his/her surrounding environment.
- 2) The network and gateway layer which transfers the data from the perception layer to the IoT network infrastructure.
- 3) The integrated application layer in which the data is stored.

Thus, different processing, cloud computing and analytics can take place on this stored data. With dedicated software and algorithms, this raw data is transformed into useful information for both the caregiver and the patient.

### B. The Use of Smart Watches to Monitor Heart Rates in Elderly People

In the United States (US), by 2030, it is projected that more than 8 million people will be diagnosed with heart failure (HF). Heart failure is a prominent disease in elderly people which requires continuous monitoring as a solution, smart watches can be used to monitor heart rate. These devices can also allow families, relatives, friends and health-care providers to visualize the heart rate data via a smart phone application or online website. Many smart watches are currently available in the market. On investigating the features of these smart watches in terms of monitoring of heart rate it was found that most of them use applications and websites to visualize the heart rate data of the elderly person being monitored, and no specifications can be taken if an abnormal heart rate occurs [5].

The complementary approach used two smart watches (Apple Watch and Fitbit) to conduct the study.

Two concerns were considered important in choosing the smart watches: the presence of heartbeat sensors and compatibility with other devices. Internet is the basis for use of this device. A Bluetooth network is used to connect the smart watch with the mobile application installed on a smart phone or computer.

- 1) Mobile App: The mobile app is an application built by the smart watch provider to offer various services.
- 2) Online Portal: The online portal is a website that allows users to visualize all activities and data whenever needed.

The data can be uploaded to the online portal via the mobile app. If the heart rate is less than 60 bpm or more than 100 bpm, the system may check the person's profile and apply the following procedures or rules:

Firstly, the system should try to contact the elderly person by telephone/text. If no response is received after a specified period, then:

- 1) If approval has been previously given to turn a camera on, the system will check the person's health; if the person is ok, it will turn the camera off and store the data; or
- 2) If approval has not been given to operate a camera, a decision is made to:
  - Telephone/text the elderly person again
  - If the elderly person responds satisfactorily, the system will store the data; or
  - If elderly person does not respond, then the system will text/call the family [3].

In this research two different types of smart watches to monitor an elderly person in different locations where used. The elderly person was monitored from three different countries. The results showed that the systems currently installed and incorporated into smart watches are only meant for visualization; no intelligent action can be taken when abnormal events occur. The proposed complementary approach for these systems by proposing a knowledge-based system combined with a rule-based system enable to overcome the above mentioned problems.

### C. Mobile Application based Drug Requisition System

Drug stores or pharmacies usually maintain a notebook in which they make a list of the drugs that are running out of stock in their store so that when the suppliers from various manufacturing companies come for taking orders, the druggists can give a written copy of the medicines needed. This process is both time and resource consuming from both the suppliers and the pharmacists perspective as it hampers the service delivery [2]. There are 1, 05,819 registered drug stores in Bangladesh which includes a variety of small individual stores or a chain of stores. The suppliers carry order forms with them which need to be filled by each pharmacy. This conventional system is a tedious process which demands the druggist to maintain a written list of the medicines and the supplier to write down the requirements onto the order form. A mobile application can be used to eliminate the use of this pen-paper based list as shown in fig 2.

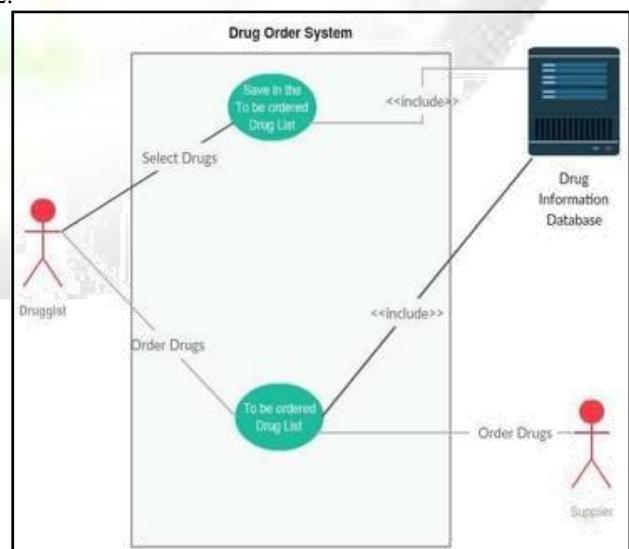


Fig. 2: Use case diagram depicting the drug order system

A few pharmacy retail stores in Bangladesh make use of various desktop-based softwares to enter and store stock information. This requires a skilled operator who needs to monitor the system all day. The main objective of a smart phone based system is that it allows ease of usage, better user experience compared to responsive websites, low cost of maintenance and does not require any technical skills to operate on. The druggist can create the order list using the app and can share it with the suppliers using sharing applications available in the android operating system. This can be done using JSON which is a lightweight data-interchange format used to input data into the application. The list can be created for each manufacturer as individual pdf files. In a country where there are hundreds and thousands of drug stores, this solution will play a phenomenal role in reducing time and resources for order collection and supply management of drugs. From the economic, social, environmental point of view this application is virtuous, cooperative and beneficial to both druggists and suppliers.

**D. Personalized Family Medicine Management System**

Today, healthcare sector has been one of the world’s largest and fastest growing industries because of the innovation and introduction of applied sciences. Information and Communication Technology(ICT) plays an important role in increasing the efficiency and effectiveness of business processes and activities in pharmaceutical industry. Contribution of ICT in pharma industry leads to one major advantage which is improvement in customer services. Mobile applications in the pharmaceutical industry enables faster access to the pharmacists but it fails to provide assistance for end-users to manage their medical records [1].

There are many well equipped apps that allow users to order medicines without visiting the pharmacy, but there are very few apps that allow them to maintain their medical history. Currently, most of the existing systems and apps focus on inventory management for pharmacy or hospitals which acts as a platform for pharmacists to track, manage and organize stocks, orders, sales and invoices there are wide range of data collection methods such as interviews, focus group and so on. However, the most common method which indulged in healthcare sectors is interview method. An Interview method is applied for the requirement gatherings and it is classified into functional and non-functional requirements. The collected data is

further used in designing and implementation phases of the application.

A solution is put forward to assist the users as shown in fig 3, to oversee their medical details through a mobile-web platform [8]. The user can register to this application by entering credentials. After logging in he/she can select the mode i.e., Family or Individual to maintain the records. After selecting the mode he/she can insert family member details such as name, age, relationship, disease type, medicine category and type.

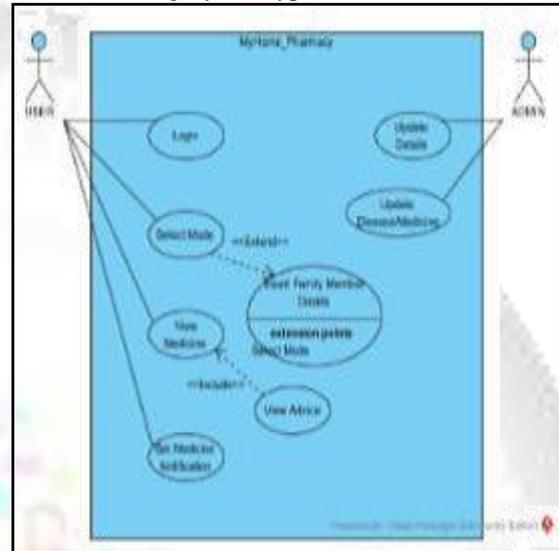


Fig. 3: Use case diagram of MyHomePharmacy

The entered details will be saved onto a database and displayed to the user. He/she can create the database for every member of his /her family and view them as required. The above mentioned method is used to collect information from the druggist about the medication, drug selection and suggestion for minor illness and disease. This application supports only the three types of minor illness categories:

- 1) Fever: Powerful Effect, Normal effect.
- 2) Flu: Drowsy, Non-drowsy, Drowsy/Non-drowsy.
- 3) Cough: Phlegm, Cough and Dry Cough.

It provides the medication for the above mentioned illnesses as follows Tablet, Syrup and Suppository. Finally, the user will be able to view the entire database of his/her family members’ medication report

Sl.No	Title	Author(s)	Published in	Year	Technology Used	Problems
1.	MediPic: A Mobile Application For medical prescriptions	Rosaly B. Alday and Ruel M. Pagayon	Information ,Intelligenc, Systems and Applications(IISA), Fourth International Conference	2013	Eclipse GIT	Less accuracy In recognizing cursive handwriting
2.	Interconnected Personal Health Record Ecosystem Using IoT Cloud Platform and HL7 FHIR	Jaeki Hong, Peter Morris, Jonghwa Seo	IEEE International Conference on Healthcare Informatics	2017	Samsung’s ARTIK 10 Iot Module	Implemented solely for gene-based obesity management
3.	Applying Domain-Specific Modeling to Mobile	Florence T. Balagtas-	Sixth International Conference on	2009	Mobia modeler	Frameworks mapper module

	HealthMonitoringApplications	Fernandez and Heinrich Hussmann	Information Technology: New Generations		suite	is constrained to set of models
4.	The Use of Smart Watches to Monitor Heart Rates in Elderly People: A Complementary Approach	Majid H. Alsulami, Anthony S. Atkins and Russell J. Campion	Computer Systems and Applications (AICCSA), IEEE/ACS 13th International Conference	2016	Smart watches with heart rate sensors, Bluetooth Network	No Intelligent action taken when abnormal events occur
5.	Integrated IoT Medical Platform for Remote Healthcare and Assisted Living	Abdelrahman Rashed, Ahmed Ibrahim, Ahmed Adel, Bishoy Mourad, Ayman Hatem, Mostafa Magdy, Nada Elgaml, Ahmed Khattab	Electronic, Communications and Computers (JAC-ECC), Japan-Africa Conference	2017	Cloud based IoMT platform	Restricted to only heart disease
6.	The MedMaps Apps: Mobile Application for Finding, Managing and Commercialize Pharmacy	Nurfarahin Natasya Binti Hamid and Assoc. Prof. Dr. Toni Anwar	Student Project Conference (ICT-ISPC), 6 <sup>th</sup> ICT International	2017	Android Studio, Google Maps and Firebase	Error during registration Process.

Table 1: Comparison of papers related to Pharmaceutical Industry and Health Care System

### III. CONCLUSION

The implementation of various technologies like mobile applications, wearable gadgets and web based applications have focused on solving real life problems that were faced by people in the pharmaceutical sectors. Mobile gadgets and apps provide many advantages for medical care professionals and patients in various ways, due to the significant increase in access to point-of-care tools, it is necessary to cater a better clinical decision-making and improved patient outcomes. The implementation of various technologies like mobile applications, wearable gadgets and web based applications have focused on solving real life problems that were faced by people in the pharmaceutical sectors. Smartphones, smart watches and tablets combine both computing and communication features in a single device which is handy to carry, allowing easy access and utilization at the point of care. Usage of complementary approach and illness guidance at retail pharmaceutical store along with these schemes provide an efficient managing of patients' health and eliminates errors caused by manual intervention and workarounds. The concept of Internet of Medical Things (IoMT) provides an advanced remote health assistance with enabled medical equipment's which provides real-time health monitoring with reduced errors, reduced medical costs, better disease prediction, prevention and supervision.

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