

Spark Challenge

21/22

Final Report

Team Zigma

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1 Details of the Team

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2 Problem Description

2.1 Area of Development

Healthcare Improvement

2.2 Other supporting areas

Education

2.3 Problem statement and Primary Objectives

Problem Statement:

One of the major problems encountered in the Sri Lankan health care sector is the lack of a properly maintained system to store patients' personal information, diagnosis history, medical prescriptions, etc. Most of the time doctors use books or papers to keep these records, which is inefficient and it is highly likely to misplace them. This lack of proper medical record history makes it difficult for doctors to do proper treatments because they will have to rely basically on asking the patient about his/her medical history.

This problem is much more prominent in the public health sector, which is underfunded. Although there have been several attempts to introduce digitization to the health sector, they have shown little success.

Primary Objectives:

Our main objective is to introduce a digital healthcare system to store patient medical records, safely with low cost. We are hoping to pay special attention to the safety and cost-effectiveness of the system.

2.4 Impact on Climate Change

Digitization of medical records will cause the health sector to reduce the use of paper. This is good for the environment indirectly because, large number of trees are cut down each year to make papers. Therefore, by introducing more digital systems, we can reduce deforestation and desertification.

3 Solution Description

3.1 Arriving at the Solution

3.1.1 Key findings in Research

Indicator	Year	Data
Number of hospitals	2019	643
Population per medical officer	2019	1069.8
Percentage of inpatient surveillance	2019	30.16%
Central Dispensaries/Primary Medical Care Units	2019	522

3.1.2 External Support

- In the workshops conducted for the Spark project, we were able to discuss our problem and solutions with our supervisors as well as peers. They gave us new insights into arriving at a better solution.
- We inquired a few doctors and nurses in our local hospital about the practicality of our solution and its implementation

3.1.3 Solution Discussion

As the solution for the above problem, we are going to develop a web-based software application. Patients and doctors have to register from the web and then they will be given an individual user account and a record in our database(Patients and doctors will have two types of accounts). Each user(patient/doctor) can log in to their account by giving their username and password. Each patient can view their records and edit/update them within a limitation. Each doctor can access a patient's records by giving the patient's username (here we can use national id number as the username and with the consent of that patient) and edit/update information within a limitation.

3.2 Proof of Concept

Many countries have already digitized their public healthcare sector. Also, there are commercial products, that provide such services(Medical record keeping) for 3rd parties. Some private hospitals in Sri Lanka have already implemented their own services.

Some commercially available could based services,

- SIMPLEX HIMES Software
- Sevocity Software

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- athenahealth Software

To connect people and pharmacies is one of our secondary motives in this project. By implementing an online platform to search for medicines and drugs, individuals can promote their own store and keep track of available medicines.

Currently there are no such solution in the island but we can list some local and international solutions.

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- mClinica
 - Zibew

3.2.1 Main Features

One of our primary object is to connect hospitals island wide and to provide a platform to keep a consistent personal medical history. After the initial phase we will implement the online pharmacy platform. Main features will be listed as following.

- Ability to access Patient data digitally from any hospital.
- Keep your personal medical history and give access to medical workers with consent.
- Find willing blood, organ donors.
- Find patterns with machine learning and identify spreading diseases around areas.
- Search though inventories around the nation to find the needed medicine.
- Help pharmacies to to track their inventories.
- Compare prices and find the most suitable option.
- Send inquiries if one could not find a specific medicine.

3.2.2 Used Resources

For the prototype, we are hoping to work with Firebase to develop the back-end and to manage databases. And to design the front-end of online platform, we are using React JavaScript Language. We will use open source services as much as possible for the initial prototypes. Also, we are hoping to get guidance from qualified medical personnel.

3.2.3 Evaluation and Results

Since our prototype website has not been created yet, and since it has not being tested, we cannot provide any results or give an evaluation on the solution.

3.2.4 Limitations and Future Work

Since we are working in the healthcare industry, the privacy policies will limit, how much we can process data and work with statistics. Also, a sudden change in system will take more time to be implemented.

In the future our main goal is to provide online platform for the pharmacy and target ayurvedic hospitals and promote indigenous culture among younger generations.

Also, in the future we are hoping to develop an app for smartphones to access the platform. Using biometric authentication protection features to provide security and easy access to the platform.

3.3 Sustainability

3.3.1 Project and the Mission Statement of Spark

Our web based software application directly impacts the quality of the service of government hospitals. Since healthcare is a basic need of the society, improvement of healthcare is very important for the development of a country. With the development of technology handwritten systems are almost outdated and digital systems are most popular today. Moreover with the paper shortage these days digitized systems are mostly encouraged. Therefore we can consider a digitized system is a main need of government hospitals today. We think our digitized healthcare system can bring the srilankan healthcare system to the next level. So our digitized healthcare system delivers a huge impact to the development of srilankan hospital system today for all the tomorrows in line with Spark's Mission Statement. Moreover this system indirectly helps to tackle the global climate crisis as this greatly reduces the paper usage in hospitals and related places.

3.3.2 How the sustainable development goals are aligned

There are 17 sustainable development goals according to the Department of Economic and Social Affairs of the United Nations. Our digitized healthcare system mainly aligns with the goal "Ensure healthy lives and promote well-being for all at all ages". Our healthcare system directly impacts the Improvement of srilankan government healthcare system and since the user can maintain personal health data collection we would say, it helps with ensuring healthy lives and promoting well-being for all at all ages.

As mentioned above our healthcare system reduces paper usage of hospitals and related places. Reducing paper usage means saving more trees. It helps to combat climate changes and its impact and protect freshwater resources . So our project aligns with the goal "Take urgent action to combat climate change and its impact". Moreover, the highest priority areas of this goal include human health. Our project directly aligns with human health.

Saving trees also helps to preserve forests, combat desertification, halt land degradation and secure biodiversity. So we can say our solution aligns with the goal "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss".

As mentioned above we can point out that our solution directly aligns with 3 sustainable development goals out of 17.

3.3.3 Sustainability of the project

Sustainability simply means meeting our own needs without compromising the ability of future generations to meet their own needs. There are three pillars of sustainability. They are social sustainability, environmental sustainability and economical sustainability.

As mentioned in part 3.3.1 healthcare is a basic need of a society. Being citizens healthy is very important to the efficiency and development of a country. So srilankan government provides free healthcare facilities to the people. Our digitized healthcare system can enhance this healthcare system and improve the efficiency of it. It is like combining all the hospitals. Any person can go to any hospital in the island at his convenience and no need of carrying physical reports etc. since his diagnosis history and other necessary data are stored in the system and the doctor who is going to treat the patient can look into them very easily. Moreover most of srilankan people are less concerned about their health and the don't maintain their health records properly. So our healthcare system is a good solution for this also. Therefore we can say our solution contributes to ensure social sustainability.

As discussed in previous parts, our solution indirectly contributes to tackle climate change by reducing paper usage. Reducing paper means saving trees and this reduces most of the environmental problems and helps with keeping environmental systems in balance. Therefore we can say our solution contributes to ensure environmental sustainability.

We can also say our system is cost saving. For example, since all necessary healthcare data is in the system people can go to the nearest hospital to him at that time which saves transport fees and fuel. So this indirectly contributes to economic sustainability.

On the other hand, our healthcare system has characteristics of project sustainability mentioned below.

Adaptability: According to changes or new additions of the healthcare system we can make changes and add new functions to our digitized system.

Implement Ability: Our system is realistic, feasible, attainable, and implementable.

Scalability: Capacity and scope of operation of our digitized healthcare system can be expanded.

Extensibility: We can extend the system through the addition of new functions or modification of existing functions to effect change while minimizing existing project functions.

Maintainability: Defects of our system can be corrected and it can be subjected to changes with new requirements. Future maintenance will also be able to be done easily.

4 Social and Environmental Impact Assessment

4.1 Impact of solution on Climate Change

Digitization of medical records will cause the health sector to reduce the use of paper. This is good for the environment indirectly because, large number of trees are cut down each year to make papers. Therefore, by introducing more digital systems, we can reduce deforestation.

4.2 Research and assessment tools

In order to monitor the impact of our solution on the general public, we will introduce a feedback section in our website/app for the users to directly give their feedback. In addition to that, periodic surveys will be conducted to know improvements the public as well as the health professionals, want to see in our system.

4.3 Risks

The system introduced in our solution handle sensitive personal data of the individuals such as health records, diagnosis, etc. There are a lot of security risks associated with such systems. We are planning to maximize the security of the database as well as user-end applications by introducing robust security measures.

4.4 Stakeholder Analysis

The primary stakeholders of this solution are,

- Sri Lankan Health ministry
- Hospital staff (esp. doctors and nurses)
- Patients
- Private health sector

If the project is to be implemented in public hospitals, the approval and main funding will have to come through the government. If it is to be implemented in private sector alone, the funding will come through their respective governing bodies.

The system will be used mainly by the doctors, who will be facilitated a lot by this solution. In addition, there needs to be a back-office of IT professionals who does the maintenance of the system.

The final stakeholders are the patients (public), who will be registered in the database and they are the end-beneficiaries of this solution

5 Logistics

5.1 Time Frame

Activity	Time Allocated
Initial research	<i>1 month</i>
Initial implementation of a prototype website	<i>1 month</i>
Intermediate testing stage	<i>1 week</i>
Project finalization	<i>2 weeks</i>
Final testing stage	<i>1 week</i>
Total time	<i>3 months</i>

5.2 Pi-Mora and Raspberry Pi related Activities

The members of the team participated in the Pi-Mora activities. Some members are Pi-mora badge holders. But in our current implementation, we have not used the Raspberry-pi.

5.3 Budget Allocation

As the project is only software based, our only expenses in this prototype stage are to buy a fire-base Spark plan subscription. For testing purposes, since we do not need very large cloud storage capacities, we will be able to use the minimum option package of Firebase spark plan, which is free.

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