University of Nairobi

B.Sc. Computer Science

Year 2 Sem 2 Project proposal

SMART HEALTH

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REG NO: P15/142647/2021

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1) Introduction.

a) **Background**.

Health care is an essential need to humans and it should be administered as a right as according to the constitution. It is vital for a government to set up quality health centers that offer quality services to all.

The National Government of Kenya has been very instrumental in the construction of public health centers in urban centers spread across the country. These health facilities act independently where each has its own head/director. It is only in private hospitals with wide spread branches that have interconnection of data and personnel.

The Ministry of Health takes control of management of these public facilities through those heads and gives directives on issues pertaining personnel, equipment, maintenance etc. but the general decision making in this institution rely on the heads.

The management of these public health facilities and all health facilities in general is very important in the development of the health sector. This will improve operations and aid in effective decision making.

b) Problem statement

An integrated health management system which integrates all health sub systems with a health portal is yet to be developed. The Kenya Master Health Facility List has done part of the task by keeping the available and licensed (by the government) names of the health facilities in its database and an ability to see the distribution. But there is one missing piece, the interconnectivity between the medical facilities and the ministry of health. The lack of this connection has brought about:

- Lack of a digitized form of data storage.

- Poor interconnection between medical institutes.
- Poor tracking of medical practitioners.
- Lack of a proper data recording of patient data and case.
- Poor handling of medicine in institutions.
- The ministry cannot access information from all major hospitals and clinics.

c) Objectives.

This project aims to design a system that could:

- Have a digital storage of patient, nurse and doctor data.
- Manage the staff organization in hospitals.
- Keep stock of medicine.

2) Literature Review.

a) Current situation

Currently the government has given licensing to 14193 medical facilities that are widespread all over the country (According to the Kenya Master Health Facility List). The following data shows the medical distribution in the country per county:

Baringo 292
Bomet 204
Bungoma 279
Busia 188
Elgeyo Marakwet 146
Embu 207
Garissa 206
Homa Bay 307
Isiolo 79
Kajiado 390
Kakamega 358

Kericho 277
Kiambu 744
Kilifi 395
Kirinyaga 231
Kisii 284
Kisumu 360
Kitui 443
Kwale 222
Laikipia 219
Lamu 68
Machakos 483
Makueni 353
Mandera 216
Marsabit 144
Meru 583
Migori 329
Mombasa 373
Muranga 382
Nairobi 1292
Nakuru 641
Nandi 253
Narok 222
Nyamira 202
Nyandarua 189
Nyeri 449
Samburu 142
Siaya 290
Taita Taveta 133
Tana River 87
Tharaka Nithi 201
Trans Nzoia 186
Turkana 283
Uasin Gishu 278
Vihiga 152

Wajir 164

West Pokot 177

These medical facilities may have been set up either by the government, through the community, or through professional health practitioners. These health facilities at the moment each act independently from the other. Only form of interconnection is through NHIF (National Health Insurance Fund) and other health insurances as forms of payment.

As per the Health Act 2017, a unified health system was established to coordinate the inter-relationship between the national government and county government systems in order to provide for regulation of health care services through a health care service provider, health products and health technologies. The health sector was put under monitoring of the county through a county executive department (with a County Director of Health) that was in line with the health policy guidelines for setting up a county health system that is answerable to the County Governor and the County Assembly. The county director of health was the technical advisor on matters of health in the county.

The Government (through the Kenya Health Information System) makes annual reports that summarize the objectives of the entirety of a governmental year. These reports highlight the achievements of the year and compares performance (of the set objectives) to the other previous years.

The health facilities are divided into different levels. The levels are:

1. Community facilities – Run by medical clinical officers.
2. Health Dispensaries – run by clinical officers.
3. Health centers – run by one doctor, clinical officers and nurses.
4. County hospitals – run by a director (who is a doctor).
5. County referral hospitals - run by Chief Executive Officers (who are medics by profession) and have big in-patient capacities.

6. National referral hospitals – same as level 5 (county referral) but offer specialized treatments to patients.

b) Role of ICT in Health.

In recent years, health has digitalized some of its functions. Some hospitals practice a digitalized form of data handling through the creation on accounts in their databases. Examples of such hospitals are Aga Khan and Nairobi West. These hospitals encourage patients to sign up at their hospitals before being treated. According to the Kenya Digital Master Plan, the government is planning to create data centers(hubs), install high speed optical infrastructure to health facilities, digitize 5 billion governmental manual records etc. These plans will create opening for the digitization of the health sector.
This opening will suit the operations of Smart health.

c) The previous existing systems.

In the near past, data was mainly handled physically and brought about bulkiness in management. Test for performance of the ministry was mainly done annually with the reports. Only some of the private owned hospitals inculcated digital data management in their operations but were not linked to the ministry of health.

d) What is the need for Smart Health

Smart health is a prospective system that is the bridge between the Ministry of Health and a hospital. Any health practitioner will hold an account in that system

that enables them to have different functionalities depending on the level of authority. The reasons are as follows:

- Since the ministry of health will be the main holder of all information, all hospitals and medical facilities will answer back to the ministry. This allows the ministry to have live and digital data concerning the facilities. Examples of such data is, level of occupancy (number of empty beds), stock of medicine, practitioners on duty, vaccinated children, disabled people etc.
- The ministry of health will be able to access all listed health facilities. This ensures that for any health practitioner who wishes to set up a private facility will have to get the proper licensing before being listed and allowed to practice. This greatly reduces the risk of incompetent or fake practitioners.
- The ministry will also able to track the trend of diseases all over the country since patient data is available to their disclosure. The system will take in data of diagnosis of patients as well as the proposed treatment given by the doctor.
- The ministry of health will also able to see the distribution of practitioners and equipment all over the country. The system will also list hospital equipment as well as their status. This allows the ministry to make informed decisions on how to allocate new equipment as well as medical practitioners.
- The ministry of health will also be able to check authenticity of medical practitioners. The medical personnel will have to fill their details before creating their account and this will allow the ministry go through and validate the papers.

The system will also give additional features as follows:

- Check for availability of spaces in hospitals.
- Store solutions of patient treatment.

- Register new born babies with unique identifications.
- Biometric checkups and vaccinations.
- Doctors can make informed decisions from previous solutions.

3) System analysis and design

a) Methodology

SPIRAL METHOD.

This is a modern method that combines elements of prototyping and linear models. The linear sequences of activities are to be executed in a staggered fashion. The sequence will be in constant loop in developing a part of the application. Each increment may be incorporated with prototyping or complete development of module.

Sequence:

- Requirements
- Analysis
- Implementation and testing
- Evaluation
- Communication

The first increment will entail the core product (the database and the users) addressing the core needs.

This method will prove effective since the program cannot be implemented in one go.

Steps to cover:

- The first time will cover the elicitation and requirement specification.

- A prototype may be developed covering the core elements obtained during the elicitation.
- Each pass through the planning region will cause a change in the project plan.
- Feedback and communication will result in plan revision and adjustment.

b) Implementation

requirements elicitation

Purpose of requirements elicitation

- To get explanations, understand better and explore opinions.
- To get ideas of designing the health system.
- To get the reviews of previous health systems and how it can be improved.
- To get the feel of the previous health system.
- To know the data collected by the system.

Methods used

- Interviews.
- Task observations
- Document analysis.
- Generating scenarios and use cases.

Target Audience of requirements elicitation

- Doctors of different hospitals.
- Citizens of different counties.
- The office of the Minister of Health.

How is the information used

- It is used to design a simpler vetting process.
- It is used to get suggestions of where the system can be efficient.
- To raise the need of an efficient health system.
- To know the data to be collected, its size and how it is stored whether physically or cloud.

c) Analysis

The system is to be built as a database with several users(patient,doctor,minister). Each user has its own features on how they access the database. They all enter their login information in a common portal from which they are redirected depending on the level. The Minister will be able to fully exploit all the data that is available. Doctors can access a portion and the patient/citizen has the least access out of all users.
The following requirements should be included in te operation of the application.

Functional requirements

The functional requirements for a citizen:

- Update any personal data.
- Search for any accessible data (spaces etc.).
- See past visits to hospitals.
- Book appointments with doctors.

The functional requirements of the doctor:

- Update hospital data.
- Assign medicine to patient.

- Store solution to treatment of patient.
- Store results of tests by patient.
- Search through hospital data (available medicine, available space etc.)
- Register new born babies.

The functional requirements for the minister:

- Search through all data.
- Form reports on the data.

Nonfunctional requirements

This section shows any other requirements that the system should hold. The system should have:

- Security – There should be a high level of security of the data held by the system. Only authorized personnel (the minister) can access the secured page on the system.
- Performance and response time – The system should have a high-performance rate when executing user's input and should be able to provide feedback within a short time.
- Error handling – An appropriate error message should be displayed to guide the user on how to recover from an error in case they run into one.
- Availability – The system should always be running for 24 hours, 7 days a week.
- Ease of use – The system should be user-friendly and have a graphical user interface (GUI).

Pseudo-requirements

- The system should be cloud based

- There should be session timeouts.

4) REFERENCES

- Kenya Digital Master plan
- Kenya Community Health Strategy 2020-2025
- Ministry of Health website https://www.health.go.ke
- The Health Act No.21 of 2017
- Action for transparency Health structure and levels of hospitals https://actionfortransparency.org/kenyas-health-structure-and-the-six-levels-of-hospitals-roggkenya/