



NGO CHARITABLES : UNUSED MEDICINE UTILIZATION USING IOT

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ABSTRACT- A noticeable number of people living in extreme poverty still remain high in India. It is becoming challenging for the poor or low-income people to pay for their health purpose. Thus they suffered from various illnesses and accordingly the passing rate is expanding step by step. Then again, there are many individuals who have a lot of extra meds even in the wake of completing those prescriptions utilization. In this paper, we have proposed a medication dissemination online interface, named 'NGO Charitables'. The NGO Charitables is a stage for the givers who need to give their unused meds to poor people or low-pay individuals who need those meds. This framework will add to lessen the expense for public wellbeing administrations by utilizing unused meds; and to help poor people or low-pay people to get better health services. The portal was also evaluated with 16 participants (including doctors, donor, NGO personnel and low-income people) and found that the portal is highly effective, efficient, satisfiable and useful system.

Index Terms- Web portal, electronic health service, ICT, medicine distribution.

I. INTRODUCTION

Health is a vital issue for the human race. In recent times, people's concern regarding health issues has increased exponentially. For developing countries, health care is a fundamental need. Due to the scarcity of doctors and physicians, people of the developing countries have less access to health care services. Thus, health care is a very challenging in these countries. India is one of the developing countries. India has expanded the health service systems and infrastructure in the government and non-government sectors. Moreover to get the better health services in context of India following challenges are playing key roles:

1) India is a densely populated country. The population of India is about 165 millions as of May 8, 2017. The population density of India is 1266 per km [1].

2) According to World Health Organization (WHO), there is an estimated 3.05 physicians and 1.07 nurses per 10,000 population (estimates based on MoHFW HRD 2011) [2]. The ratio of doctor to population is 1:1500 in urban areas whereas 1:15000 in rural areas [3].



3) Illiteracy is also a fact for this country where illiteracy rate of India was 40% in 2013 [4]. Due to the illiteracy, major proportion of our population still remain unaware of the ICT uses. According to BTRC about 67.245 million people use the internet and most of them live in the urban areas [5].

4) Poverty erodes good health status of a populace and further deepens individual and national poverty while creating a public health concern for the society. About 13% of the total population live below the national poverty line (average income US \$2 per day) [6]. Another study conducted by World Bank in 2016 mentioned that India's outrageous neediness rate has dropped to 12.9 percent [7]. Nonetheless, India is likewise gaining ground in lessening its destitution rate and there is an opportunity of a lifetime of beating outrageous neediness rate by 2030 [6].

Because of these difficulties, individuals living beneath the destitution line would rather not pay for medical care purposes. Besides "cost of the medications" is a vital worry for them; in this manner they can't buy drugs and experience the ill effects of different sorts of sicknesses, and many individuals give their lives. Individuals living over the destitution line are fit to purchase numerous sorts of drugs when required and may likewise save medications after their utilization. In this paper, we planned to foster a web-based interface, which can assist with gathering unused meds from givers, and to convey to poor people or low-pay individuals. Approved specialists can suggest medications for poor or low-pay individuals utilizing this entryway. The rest of the paper is organized as follows. Background study of our work is presented in Section II. In Section III, we discuss about the need findings, conceptual design and the development of the portal. The result of evaluation of our system is demonstrated in Section IV. The discussion, implications and idea for future work are presented in the final Section V.

II. RELATED WORK

This section briefly discuss the works related to ICT based health services and electronic health services for poor/low-income or unprivileged people. Leisinger [8] highlighted the constraints of the poor people to get access to medicine and health services in the developing countries, that includes high drug prices, low income etc. to guarantee and further develop strength of the oppressed individuals. In this work, he likewise recommended to make a cooperation among government association, NGOs and people to guarantee general wellbeing. In another review, Islam et al. [9] found that instructive, monetary and regulatory elements impacted the people groups' cooperation in wellbeing administrations particularly in the provincial regions. They likewise found that country wellbeing buildings didn't have adequate clinical hardware's and government's allotment.

The valuable open doors and provokes of the non-industrial nations to support the Health Management Information System (HMIS) are examined in a review [10]. They featured a few open doors like expanding the utilization of web, ICT based application improvement, and reception of telemedicine, while a portion of the moves are reasonableness and openness to ICT, policy driven issues, information quality and usage. In another review, Ruxwana et al. [11] found that apparent helpfulness and convenience influencing individuals' acknowledgment of the e-health supports in rustic centers in the Eastern Cape Province of South Africa. A few different investigations have been led on e-wellbeing and m-wellbeing administrations to assess their perspective. A study conducted by Prentza [12] showed the architecture of congestive heart failure (CHF) application, an e-Vital application in which patient can measure their blood pressure, weight, pulse using comfortable wearable devices and send their readings to the doctor for further diagnosis sitting at home. But these applications leave the question of their affordability accessibility to the poor and low income people. In study [13], Karim et al. showed the present status of m-health applications development in India. They also evaluate the related applications through clustering, extracting and analyzing features to provide the open issues, opportunities that practitioners may consider in future to develop Health application for the users from



India. Some other studies like [14]–[17] talked about the current status, challenges, potentialities and initiatives of the ICT health services (e-health, m-health) in developing countries including India. Their findings showed that existing ICT health services are not up to the mark to meet the needs of the people specially the low-income, illiterate and under privileged people. They also acknowledged that the difficulties and barriers of accessibility and quality can be overcome and brought positive influences in the improvement of public health.

III. DESIGN AND DEVELOPMENT OF WEB PORTAL

In this section, we have discussed how the system is designed and developed. We have followed three sequential steps that include- (a) finding the users' needs, (b) develop the conceptual design, and (c) develop the web portal.

A. Need Finding

To attain our aim for developing the web portal, we have tried meticulously to understand the major requirements and needs of the portal from the focused end users. We have followed two methods to assess the requirements, one is an online survey and another is the interview of the focused users. For conducting the survey, we developed a form where the users were asked about their biographical background, age and profession. We also wanted to know how frequently they meet with the doctors, how they utilize their leftover medicines and their speculation to do some welfare work with their leftover medicines [25]. The survey was distributed through the social media and emails. We sent 200 mails to request people to give their valuable opinions through this survey so that we could get accurate data as far as possible. This survey was distributed during the middle of March and three weeks were given to response to our survey. After the ending period, we have found the successful return of 110 survey responses that we consider for analyzing the needs finding.

Because of poverty, poor people cannot buy expensive medicines whereas many people waste a large amount of medicines. From the survey, we get to know that 91.1% people think of a trusted web portal where they can donate their unused medicine to help the poor people and it is the major cause of building our web portal. We also kept an open forum to know why people are not willing to receive medicines from a trusted web portal where people mentioned various reasons and one of the main reasons is the trust issue. People have doubt on medicine expiry date, therefore we thought of putting a restriction on medicine expiry date.

B. Conceptual Design

This section is focused on the conceptual design of our system which is the representation of the system composing the key concepts which can be used for knowing, understanding and simulating our system. The web based system will be the interface between the users (donors, doctors) and the trusted sources (government organizations/ NGOs) which will distribute medicines to the poor. The donors can donate their medicines through this web-portal and registered doctors can prescribe medicines for their patients who are unable to buy the costly medicines.

The stakeholders of our system are donor who would donate medicine, doctors who would prescribe medicine, receiver (with income below US \$2 per day) who would receive medicine for free of cost and the inter-connecting medium which can be any government welfare organization or any NGO that would be responsible for maintaining the system through checking the medicine list, donor's information, receiver's information, registered doctor's information, availability of medicine and also would be responsible for collecting medicines from donors and delivering prescribed medicine to the receivers and thus completes the circle of our system.

The medicine provider or donor as well as the doctor needs to create an account in our software system through which the system would be able to verify the account as well as all the information given by the donor

or the doctor. For this process, registration name, address, sign up as (whether doctor or general), registration ID (for doctors only), email and password would be mandatory. During registration, the provided information is crosschecked to verify as this system is used for very delicate purpose and therefore, we handled the authentication system (specially for doctors) very cautiously. Doctor and donor both can access his/her account after this registration process and would be able to see the medicine list, from which the registered doctor can prescribe medicine and a PDF report would be generated and also the donor can donate medicine after providing necessary information.

On the other hand the receiver can receive medicines in two ways from the facilitators (responsible NGO's or government organizations) by visiting them in person. One way is to show a valid prescription from any registered doctors and national identity (NID) card to the concerned supplier for receiving medicines. Another way is- the patient needs to visit the doctor who are subscribed to the system and if the patient is unable to bear the cost of the medicine then the doctor may request for the medicine through the system and would generate an e-prescription so that the patient can visit to the facilitator with this prescription and with also his NID card for getting the medicine.

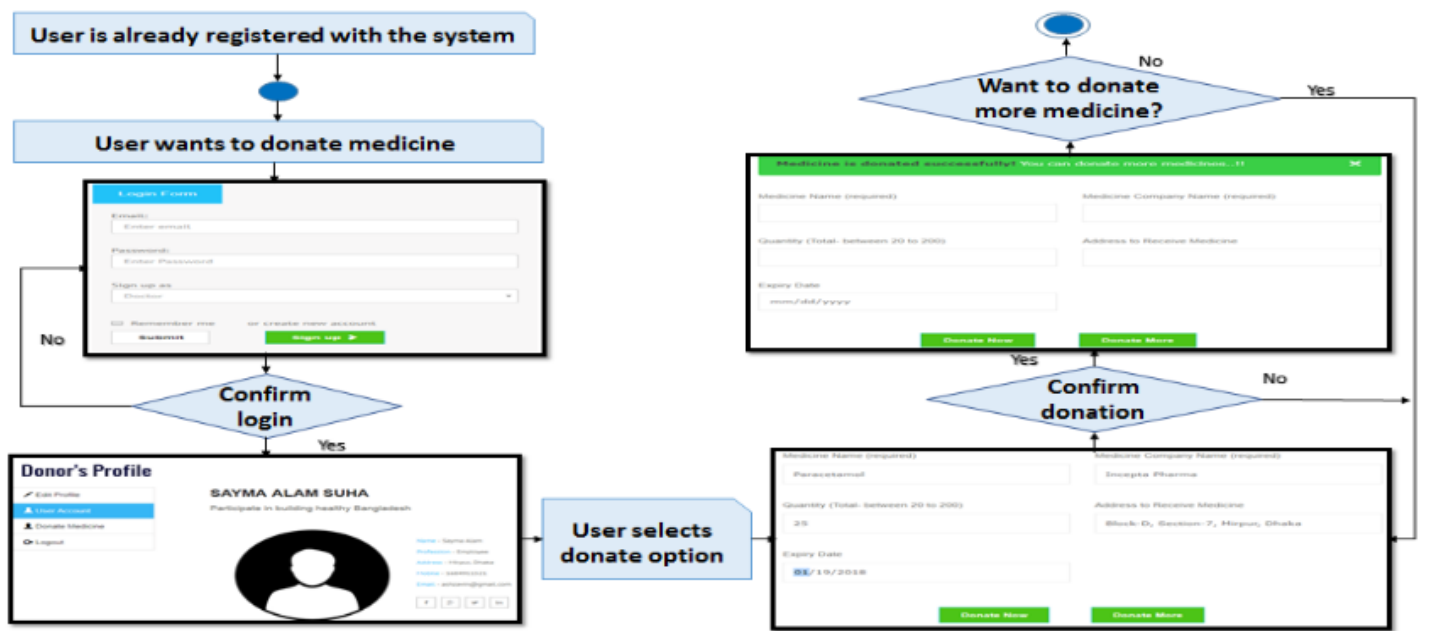


Fig. 1: Flow diagram of donation process

C. Developing the Portal

This section represents the portion how we develop the portal. We can divide the development phase in three parts.

- 1) Database and Server End: At first, we have designed an E-R (Entity Relationship) diagram of the database according to the requirements of our system and implemented the database in MYSQL server with enough security constraints to prevent unauthorized access. For security purpose in the system we used two separate databases (admin and user) so that no one can easily hack or destroy the existing top level information of admin panel. Admin panel ensures the requirements of the system that coming from the user database and keep the whole system updated.



- 2) **User interface:** In the system, secured access point is provided to personalize the information of the users where content of the web portal is unique based on the user criteria (donor/doctor/receiver). It has device and browser compatibility at the same time it is designed in a user-friendly way so that it is easy to access for authenticated user. We have implemented notification system to notify the users through mail integration using PHP mailer (SMTP server) so that they can remain up-to-date about the web portal. For technical development of the system, we used HTML, CSS, JavaScript, jQuery, PHP etc. that make the system more interactive for the users.
- 3) **Security Aspects:** Users need to register first to get the facilities of the web portal and their registration will be completed after verifying all the required information such as doctors will be verified against their registry number. We have used HTTP Basic authentication (using password hash() function of PHP) which confirms the encrypted strong password for user that is verified with the existing email address through encrypted message. The session-based login will be valid until the user will logged out or system will automatically logged out after a specific time when the session will be ended. Thus implementing these types of security aspects, we have tried to make the web-portal trustworthy and secured for the users.

IV. EVALUATION

The NGO Charitable portal was evaluated through a user study to evaluate the effectiveness (how accurately users can perform task using this portal), the efficiency (how much difficulty or effort is required to learn and perform the task in NGO Charitable portal), and satisfaction (how much users are satisfied to replicate the evaluation study). This section will briefly discuss the participants profile, the study procedure and the results of the evaluation.

A. Participant's Profile:

We have recruited a total of 16 participants from different types of stockholder to replicate the evaluation study; the participants team encompassed 4 doctors, 4 donors (1 banker, 1 engineer and 2 students), 4 NGO personnel and 4 low-income people (1 car driver, 1 housemaid, 1 shopkeeper and 1 home security guard). Among them 7 was male and 9 was female. Their average age was 35.121 years; except the low-income peoples all other participants had a good level (average 5.1 years) of experiences of using internet and smart phone.

B. Study Procedure:

We have performed a formative study where we have invited all the participants in the software engineering lab of the authors' institute. At the beginning, we provided a small brief about the purpose of the study, presented the NGO Charitable through PPT and live demonstration and then asked them to sign a concerned form. Doctor, donors and NGO personnel were asked to perform the tasks as listed in Table II and collect the data related to TCT (Time Completion Time) and frequency of wrong navigation, asking help, input error and system error. Finally, all types of participants are asked to complete a set of questionnaires.

C. Evaluation and Results:

The resultant outcome is shown in Table II and Table III. From Table II, we observed that all participants completed the task successfully within a short time (73.140 seconds) and most of the participants completed in single trials. No system error except internet failure occurred and input error frequency was comparatively less which all shows a good level of effectiveness. Required TCT, wrong navigation and asking help frequency were less; therefore they completed the task very smoothly and efficiently.



V. CONCLUSION

Modern era has begun. People both privileged or unprivileged, literate or illiterate are now conscious about their health. It is a matter of sorrow that being conscious poor people cannot pay much attention to their health care routine because of their low pay. Government show incredible drive by giving free treatment to needy individuals. Yet, the majority of the cases, they seek the treatment not the costly medications. Subsequently, the incredible drive become useless to them. This paper gives a short outline of the plan and improvement of an online interface, which will be exceptionally successful and will bear extraordinary commitment to get the wellbeing administrations for these poor or low-pay individuals in India. The light weighted assessment concentrate on likewise featured the entry as a valuable, powerful, productive, and inventive mean of getting wellbeing administration. One of the primary impediment of this exploration was the number of members enrolled in the evaluation study were comparatively low. Further research may therefore be carried out an extensive empirical study with large number of real-users for the improvements of the portal's usability and technical features. Future research may also be conducted to design and develop a mobile application of this portal and assess the performance comparing with this web portal.

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