Developing a Healthcare Framework using IoT for Sultanate of Oman

KawtherAmer Al-shibli, Vimal Kumar Stephen

Department of Information Technology,
University of Technology and Applied Sciences, Ibra,
Sultanate of Oman.

36J1858@ict.edu.om, vimal@ict.edu.om

Abstract

The current developments in diseases have made hospitals need further development in devices and keep pace with the latest devices at the present time, to be of high quality and to preserve the health of the patient. The hospital was visited to measure the effectiveness and quantity of devices available in the hospital. The results show the hospital's need for many high-quality and reliable equipment, so that the patient can live a good healthy life. This paper proposes the development of a healthcare framework using the Internet of Things for the Sultanate of Oman.

Keywords: (IOT) Internet of Thing, Patient ,Diseases.

Introduction

Before the Internet of Things, patients' joint effort with experts was restricted to visits. "Web of things" advances in medical services have added to further developing the day to day work in clinics, particularly in understanding consideration. This reconciliation of clinical gadgets and the accessibility of information trade capacities plays had a significant impact in Keeping patients protected and sound[8], as well as further developing how clinicians convey care Enhance patient commitment and fulfillment by permitting patients to invest more energy collaborating with their doctors. Besides, remote checking of patient wellbeing diminishes the length of stay in the center. The Internet of Things likewise significantly affects the generally lower expenses of clinical consideration and the further improvement of treatment results [1]. The Internet of Things obviously changing the clinical benefits industry by reexamining the gadget space and individuals' cooperation in moving clinical benefits courses of action.

Research Statement:

Learn about the importance of the Internet of Things (IoT) in health care, which has an effective role in the treatment and safety of patients at the present time. The more you know about the most important devices used for the Internet of things, the more you know about the development and growth in hospitals, which Easy application of the Internet of things on the ground. The lack of equipment in hospitals has slowed down work, which hinders the patient from accelerating his treatment. The lack of high-quality equipment that lasts for long periods and is financially inexpensive.

Hypothesis:

- ➢ Is IoT devices support to reduce the processes of Hospital functions?
- ➢ Does the Internet of Things have an impact on health care in Oman?
- ➢ Can the Internet of Things replace human labor?

Assumption:

1- The impact of the Internet of things on the health sector.
2- Full dependence on the Internet of things in health care in the coming years.

3- Giving a more accurate diagnosis to patients and getting better results.

4- Ease of communication between developed countries in health care with other countries and the exchange of experiences.

5- Improving the quality of health care in the country due to the presence of the Internet of things.

Objective:

➢ Implementation of Smart hospital by the help of IoT devices.

➢ IoT devises used in various departments to make decision.

➢ Helping the patient to save their life and used general facilities without need of help form others.

Significance of the Research:

It is helping to modernize the existing IBRA hospital with technological implementation. This will reduce the human work and update the current information. Internet of things technologies in the field of health care have contributed to improving the daily work in hospitals, especially in patient care and safety. By providing devices and others, this integration in medical devices and the availability of data exchange capabilities has played an important role in maintaining patient safety and health.

Scope of the problem:

Since the emergence of the Internet of things in the health sector and its impact on the health sector and how it increases the quality of healthy life. The lack of Internet of things in health care and its development. The aim of the research is to present a report on the development of the Internet of Things in the health sector in the Sultanate of Oman. The scope of the research is limited to a hospital visit, and they will be given some questions about the Internet of Things in healthcare. In this study, they will be asked to complete a questionnaire to determine whether the Internet of Things has affected them significantly or not.

Related work / Literature Review:

The brilliant Medical services framework is one of the critical IOT application that interfaces shrewd sensors, patients, specialists, frameworks. In best way, the IOT brilliant medical services framework has given the likelihood to specialists to screen their patients at a far off area ceaselessly (Mohammad Dawood Babakerkhell, April 2019)web of things (IoT) has become exceptionally fundamental in pretty much every field. Its application in medical care is one of the essential areas of exploration. provides an overview of different aspects of IoT in healthcare. It examines a portion of the significant administrations of IoT medical services and its advantages to the networks at large, (Albesher, February 2019). The Web of Things (IoT) is the organization of actual articles or things inserted with hardware, programming, sensors, and network availability. The Web of Things permits objects to be detected and controlled from a distance across existing organization foundation. The IoT is empowered by the most recent improvements in RFID, brilliant sensors, correspondence advances, and Web conventions. The essential reason is to have shrewd sensors team up straightforwardly without human inclusion to convey another class of utilizations. The ongoing upset in Web, portable, and machine-to-machine (M2M) advancements should be visible as the principal period of the IoT (B. Sobhan Babu, 2016)In this paper the creators attempt to give a sensible, subjective assessment of IoT-driven eHealth from hypothetical and down to earth perspectives. They take a gander at related information the board issues also, commitments of IoT to eHealth, alongside necessities, advantages, restrictions and section obstructions. Significant consideration is given to security and protection issues. (Lokshina, 2018). We should know about and execute recent fads in canny social wellbeing frameworks fueled by the Web of Things (IoT). Reasonable turn of events, energy proficiency, and general wellbeing are interrelated boundaries that can change a framework or a climate to support individuals and the planet. The coordination of sensors and shrewd gadgets ought to advance energy proficiency and guarantee that supportable advancement objectives are met. (Ángeles Verdejo Espinosa, March 2021)

Author	Title	Goal	Method	Result	Future direction
Mohammad Dawood Babakerkhell, April 2019	Investigation of Different IOT Based Healthcare Monitoring Systems.	the patient continuous healthcare monitoring system	Experiment method to monitor heartbeat, temperature and blood pressure	to access patients record through smart phone	Limited organs only like Heart, BP, Temprature
Albesher, February 2019	Progresses in the Development of Smart Cyber-Physical Ubiquitous Environments	overview of different aspects of IoT in healthcare	Studied and classified	Continuous transformation, growth and innovation of new devices	No soultionsto wards the challenges
B. Sobhan Babu, 2016	IoT for Healthcare	the IoT should associate arranged advances to engage new applications by partner genuine things together on astute free course.	Experimental method used IoT for healthcare applications.	Health problems are easily predicted at the beginning stage based on IoT healthcare system	qualitatively different lifestyles from today.
Lokshina, 2018)	A Qualitative Evaluation of IoT-driven eHealth: Knowledge Management, Plans of action and Opportunities, Deployment and Evolution	qualitative evaluation of IoT-driven eHealth from theoretical and practical viewpoints	Qualitative analysis	The Internet of Things in the dissemination of e-health and evolution	To carry it back in a state of harmony with clinical and mechanical improvements in a modern cutting edge viewpoint, and to get perceived and get opportune the advantages.
ÁngelesVerdejo Espinosa, March 2021	Use of IoT in Healthcare: Keys to Implementation of the Sustainable Development Goals	Are IoT applications key to the improvement of individuals' wellbeing and the climate?	mixed approach, in which a literature review, case studies, and real projects	Integrating sensors and smart devices enhances energy efficiency	It is important to develop and additionally investigation into detecting advances also, IoT applications, as it gives data, information the executives and constant Further developing medical care arrangements.

Table 1.1: Comparison of Literature Review

Research Methodology and Method:

Experimental method based on the Input that was collected from the hospital. This data is helping to prepare a framework for the implementation required IoT devices in this hospital. This will help the hospital management to make smart hospital.

System model:

I have prepared an system model for the implementation of IoT on regular activities to minimize the human interactions as shown in the figure 1.
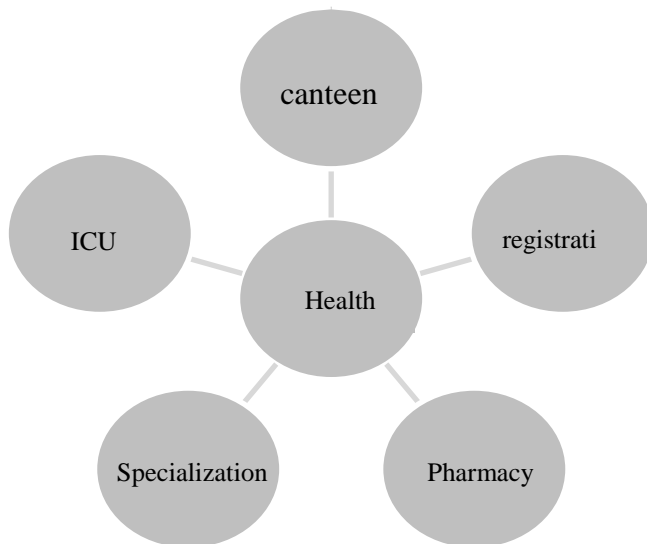

Figure 1: System model for the implementation of IoT

Implementation of IoT:

IoT devices are used in various departments to minimize the activities of the workers and improved treatment to get patient in the domain of pharmacy, registration, specialization, ICU and canteen.

➢ **Pharmacy**:

Currently Pharmacy people are maintain their stock in manual, there is no monitoring system to maintain the availability of moving medicines[10]. We have a problem with the pharmacy running out of medicine, and it hinders the patient from receiving the medicine, so it is possible to find a solution to get rid of the problem by inventing a device that limits the amount of medicine remaining. When the drug is running out, it sends a notification alerting that the drug is running out.

➢ **Registration**:

It is possible to put a screen to count the number of patients visiting the hospital, and through it the building will be expanded. It will be giving idea to the management to increase or decrease the general facilities like water, canteen, toilets, safety measurements (Coivd19), etc. Also used to prepare a budget for the above said management activities. The management can do analysis on gender, Age, Place, etc. If more people/ patients are from one place, it will help to open a branch at their location. This will help them to take treatment in their place and save people life from death/ sick.

➢ **Intentional Care Unit (ICU):**

An emergency is every situation that poses an immediate threat to health or life, and most emergencies require urgent intervention with the aim of treating without aggravating the situation[6].It is important to have effective devices for these cases, and one of the most important of these devices is the feeder, but there is a problem facing the feeder, which is that the nutrients draw blood from the human body when the fluid is drained from it. The feeder, and in order to solve this problem, we put a sensor or a device that closes the feeder after the liquid is finished from the feeder.

➢ **Canteen:**

The restaurant in the hospital is very important for the patients who are there and some of its facilities should be upgraded. In order to develop and keep abreast of the latest devices[3], it is possible to put a device for the account in addition to the surveillance cameras. This will help the employee in performing his work in an orderly manner and there will be smooth work and in the purchasing process and avoid problems and crowding.

➢ **Specialization:**

Implementation IoT on specialization will help the patient to take treatment from the particular department or

doctor. During their registration ,they have to explain the symptoms of their disease. The device will advise to meet specialized doctor. This will help rural people to take appropriate treatment without help of others. Also, To minimize the wrong suggestions and improve to get right treatment at right time for the patients. The patients are distributed to the specialist based on the symptoms.

Research design:

• an exploratory study.
• Data source: Hospital Staff
• Research tools: Interview/ Observation.

This study will look at how the health sector is developing using the Internet of Things and how it affects the quality of health care.

Data collection:

I have visited my nearest hospital and using data collection based on interview and observation, the following details are existing in that hospital.

- **Pharmacy:**

used two computers for billing, they have to check the database to identify the minimum level of the medicine for further purchase. Therefore, it is recommended to implement an IoT device to monitor the medicine level to send notification for further purchase[7].

- **Registration:**

Several devices are used to measure pressure and others, but it is possible to put a screen to calculate the number of patients who come to the hospital to contribute to knowing the number in order to expand or reduce the buildings and thus develop a plan for the hospital budget.

- **Intentional Care Unit (ICU):**

One of the most important departments, as it receives emergency cases, and it is important to have the latest equipment in it. Including the feeder, which is one of the most important. For the safety of patients, a sensor or a small device must be placed that closes the feeder's path at the end of the medicine in the feeder so that the blood is not drawn

into the feeder and the situation becomes opposite to the patient.

- **Specialization:**

There are several departments in the specialization in order to speed up the knowledge of the appropriate department for the patient's condition. It is recommended to put a device that diagnoses the patient's condition and directs him to the appropriate department for his illness without resorting to others, and this will reduce the time and facilitate the process of receiving treatment faster, and the diagnosis will be much more accurate than other methods[5].

- **Canteen:**

No device has been used in it, but the purchase process is done in the old, traditional way. Therefore, I recommend the use of Internet of Things devices to facilitate the purchase, organize the process and be more flexible. Through it, the customer receives his order easily and avoids crowding in the place.

Analysis:

Table 2: Available automation devices

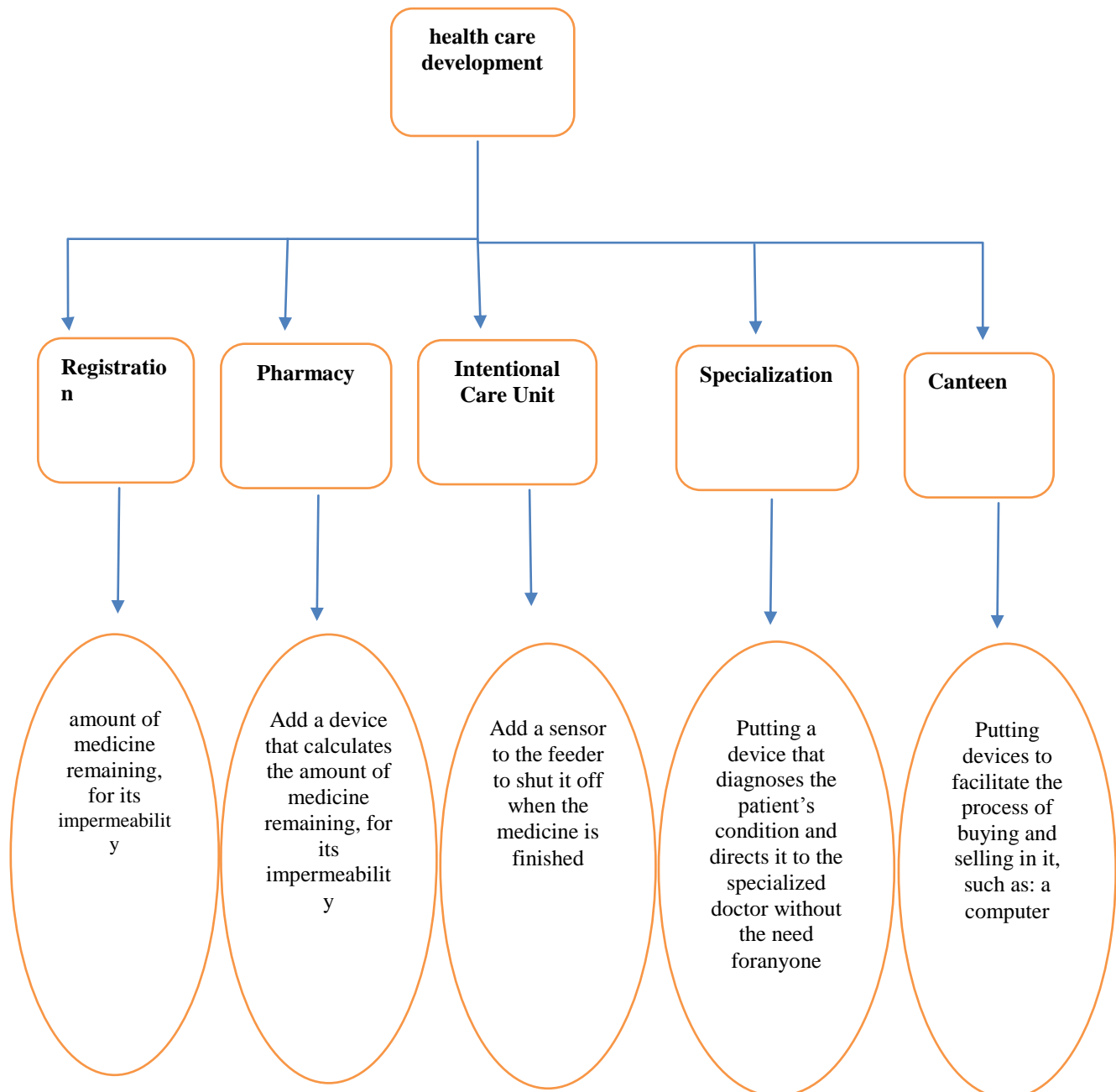| Sl No	Available	Need to implement
Pharmacy	2	5
Canteen	0	2
Registration	4	7
Specialization	8	11
ICU	5	10

Implemented Framework:

Figure 2: health care development

- This figure shows the development in health care, and the most important devices that can be placed in some sections, which would modify and improve these sections and make them more efficient and work better.
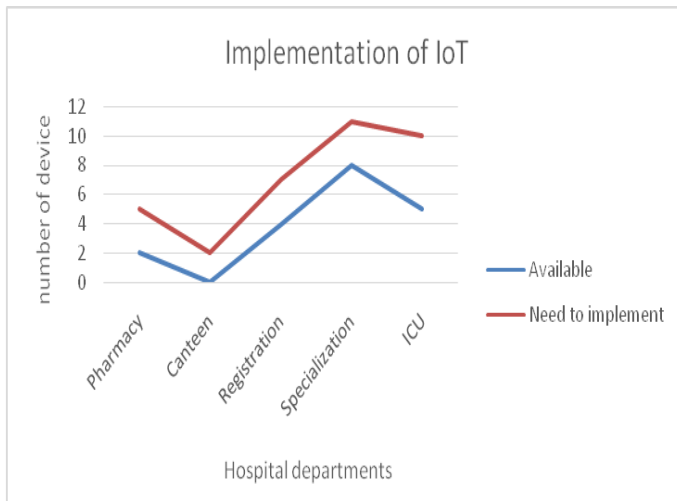

Figure 3: Chart Implementation of IoT

This graph contains the hospital departments, the number of devices available in it, and the number of devices to be added to it.The pharmacy contains 40% of the number of available devices, and 60% of the number of devices to be added to it.The number of devices to be added to the canteen is 100%, compared to 0% of the existing devices.57.1% of the devices available in the registry while 42.9 of the number of devices to be added to the section. The specialization sections contain 72.7% of the number of available devices, but 27.3% of the number of devices to be added to it.The number of devices to be implemented is 50%, while 50% of the number of devices available in Intentional Care Unit .

Findings:

I have noticed that there are few devices in hospitals and it is important that they are available in abundance in hospitals, which in turn diagnose and treat the patient to live in a good health condition.I concluded that the greater the number of devices in hospitals, the better the patient's life will be, the faster the diagnosis and the faster the discovery of diseases, and from the doctors' point of view, the easier it is for them to treat accurately and with fewer errors.

Recommendations:

This study provides a wide range of potentially important beliefs about the development of the health care framework. So I hope, there will be other devices to be included in future research that include other departments in the hospital.

Conclusion:

The Internet of Things in health care raises the level of medical services, It helps doctors and health care providers to detect and follow up patients' cases with high accuracy and credibility. The study looks at developing a healthcare framework using the Internet of Things for the Sultanate of Oman and making it more efficient and high quality, making the patient in the best health condition, protecting patients from serious diseases, and treating them quickly and without significant financial cost. And be a society with a good healthy framework. To study with this development.

Future Work:

My future plan is to search for more efficient devices that will make hospitals more quality and to make the patient enjoy the best healthy life. I hope that the experts will take into consideration the importance of developing these devices and their quality and working to provide them in a larger number.

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