Mobile-based Social Platform for Emergency Response Coordination

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Abstract: The number of mortalities coming into the emergency room is still very high. While it is evident that the sooner professional medical assistance is provided the higher chances of survival, emergency response systems are yet to be improved and widely implemented to produce a significant impact. Mobile Applications are an important instrument to improve such a service. Mobile health (or 'mhealth') refers to healthcare and medical information that is supported by mobile technology. In 2015, approximately 80% of physicians used mobile devices and medical apps and 25% applied them to provide patient care. This study seeks implementing a design thinking approach to connect growing logistics and healthcare startups through an Information and Communication Technology (ICT) application and platform to provide a more efficient, effective and responsive emergency care through the coordination between emergency responders and the victim or rescuer at the point of incidence.

1 INTRODUCTION

An emergency is a situation that impacts the lives or well-being of one or more person and requires substantial assistance (WHO, 2017). Effective emergency response management is dependent on the timely and effective delivery of information to those who need it. Whether the emergency is due to natural causes or man-made causes, a primary challenge in responding to the emergency is 'Communication' (Manoj and Baker, 2007). The types of information needed to support emergency response management cover wide-ranging areas such as disaster sensing and alerts, damage assessments, logistical and supply chain coordination, emergency medical support, and search and rescue. Communication channels involve citizens, government and public safety officials, relief workers, and private sector organizations. Information and Communication Technology (ICT) provides essential tools to support the diverse communication requirements between these diverse stakeholders (ITU, 2017).

In 2013, the ITU-BDT launched the Smart Sustainable Development Model (SSDM) Initiative to help create a framework for optimizing the use of ICT resources for both development (ICT4D) and disaster management (ICT4DM). The intention is that a dual ICT4D and ICT4DM approach may be efficient, cost-effective, and timely in the utilization of scarce resources during a crisis (ITU, 2020).

In the era of the Fourth Industrial Revolution (Industry 4.0), information technology has become a crucial part of the dynamic life of every human being in the world, and the usage of smart phones is rising exponentially. Elderly people who are unable to provide accurate information and utilize the emergency phone calls, users who find themselves in an unknown location that can't be described or unable to provide an accurate address when an emergency occurs, casualties caused by the late arrival of ambulance and searching for an available nearby ambulance have been some of the hustling factors faced by current fast paced society. With more congested roads and insufficient information,

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search and rescue operations have become extremely challenging (Sakriya and Samual, 2016).

According to the WHO estimates, more people die due to the lack of timely emergency care than AIDS, TB and malaria combined. Billions of people lack access to reliable emergency response during medical emergencies (WHO, 2019). During an emergency, every second counts, lack of access to proper emergency care could be the difference between life and death.

In this study, a design thinking approach is implemented to develop an ICT application and platform to connect growing logistics and healthcare startups in order to provide a more efficient, effective and responsive emergency care service.

2 LITERATURE REVIEW

On-demand healthcare is a recent approach that uses ICT to connect patients with available healthcare providers through websites or mobile applications in real-time. The idea started since the 2000s but it was mostly based on simulation models and algorithms with low usage of technology (Brailsford et al., 2004; Laganga.et al., 2007). The 2010s witnessed the rise of smartphones and that has triggered a major change in consumers' behavior driven by brands like Uber™ and Yodawy™. Over the recent past years, an increasing number of works has addressed the development of ICT in several applications including healthcare. Studies show that integrating smart phones as a self-management tool in outpatient clinics is acceptable and suitable to the patients (Pavliscsak et al., 2016; Ong et al., 2016). Chowdhary et al. (2016) proposed a software architecture framework that simplifies using analytics in mobile-healthcare applications.

One of the major challenges in healthcare is the shortage of medical care workers. According to The World Health Organization (WHO), in 2013 there was a global shortage of 17.4 million physicians, nurses, and other health professionals (WHO, 2016). It is estimated that by 2035, the shortage will be 12.9 million (WHO, 2013). The situation is worse in developing countries due to large population and the limited capacity of medical schools in these countries.

Hence, with a national shortage of primary care physicians and specialists, the waiting times at hospital Emergency Rooms (ERs) are getting longer, that is why on-demand healthcare is a welcomed addition to the marketplace. Some independent companies emerged recently, such as Doctor on Demand, a video conferencing telehealth model, and

Heal, a house call archetype. Cleveland Clinic offers Express Care in which adult patients can see a virtual provider for non-emergency conditions. Concierge practices, where patients pay a membership fee for more access to a healthcare provider, are also offering on-demand healthcare (CardinalHealth, 2018). A good example on emergency applications is VMEDO, a healthcare application that connects to Nearest Ambulance, hospital and blood donors during Medical Emergencies (VMEDO, 2016). Oberoi et al. (2016) compared different software applications developed over time in the area of healthcare; they argued that most of the developed applications lack the applicability, especially in developing countries due to the poor infrastructure and the high cost. Various approaches were used in the studies on smart healthcare applications but to improve the applicability and the user experience, user-centered methods should be adopted to design applications that comply with users' needs and desires. In this work, this gap is addressed by choosing 'Design Thinking' as our methodology.

3 METHODOLOGY

Although the term "design" is commonly associated with products' quality and/or aesthetic appearance, the main goal of design as a discipline is to promote the well-being in people's lives. Nonetheless, it is the way that designers perceive things and act upon them. Design has attracted the attention of management, opening new paths to business innovation.

Design Thinking is a human-centered approach that refers to how the designer thinks; drawing on a style of reasoning that is hardly conventional in the business world, known as abductive thinking. In abductive reasoning, the solution does not derive from the problem: it patterns itself after the problem (Brown, 2008; Vianna et al., 2013). Figure 1 illustrates the design thinking methodology.
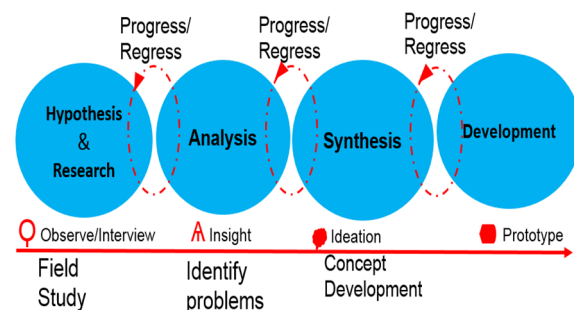

Figure 1: The design thinking Process.

Few studies have used design thinking as a solution approach in healthcare; Watkins et al. (2014) have used a design thinking qualitative approach for healthcare services in Zambia. Cheung (2015) used design thinking to design a product to be used in operating rooms in Hong Kong. Carroll and Richardson (2016) argued that design thinking principles are desirable to establish a connected healthcare framework. Hopkins et al. (2016) investigated opportunities of using brainstorming and prototyping to build a health follow-up platform. Hsueh et al. (2016) have implemented a platform to support patients before, during, and after medical encounter. Heshmat et al. (2017) have implemented design thinking approach to address the design problems for patients and clinic staffs at outpatient clinics in Egypt.

4 CONCEPTUAL FRAMEWORK

Our design thinking approach involves gathering information about real end-user issues, understanding their journey, and proposing tangible solutions. The process is divided into five stages:

Immersion, Analysis and Synthesis, Ideation, Prototyping and Implementation.

The first stage of the Design Thinking process is called Immersion. At this moment, the project team approaches the context of the problem from the point of view of not only the user but also that of the involved stakeholders. This stage begins with a reframing process in which the project team meets the potential platform users, through individual interviews and focus group dynamics, to look at the problem from other perspectives and define project boundaries. The team, moreover, will conduct a survey in the field to hear about the subject so it can arrive at an initial understanding of the users and stakeholders enmeshed in the context and help to define the key profiles to be looked at next. The team also undertakes desk research to discover trends on the subject on both a national and global level.

The next step is to analyze the data collected through field and desk research we started to analyze and categorize how the user will engage with the platform. A user journey map was developed to describe different situations where the application can come in handy. Figure 2 shows the developed user journey map.
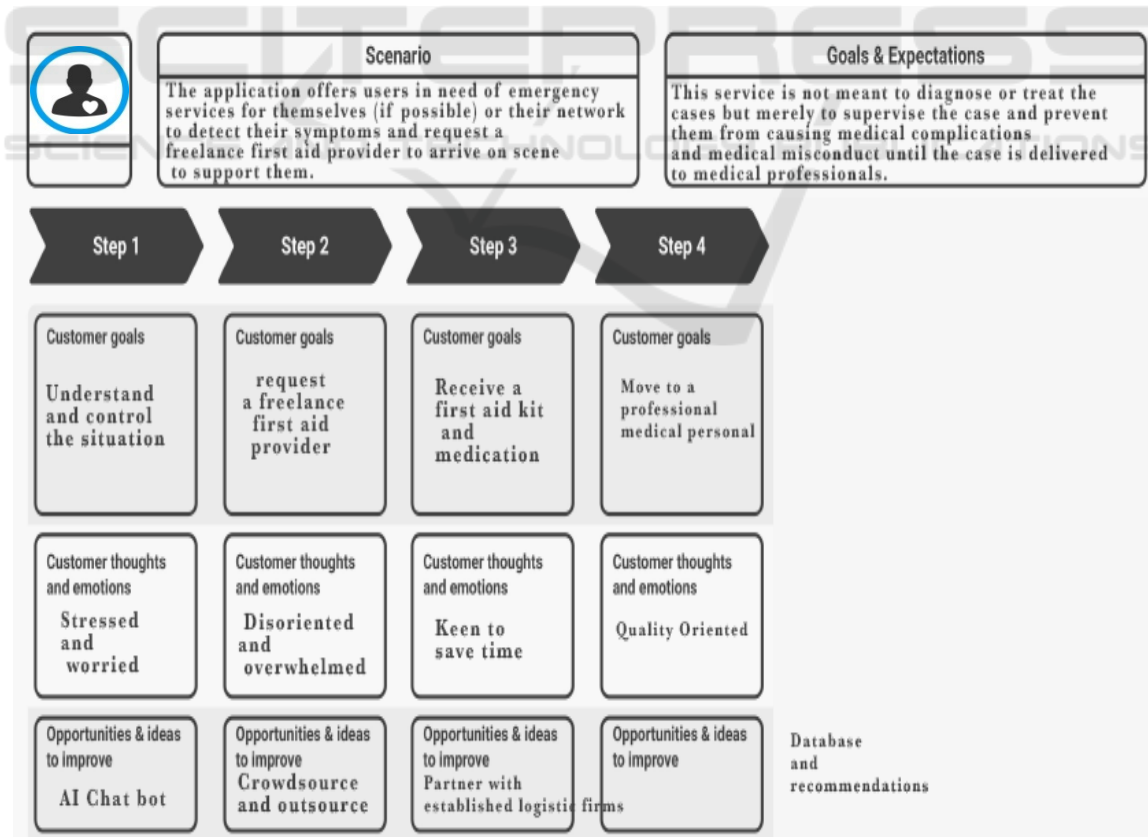

Figure 2: User Journey Map.

We have set these initial situations to deal with.

- Bleeding - Someone is injured and the bleeding is not stopping.
- Breathing difficulties - Someone is having problems in breathing – for example, having an asthma attack or an allergic reaction to something, this is known as anaphylaxis.
- Someone collapses.
- Fit and/or epileptic seizure.
- Severe pain.

Brainstorming comes next as the third step in design thinking which is 'Ideation'. After several thoughts and ideas we decided to create a matchmaking platform between the stakeholders and the user (Emergency Case). The idea is to "uberize" the delivery of emergency health care services by partnering Medical Personnel (clinics, hospitals, and freelance certified first aid providers) using a running logistics platform like Uber™, Careem™, Halan™ and Yodawy™. This is also to provide a platform where Pharmaceutical Companies can efficiently spend their Corporate Social Responsibility (CSR) and marketing budget by providing promo codes to use the emergency care service.

The stakeholders are:

- Professional Medical Service Providers (Clinics, Hospitals)
- Freelance Medical Personnel (Certified First Aid Providers)
- Pharmaceutical Companies (Marketing and CSR)
- Logistics Application (Ride Hailing and Delivery Applications)

The application offers users in need of emergency services for themselves (if possible) or their network to detect their symptoms and request a freelance first aid provider to arrive on scene to support them. This service is not meant to diagnose or treat the cases but merely to supervise the case and prevent them from causing medical complications and medical misconduct until the case is delivered to medical professionals. The application also offers an opportunity to connect with mobility solutions such as Uber and Careem that are equipped with first aid kits through some partnerships. It also provides the nearest hospital and clinic that is available to receive the case based on their choice of medical care service.

Fresh graduates from medical backgrounds get trained, equipped and certified. They then get signed exclusively to our platform where cases can request

their assistance. Careem, Uber and Halan will be equipped with first aid kits through our service. Yodawy will receive medication orders once our care provider is at the scene. The call for an emergency will include location, needed supplies (if any) and indicators or symptoms.

One of our main revenue streams is from Pharmaceutical companies to give away promotional codes where customers get incentives to use this service.

5 CONCLUSIONS

In this study, a Design Thinking approach is used to develop a mobile application for On-demand healthcare and respond to emergency situations. The proposed platform connects cases in need of emergency care with well-trained health care providers as well as emergency equipment and first aid kits holders. Trained fresh graduates from medical backgrounds register on the system. They then get signed exclusively to the proposed platform where cases can request their assistance. Ride hailing providers, such as Careem, Uber and Halan will be equipped with first aid kits and small emergency response equipment and supplies through our service. The call for an emergency will include location, needed supplies (if any) and indicators or symptoms. The system will optimally designate nearby emergency responders and equipment holders and direct them to the victim, meanwhile notifying Ambulance service for further assistance.

For future work, operations research models can be used to make optimal assignment for emergency cases to healthcare providers. Another recommendation is to use an Internet bot to gather information for the emergency case where it can be easily reported to the medical personnel. It is also suggested to include a social platform where people can raise awareness to health related issues under the supervision of medical professionals.

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