CLIENT TO SERVER DESIGN APPROACH, COVID 19 TESTING AND ISOLATION MANAGEMENT SYSTEM: A CASE OF DR JOHN GARANG INFECTIOUS DISEASE UNIT JUBA SOUTH SUDAN

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ABSTRACT

The purpose of the study was to Design and Develop a Secured Health Information System, the research looked at managing infectiologists and their daily interactions with covid 19 patients, testing and isolation process. When Covid 19 was bitterly spreading at a high rate, there was great fear among Health practioners and hence management of growing number of patients turned to be a dilemma, this prompted the researcher to investigate and offer a solution to the problem.   The Researcher deployed a quantitative research design technique, as it produces objective data that can be clearly communicated through statistics and numbers since the area of interest focuses on statistics.

From the survey which was conducted, findings show that, 54.2% of the population has described the current system as 'poor', 37.5% described the system as 'fair', and 8.3% has described it as 'good'. which is a clear indication of an ineffective management of, infectiologists, daily activities, and patients' system, there was a need to develop a secure and effective health information system to collect new information, store, retrieve and process. This system was designed specifically to support the giant medical facility in decision making, proving services and keeping people safe as far as covid is concerned. The project was built using PHP as the server-side language, MySQL database as the backend of the web-application and html, CSS, front-end JavaScript and bootstrap framework which formed A responsive, aesthetic and accessible user-interface for managing covid 19 patients, infectiologist, testing, and beds. The project was designed in a such way that the user interface changes dynamically according the status of the infectiologist, staff and patient.

Introduction

Coronavirus disease (COVID 19) is a communicable respiratory disease caused by strain of coronavirus that causes illness in humans coronavirus was first discovered in the city of Wuhan China, the world health organization declared the outbreak as a public health emergency of international concern on 30 January 2020. The first case in Africa was reported on 14th of February 2020. On April 5th 2020 , the ministry of health of the Republic of South Sudan reported the first case of covid 19 , the patient was a 29 years old female who returned from Netherlands on 28th of February 2020 via Addis Ababa, Ethiopia. The number of confirmed cases of covid 19 in South Sudan lately reached 17,780 confirmed cases and 138 deaths. Dr. john Garang Infectious Disease Unit was officially opened on 20th December 2018 as part of the National Emergency preparedness and response to an Ebola outbreak in the Democratic Republic of Congo. But as number of covid 19 cases begun to increase the Facility was redesigned and equipped to enhance supportive care. Its currently the hallmark of treatment for covid 19 patients and prevention of environmental contamination. The Healthcare field has been enabled by technological progress, which has supplied them with improved tools to help them operate more efficiently. The "covid 19 testing and isolation management System" aims are to automate the recording, storing, and retrieval of patients' data at Dr. John Garang infectious disease unit juba South Sudan. The implementation of this system is a superior approach that will ensure that patients' information is kept accurately and safely. Every day, hospitals are swamped with paperwork. The higher the stack of medical records to maintain grows as the number of patients grows. The patient's information is kept private and serves as a valuable resource for future patient consultation. Patients' information is traditionally kept on paper and retained in physical storage. This method is obsolete and inefficient. Records are prone to errors, are easily misplaced, and retrieval takes a long time. Health care's' response times to patient requirements and questions will be slowed by the existing system of records administration. The necessity to address this problem and improve health care's records management operations has become even more pressing.

Literature review

The global pandemic caused by the deadly disease known as COVID-19 is a new respiratory infectious illness also called Coronavirus reported

on December 31 by the World Health Organization WHO (2019). It is a global health emergency issue that put the entire world into despair. The disease spread mainly through humans when they come close to each other (about 6 feet) and another through respiratory droplets from an infected person's cough or sneeze. Though many researchers, scientist is putting in their best to ensure that the treatment of this deadly disease is discovered. Furthermore, it was also identified that the symptoms of the disease include: Fever, Cough and Shortness of breath or difficulty breathing. World governments are at work to establish countermeasures to stem possible devastating effects. Health organizations coordinate information flows and issues directives and guidelines to best mitigate the impact of the threat.

Information Systems in Fighting COVID-19 Infectious Disease

Boell, S.K. and Cecez-Kecmanovic, D. (2015) noted that information systems (IS) involve a variety of information technologies (IT) such as computers, software, databases, communication systems, the Internet, mobile devices and much more, to perform specific tasks, interact with and inform various actors in different organizational or social contexts. Of general interest to the field of IS are therefore all aspects of the development, deployment, implementation, use and impact of IS in organizations and society Orlikowski, W.J. (1992). In respect to the role information system plays in providing a platform for the diagnosis, treatment, tracking, reporting and retrieving of related information's on the infectious disease called COVID-19. In this research, the researcher noted that information system (IS) is used by various IT organizations like Apple and Google as reported by Stan Horaczek, S. (2020) designed a contact tracing system using a mobile phone Bluetooth to track infected persons with COVID-19 shown in Figure 2 below. The companies designed the application in a way that enables public health organizations to keep track of everybody that users of the application come into contact with in a day. Therefore, if someone with whom the user comes close with finally test positive after diagnosis, then the application will alert the user so as to take appropriate action. On the same hand, the Centers for Disease Control
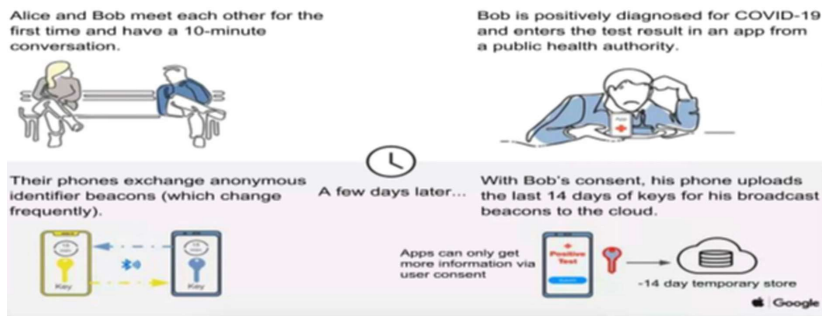
Figure 1. Diagram Demonstrating the use of ICT in fighting Covid Virus.

Apple and Google coronavirus tracking system into iOS and Android (Source: Brandom, R. and Robertson, A. (2020) and Prevention Centers for Disease Control and Prevention (CDC-2020) of United State of America has activated the Emergency Operations Center (EOC) which could assist the public health partners in replying or providing answer as they come in on the corona virus pandemic first acknowledged in Wuhan, Hubei Province, China. The organization tends to use their website to monitor the effects of this COVID-19 pandemic by updating their website on a daily bases as information comes in. Furthermore, Bio-Rad (2020) designed its blood-based serology immunoassay kit which could help to diagnose SARS-CoV-2 (Virus that cause COVID-19) by analyzing a patient's immune system and hence watch it response against COVID-19 infectious disease and their platform could be operated manually or automated. In respect to the fight against COVID-19, China adopted some technologies like artificial intelligence (AI), big data, cloud computing, blockchain, and 5G which help to improve the efficiency and management, monitoring, virus tracking, prevention, control, treatment, and resource allocation of the epidemic as reported Qi, X.X. (2020), some of the designed technologies includes: automated genome wide testing and analysis platform, temperature measurement technology based on computer vision and infrared technology used in checking body temperature in a contactless, reliable, and efficient manner, big data was used for prediction and early warnings of the disease, analyzing the flow of people and the distribution of materials and designing of Big Data Migration Map which allow people to use their phone to check for the migration trend of the Chinese mainland from the start till date, cloud computing was made free by Alibaba Cloud for public research

institutions around the world for free to accelerate the development of new pneumonia drugs and vaccines, Online-Class was in high demand Youku and Ding Talk (an all-in-one platform under Alibaba Group) which allow students to attend class at home. The virtual and secured learning environment was equipped with adequate convenient learning tools, in the other hand, blockchain technology also help to provide maximum security towards making sure that data lose and alteration was not witnessed, and information tracing on corona virus within and outside the country is identified and aborted. In the aspect of 5G, it was used in providing assistance towards management of this deadly pandemic; 5G was used to create live-streaming video and telemedicine systems, remote clinic consultation systems are developed in China and used in total fight against this disease Qi, X.X. (2020).

Research Questions

1. What is the relationship between the impacts of covid 19 and medical workers?
2. How can the new designed and implemented system improve on the medical services to patients?
3. What parameters can be put in place to ensure confidentiality of information and other services of patients?

Methodology

In this study the researcher deployed a quantitative research design technique. the quantitative method has been used because it produces objective data that can be clearly communicated through statistics and numbers since my area of interest focuses on statistics (Gray, 2009). The sample size of the study was determined using Krejcie and Morgan (1970)'s table to select respondents. According to Krejcie and Morgan tables (2010) out of the total population of 90 respondents, the researcher used a sample size of 73 respondents who participated in the study as shown below.

Table 1 Sample size distribution

Population category	Target Population (n)	Sample (S)	Sampling technique
Medical workers	5	3	Purposive samples
Administrators	3	1	Purposive sample
Patients	25	20	Simple random samples
phlebotomist	7	1	Purposive sample
Total	40	25	

A study sample comprised of part of the items of the study population. It is part of the total population studied that took and considered for the study in order to make conclusions about the entire population (it is a representation of the population) from which generalization are made about the entire population (Russell, 2011). Simple random sampling and purposive sampling techniques were used in this study, as indicated in table 1 above.

PURPOSIVE SAMPLING

After choosing the targeted population the researcher used the objectives of the study to find people who can and are willing to provide the information by virtue of knowledge or experience (Bernard 2002, Lewis & Shep¬pard 2006) therefore purposive sampling was use on the key informants who knowledgeable and willing to share their knowledge (Bernard 2002, Campbell 1955, Seidler 1974, Tremblay 1957).

According to the American statistical Association (1999) Purposive sampling is used to select only those respondents considered to be key and resourceful in providing required data. The purposive method of sampling was used to gather data from the management and employees of the facility.

SIMPLE RANDOM SAMPLING
AFTER DEFINING THE POPULATION OF INTEREST, THE SAMPLING PROCESS INVOLVED SELECTION OF INFORMANTS RANDOMLY FROM THE POPULATION OF INTEREST WHICH REPRESENTED THE WHOLE POPULATION THE RESEARCHER USED RANDOM SAMPLING TO GIVE ALL PATIENTS CHANCES OF PARTICIPATING IN THE RESEARCH, TYPICALLY TO FACILITATE GENERALIZATION FROM THE SAMPLE TO THE POPULATION (SHADISH, COOK,&CAMPBELL,2002).THIS METHOD WAS SELECTED BECAUSE IT'S ALSO PREFERRED FOR DATA COLLECTION AS IT MINIMIZES THE BIAS ON THE SIDE OF THE RESEARCHER WHILE SELECTING RESPONDENTS (MAXWELL, 2005).

Findings, Discussion and Recommendation
Dr john Dr Garang infectious disease unit is one of the modern and equipped infectious disease centers in the country, however the system that handles testing and isolation processes within the facility is ineffective. Based on a survey carried out on both medical workers and patients 54.2% of the population have described the current system of testing and isolation as 'poor', thus 37.5% has described the system as 'fair' and only 8.3% has described it as 'good' which a clear indication that the current system is ineffective. The results are shown in the below table. Participants were asked to describe the current system using the following words (good, fair, poor) where the majority have gone against the workability of the system. There was a need to develop a system to collect new information from an emergency preparedness perspective This system was designed specifically to support the giant medical facility in decision making, proving services and keeping people safe as far as covid is concerned.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	fair	9	37.5	37.5	37.5
	good	2	8.3	8.3	45.8
	poor	13	54.2	54.2	100.0
	Total	24	100.0	100.0	

Discussion

This study assessed the design, use, improvement and achievement of covid 19 testing and isolation management system, since covid 19 is an infectious disease which spread at a faster rate, and the current system allows gathering of patients from different locations, the study manage to come up with a solution in a such way that patients are registered and managed electronically, in addition test documents and results are received online. This way the risk of the virus spreading will be significantly decreased. The system was designed in a way that detailed and complete data will be produced about individuals which facilitates the process of tracking incase of any change in status.

Recommendation

Based on the nature of the pandemic and its impact on health information systems it's important to focus on this study for future research and the health information system. The pandemic has caused an immense impact on the hospitals systems, business, schools and the economy. (Chavez & Kounang, 2020; Loh & Fishbane, 2020; Young, 2020). the quick transition to telehealth, telework and online education in response to the corona virus threat is a reminder that digital technology brings many benefits, and can play an essential role in managing and reducing the risks caused by the lockdown during the pandemic even after the pandemic (Richter, 2020). Therefore, the researcher recommended the health facility's management to consider this study and adapt the proposed system for improved and reliable services for patients

Conclusion

Information needs during public health emergencies are different from routine health monitoring, and existing HIS were developed to serve the latter (Sittig DF, Singh H. 2020). The pandemic prompted a greater need for accurate and timely epidemiological data on various topics, to understand the impact and plan for an adequate response (He.w,et. al, 2021). this study intended to develop a secure health information system which helps workers, administrators in achieving a successful way of handling data at Dr john Garang infectious disease unit juba South Sudan. When the covid 19 testing and isolation management system is adapted it's expected that data handling and trucking of patients will greatly improve.

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