

# ICT Driven Universal Healthcare Information System for Social Development

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## ABSTRACT

India has to go a long way in healthcare. In order to provide affordable healthcare in a very short period of time it is important to move rapidly to take care of 1.2 billion people. In this paper a structured approach is made towards a practical solution to address the healthcare issues of our country. A technology framework and the user requirements for a comprehensive national healthcare information system are proposed. Database creation and related data integration issues are addressed. The Software requirements based on user needs are illustrated with specific examples. The user profile variations vis-à-vis software modules are discussed

**Index Terms**—Computer technology, social development, information technology, healthcare, health insurance, National Health policy

## I. INTRODUCTION

Universal Health Care is the goal being pursued by many countries in the world. To proceed towards such a goal, our country needs to do a lot in a short span of time. We have to resort to the full force of technology for providing a healthcare regime for our masses. The role of mobile phone in the service sector is rapidly growing. It is interesting to note that mobile phone user base in India is quite large even in less developed states such as Uttar Pradesh.

The uses of mobile devices for health care professionals have been well reported in the literature [1]. While the developed countries have evolved steadily in this sector, developing countries suffer from digital divide and have to look for intelligent application of technology as a cost effective manner to achieve the goals of health care in a record time. The mobile phone can be used in a variety of ways by all stakeholders in the health care sector. The major bottleneck in India is the lack of records that prevents us from arriving at key decisions in any sector. Health care should cover each and every citizen. Many people, particularly the tribal people are in remote areas. Hence mobile phone centric approach gives us the advantage of the end users already possessing a device with infinite possibilities and uses.

Before looking at the mobile apps for health care we should look at the Indian landscape in terms of history, language, culture and other parameters. Any hardware and software design must tackle the digital divide head on and the benefits must go to the less privileged population. To achieve this objective we must provide multilingual and user friendly systems. It is interesting to note that even highly developed countries like the US is focussing on the health care in rural areas [2]. It is also reported that rural population in the US face many problems in getting medical attention and care [3]. Hence countries all over the world will be looking at these problems closely and the solution lies with the application of technology. It is interesting to note that the Indian government has taken certain initiatives in the application of technology for rapid development. The most important example is the Aadhar scheme for providing a unique ID for every Indian citizen.

In India focus on health care has improved recently. As a result, the health insurance coverage has increased from 75 million people in 2007 to 300 million people in 2010 [4]. Moreover certain states in India are providing health care for the poor at very low cost through micro insurance schemes. India's success in this sector has been well recognized [5].

## II. MOTIVATION

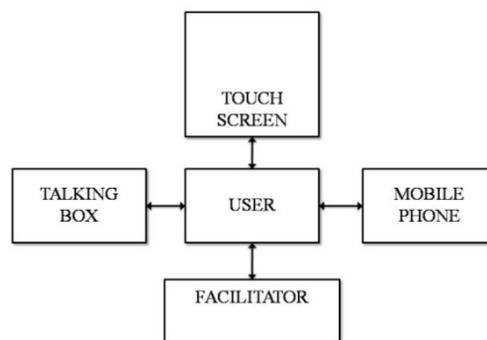
The IT sector in India caters to many organizations worldwide. The export market of the Indian IT-BPM industry for 2014-2015 is approximately \$100 billion. There cannot be a more opportune moment for the major IT players to enter the health care sector. The worldwide market for health care sector is likely to rise for several decades. Following the success of Andhra Pradesh, Tamilnadu and Karnataka, other states will follow suit sooner than later. If we look at the mammoth task of providing wellness to almost 1.2 billion people we can sure read the revenues in the background. Moreover any company looking at this can read the higher margins in repeat orders from same government as well as the ease of operation in subsequent projects in other countries.

Developing apps for mobile phones have many benefits such as large user base, ease of portability etc. People in India can be easily reached through media. Traditionally the family planning campaign was launched through the media. Starting from All India Radio the government reached out to the masses in many ways including the Satellite Instructional Television Experiment project. It is interesting to note that the southern states, particularly Tamilnadu and Andhra Pradesh have done well in population control. The success in this sector can be attributed to the influence of media. However the success of Kerala is due to better literacy. IT firms and consultants may well start with the southern states to seek contracts in the healthcare sector. The next starting point should be Uttar Pradesh were the mobile phone penetration is maximum.

## III. Technology framework

First we have to look at the technology framework that can be put in place in shortest possible time. We can take the advantage of technology tools already developed for rural masses. The Talking Box [6], [7] is a well-known example. The huge success of smart phone is due to many features. The touch screen feature and icon driven applications expands the user friendliness beyond limits. Hence any mobile application software has to run in the background of a user friendly interface suitable for the rural masses. Such thinking only can bring a revolution in health care and also increase revenue of the companies that undertake government contracts for health care. The broad objectives of the proposed mobile application software must include health record generation, health information dissemination and health care delivery. The health record data can be shared by various stakeholders including the health insurance providers. Since medical care in our country is already reaching the remote villages through primary health centres, the basic framework of health care data collection can be easily configured [6]. Health care records are much more comprehensive than medical care records [8].

The very first mobile application software package proposed here is the Health Record Generator. It should run on a smartphone. The most sophisticated features of this software come into play when it used at the remotest possible location. The set up for data collection is illustrated in Fig.1



**Figure 1: Facility at Primary Health Centre (PHC)**

The facilitator represents the human interface trained to create proper health records. The touch screen device enables a user to input disease symptoms, food habits etc. easily. The talking box guides the user in local language. The proposed configuration can be modified. For example in tribal areas with no infrastructure the exercise can be done in a tent. All systems are battery operated. Once the health records are created they are electronically transmitted to the district headquarters. In a similar manner the data from all districts are integrated in a national database. There can be variants of this scheme with a combination of paper and paperless interfaces. A national database can be created by consolidating the data from all the states and union territories. Once the national and state databases are in place, then an efficient healthcare system can be put in place. The healthcare database is needed by all stakeholders. For example health insurance firms can use the database to design innovative micro-insurance schemes that can be tailor made for different groups of people. The pharmacy companies can use the database for optimizing their products for improving public health. In addition to government initiatives many private hospitals are reaching out to the poor in many ways. Some hospitals are conducting health camps in rural areas. Hence by defining a set of standards for citizen health care records at the national level, the national database can be used selectively with the databases of private hospitals.

#### IV. User Requirements

There are various users of the health care information system. If we take a top down approach, the government becomes the first user and the citizen is the end user. India is not rated so well by international agencies in the field of healthcare. Hence we have to maximize the benefit for the end user. By using the mobile phone as a primary device for interaction between the user and healthcare information system, we make it very easy for an end user to access the system. However a person with a mobile phone should be at no disadvantage. This can be tackled through the human interface at Primary Health Centres (PHC). The basic requirements of an end user are (but not limited to)

- Health Record Updating
- Disease diagnosis
- Food and nutrition guidance
- Alerts
- Assistance for hospital visits
- Medical consultation
- Critical care facilitation
- Guidance on emergencies
- Rapid assistance after an accident
- Family planning
- Wellness tips
- Guidance for health insurance

The user requirements also vary according to the stakeholders. For example commercial firms dealing with the over the counter medical products, health foods etc. should not be permitted to misuse the system. Hence it is important for the government to include the regulations of national and international organizations within the legal limits of operation of the health care information system so that we arrive at a robust and workable healthcare information system.

The end user profile in our country varies drastically across the nation. The end user in rural areas should get all services free of cost. The users in the cities can be charged suitably. Moreover the end users in the cities can access medical reports including scans through their mobile phones

The first user, Government of India needs comprehensive data across the country on the following topics:

- Nutrition needs and deficits, region wise, community wise, etc.
- Child health data
- Occupational health and hazards data
- Safe delivery of data
- Region specific bacterial and viral infection as a time series data
- Comprehensive post flood health impairment data
- Periodic data on health of workers in hazardous environment
- Health data on employees working in night shifts

- Region wise environment related health impairments
- Alcoholism related health impairments

Private hospitals need comprehensive data on the following topics

- Health and nutrition awareness levels of current and potential customers
- Mass population nutrition imbalance and deficiency
- End user health records
- Medical history of new customers
- Insurance and government aid subsidy entitlement data
- Defective food product vs disease correlation data
- Special medical facilities in each hospital
- Data on highly specialized doctors
- Rapid access to health care record if VIPs to be accessed in an emergency
- Rapid access to health care records of victims during accident, bomb blast, terror strike

In a similar manner the requirements of other users can be identified

## V. Typical Mobile Healthcare Apps

Prevention is better than cure is the common health mantra. One useful mobile app in this area is a combination of food alerts for a person. Consider a person whose blood glucose levels are in the boundary region of a diabetic. All the user has to do is to enter the food consumed by him each day in his/her mobile phone along with the blood glucose level measured with a portable device. This app issues an alert to the user containing tips for the food to be consumed during the next 24 hours. Many options can be provided in the interactive menu. For example a user can enter physical exercise, walking and sleep data to get guidance from the system on food, medication etc. Another option sends the data to the family physician for additional guidance.

In the case of rural areas daily and weekly sessions can be conducted at the PHC. Here the talking box- touch screen combination is used for end user interaction. The end user need not possess any mobile phone. The facilitator will provide the mobile phone. In this environment the mobile app is in local language and is designed for the rural scenario. In the state of Tamilnadu the Government has been distributing free laptops to the students. Hence the family members of the student have access to a laptop at no cost. We can think of another mobile app that has an option for the user to work with the mobile phone and laptop. Moreover the laptop can be augmented with an interface for networking with the devices at the PHC. This will provide empowerment to the end users at rural and semi-rural areas at no extra cost.

## VI. CONCLUSION

Any social development initiative with no assurance on the wellness of the people will not lead to prosperity. Irrespective of the past track record countries like Kenya, Philippines and India have been applauded for successful implementation of Micro insurance for healthcare. The Technology framework and the structure of the proposed healthcare information system will be a good starting point for multiple agencies of the Government and other stakeholders in this sector. It is believed that this paper will bring to focus the need for proper healthcare systems for developing countries.

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