DESIGN AND IMPLEMENTATION OF A CLINIC SCHEDULING TIMER USING ROUND ROBIN SCHEDULING ALGORITHM

BY

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FACULTY OF PHYSICAL SCIENCES,

UNIVERSITY OF BENIN,

BENIN CITY

JULY, 2021

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A PROJECT SUBMITTED TO THE DEPARTMENT OF COMPUTER SCIENCE,

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UNIVERSITY OF BENIN, BENIN CITY.

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CERTIFICATION

This is to certify that the project titled “design and implementation of a clinic scheduling timer using round robin scheduling algorithm” was carried out by **XAVIER JOSHUA AKPAN** with matriculation number **PSC1607209** of the Department Of Computer Science, Faculty of Physical Sciences, University of Benin, Benin City, Edo State, under the supervision of Prof (Mrs.) F.A. Egbokhare.

_____ _____

PROF (MRS.) F.A. EGBOKHARE. **DATE:**

(Project Supervisor)

APPROVAL

This project work is hereby approved in partial fulfillment of the requirements for the award of Bachelor of Science degree (B.Sc) in computer science from the university of Benin, Benin City.

_____ _____

PROF. F.I. AMADIN **DATE:**

(HEAD OF DEPARTMENT)

DEDICATION

This project work is dedicated affectionately to god almighty for strength, wisdom and divine favour upon me.

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Firstly my profound gratitude goes to God Almighty for his strength and wisdom for making this work a success.

I am sincerely grateful to my supervisor Prof. (Mrs) F.A Egbokhare who patiently went through my work at each stage making corrections. Her patience and guidance saved me a lot of errors and enhanced the exposition of my work.

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ABSTRACT

Globally, health care sector is the pivot and integral part of human lives. Thus, any error committed in the clinical services might leads to defect or termination of life. Recently, information and Communication has been used extensively to improve the various operations and services in the field of the health care service. Patient appointment scheduling with the Doctor is one of the clinical services that have been automated. In developing counties like Nigeria, the clinical system is faced with plethora of issues. These include: long waiting of patient, queues, congestion of patient over a long period of time without been attended to.

This paper focuses on developing a system to improve upon the efficiency and quality of delivering. The proposed algorithm eliminates the manual system of registration and its drawbacks, by implementing a simple round robin (RR) architecture in real time system which introduce a concept of assigning different time quantum to different rounds of RR scheduling algorithm. functionalities of registration of patient data in the database and scheduling of patient. The system is designed to enable a more efficient patient clinic section with an improved organization setting by maximizing the throughput. Minimize the time between a patient and doctor, the time spent in the waiting queue will be minimized. minimizing response to a patient, increasing the number of patients attended to and also Improve work efficiency.

CHAPTER ONE

INTRODUCTION

The current health care landscape desired efficiency and patient satisfaction for optimal performance. The outpatient of most clinics in developing countries are faced with plethora of issues. These include: overtime for doctors and nurses during clinic sessions, long waiting time for patients, and peak workloads for counter personnel. The quality of health care delivery has been threatened by overtime and peak work load.

health workers can help alleviate workforce shortages. They are individuals who have been trained to deliver specific health care services, or to undertake surveillance and treatment for communicable or noncommunicable diseases. They usually come from the communities that they serve, thus providing a potential bridge to community engagement efforts. Health workers can overcome cultural and linguistic barriers, whilst expanding access to care and providing new forms of employment. Evidence shows that health workers are capable of delivering safe and effective care for childhood illnesses, reducing the spread of communicable and noncommunicable diseases, promoting nutrition, and providing family planning services, at low cost Merten et al (2010).

The appointment system is common practice in Primary Health Care (PHC) clinics in the United Kingdom, and other Western countries Cardew (1967). Its value in general practice is obvious particularly in the planning of the daily work schedule. Needless to say, an efficient appointment system encourages more organized attendance and better care for chronic and other cases where follow-up is important Arbers and Sawyer (1982). The appointment system in the PHC setting is perceived as an indicator of good quality service by providers and consumers. Campbell et al (2005) The system contributes positively to the appointment of the in improving accessibility of patient and consequently their satisfaction Al-Omar (2000). Locally, the importance of an appointment system in PHC has been recognized not only for

administrative and organizational advantages, but also as a means of improving the quality of patient care. Tawfik (1994).

1.1 BACKGROUND STUDY

Globally, health care sector is the pivot and integral part of human lives. Thus, any error committed in the clinical services might leads to defect or termination of life. Recently, information and Communication has been used extensively to improve the various operations and services in the field of the health care service. Patient appointment with the Doctor is one of the clinical services that have been automated.

A comprehensive system of care allows people to access a continuum of care across their life course, comprising health promotion, disease prevention, diagnosis, treatment, disease management, rehabilitation, emotional and spiritual support, and palliative care.

Healthcare providers are motivated to reduce operation cost while improving the quality of service. This has given rise to preventive medicine in order to avoid disease, lessening the demand for emergency department and hospital stays for sick people. The importance of Patient Scheduling cannot be underestimated in the health care delivery landscape.

Patient scheduling is a complex process that performs a crucial role in health care. Patient scheduling performs several functions, from allocating resources to patients in need of exams and allocation of surgery rooms to on-demand appointment scheduling with Family Doctors working at Primary Care clinics. A good appointment scheduling system encourages patient and physician satisfaction, and as such, is an important component of healthcare Taveira-Gomes (2017). The efficiency of health care delivery hinged solely on the effectiveness of the Patient scheduling system. it reduces medical error among practitioner and also reduce the number of unsatisfied patients.

Appointment systems have been extensively used to reduce patient waiting times and waiting-room congestion Cayirli and Veral (2011). Such systems have the potential to increase access to medical

resources while reducing cost, as well as staff and patient dissatisfaction derived from unmet schedule constraints.

Clinical scheduling has a problem of assigning appointment seeking patients to time slots, and even at that most patient still do not get the necessary satisfaction need. An operational or service approach called Round Robin is introduced as a means of allocating time slice (typically, 20, 30, 35, or 40 minutes) to patient as a means of reducing congestion, waiting time, and overtime.

1.2 STATEMENT OF THE PROBLEM

The current health care landscape desired efficiency and patient satisfaction for optimal performance. The outpatient of most clinics in developing countries are faced with plethora of issues. These include: long waiting time for patients, congestion and peak workloads for counter personnel. The quality of health care delivery has been threatened by overtime and peak work load.

It has been observed that to receive medical treatment in most of our hospitals, the patients queue up for several hours from one unit of the hospital to another starting from obtaining a new hospital folder, or retrieving an old one before consulting a doctor, to the laboratory unit for lab test then to the pharmacy to get the prescribed drugs and so on. With the manual processes involved in handling the patient most of them waste the whole day in the hospital. Very often, patients leave their homes very early in the morning in order to be among the first group to see the doctor. Otherwise, they may end up wasting the whole day without due attention.

1.3 Motivation of Study

The use of costing system in Hospitals is limited. The Ministry of Health requires hospitals to manage themselves with the aim of decentralizing health care services and increase their quality Liliana et al (2014). However, the general outpatient department (GOPD) of the university of Benin teaching hospital has no system to monitor patient satisfaction with hospital bills and the overall well-being of the patient, as outpatient wait over a long period of time without been attended to. This study is motivated to develop

a decision system to manage the general outpatient department (GOPD) of UBTH in terms of hospital time management.

1.4 AIM AND OBJECTIVES OF STUDY

The aim of this study is to develop a scheduling timer using Round Robin scheduling algorithm to minimize patient wait times, maximize resource utilization and improve patient satisfaction.

The objectives of this study are to:

(a) Design a web-based scheduling timer system for the GOPD department in the University of Benin Teaching Hospital (UBTH).

(b) Implement the design

1.5 METHODOLOGIES

The structured systems analysis and design (SSAD) methodology will be adopted in this project.

1. Requirement analysis of the system
2. Design and development of the proposed system
3. Testing
4. Implementations using specific tools like HTML, CSS, JAVASCRIPT, PHP, MYSQL and XAMPP Server.

1.6 SCOPE OF STUDY

The documentation of the project scope explains the boundary or limitation of this project.

This research is for analyzing and discussing a web-based scheduling timer system to manage medical health care information such as:

a. Patient information: personal patient information, patient consultations history, patient appointments, confirming the appointment online, patient documents and details.

b. Doctors' schedule information, specialty, consultation fee.

c. Doctor can observe patients' information based on consultation history for each appointment.

The scope of the project is limited to the University of Benin Teaching Hospital specially for the general outpatient department at the hospital.

1.7 LIMITATIONS OF THE STUDY

In the course of this study, a major constraint experienced was that of time factor and insufficient finance. Others include the inevitability of human error and bias as some information were obtained via interpersonal interactions, interviews and research, making some inconsistent with existing realities or out rightly incorrect.

Great pains were however taken to ensure that these limitations are at their very minimum and less impactful on the outcome of the work.

1.8 Definition of terms

(a) HTML means Hyper Text Markup Language
(b) CSS means Cascading Style Sheet
(c) MYSQL means My Structured Query Language
(d) PHP means Hypertext Preprocessor
(e) XAMPP means Cross Apache MYSQL PHP (Hypertext Preprocessor) and Perl Programming.
(f) Inpatient means a patient admitted in the hospital
(g) Outpatient means a patient who visit the hospital regularly for treatment from home
(h) Web based- The entire application is implemented using web technologies
(i) Web Enabled – Key part of an application like a database remain on a legacy system but the application can be accessed from a web-based component and displayed on a browser.

CHAPTER TWO

LITERATURE REVIEW

2.1 THE CLINIC SYSTEM IN NIGERIA: AN OVERVIEW

Patients and healthcare services in Nigeria, as one of the low-to-middle-income country (LMICs), typically encounter or face a dual health burden from communicable diseases such as tuberculosis, hepatitis B, influenza, HIV/AIDS, and other highly infectious diseases, as well as non-communicable diseases.

Poor healthcare facilities, a lack of or insufficient money, and poor policymaking and implementation are all factors that contribute to underinvestment in the Nigerian healthcare system. These issues, among others, contribute to the Nigerian healthcare system's failure. *Akunne, et al (2019)*

The provision of healthcare in Nigeria is a joint responsibility of the country's three levels of government. Rais Akhtar (1991) In the delivery of health care, private healthcare providers have a noticeable role. Traditional medicine (TM) and complementary and alternative medicine (CAM) have been increasingly popular in recent years.

Healthcare delivery in Nigeria has experienced progressive deterioration as a result of weakened political will on the part of successive governments to effectively solve a number of problems that have long existed in the sector over many years. This directly impacts the productivity of citizens and Nigeria's economic growth by extension. Over half of Nigeria's population live on less than $1.90 a day ('Poverty Head-count'), making them one of the poorest populations in the world. As of February 2018, the country was ranked 187 out of 191 countries in the world in assessing the level of compliance with the Universal Health Coverage (UHC), as very little of the populace are health insured, whereas even government provision for health is insignificant. Out-of-pocket payments for health causes households to incur huge expenditure. Private expenditure on health as a percentage of total health expenditure is 74.85%.

The implication of this is that government expenditure for health is only 25.15 percent of all the money spent on health all across the nation. Of the percentage spent on health by the citizens (74.85%), about

70% is spent as out-of-pocket expenditure to pay for access to health services in both government and private facilities. Most of the remaining money spent by citizens on their health is spent on procuring 'alternatives' which cost a lot. Nigeria has better health personnel than most other African countries. However, considering its size and population, there are fewer health workers per unit population than are required to provide effective health services to the entire nation. Sadly, the most commonly advertised reason is the 'brain drain' of health professionals to other countries, especially in Europe and America. *Business Day (28 January 2019).*

The federal government's role is mostly limited to coordinating the affairs of the university teaching hospitals, Federal Medical Centres (tertiary healthcare) while the state government manages the various general hospitals (secondary healthcare) and the local government focus on dispensaries (primary healthcare), (*"Federal Medical Centre Abeokuta: A Case Study in Hospital Management"*) which are regulated by the federal government through the NPHCDA.

The total expenditure on healthcare as % of GDP is 4.6, while the percentage of federal government expenditure on healthcare is about 1.5%. Ronald (1993). A long run indicator of the ability of the country to provide food sustenance and avoid malnutrition is the rate of growth of per capita food production; from 1970–1990, the rate for Nigeria was 0.25%. Ronald (1993) Though small, the positive rate of per capita may be due to Nigeria's importation of food products.

2.1.1 Health insurance

Historically, health insurance in Nigeria can be applied to a few instances: free health care provided and financed for all citizens, health care provided by government through a special health insurance scheme for government employees and private firms entering contracts with private health care providers , Ronald (1993) . However, there are few people who fall within the three instances; as at 2015 less than 5% of Nigerians have health insurance coverage. (*"Nigeria's new government and public financing for universal health coverage"*)

In May 1999, the government created the National Health Insurance Scheme, the scheme encompasses government employees, the organized private sector and the informal sector. Legislative wise, the scheme also covers children under five, permanently disabled persons and prison inmates. In 2004, the administration of Obasanjo further gave more legislative powers to the scheme with positive amendments to the original 1999 legislative act. (Felicia Monye). The number of Nigerians covered by the National Health Insurance Scheme (NHIS) since its establishment are 1.5 percent of the population. In 2017, the House of Representatives Committee on Health Care Services in Abuja, organized a two-day investigative

hearing; where the Minister of Health Isaac Folorunsho Adewole said that the sum of N351 billion had been expended on health management organizations (HMOs) so far without commensurate result. *Ovuakporie* et al (2017).

2.1..2 Bone marrow surgeries

A new bone marrow donor program, the second in Africa, opened in 2012, *McNeil* (2012). In cooperation with the University of Nigeria, it collects DNA swabs from people who might want to help a person with leukemia, lymphoma, or sickle cell disease to find a compatible donor for a life-saving bone marrow transplant. It hopes to expand to include cord blood donations in the future. *McNeil (2012), Onogu (2016)*.

2.1.3 Cancer care

About 80,000 Nigerians die of cancer annually and over 100,000 are diagnosed with cancer annually, *Onogu (2016)*. More people are dying of cancer in Nigeria because cancer and Non-Communicable Diseases (NCDs) are not given priority in the country's health budget. There are only seven cancer radiotherapy centres in Nigeria. *Chidebe (2017)*.

Many of the cancer-related deaths in Nigeria can be attributed to a lack of knowledge regarding this family of diseases. Furthermore, a lack of education on both prevention and early detection and a culture which endorses silence and places a negative social stigma on such illnesses has led to more than one-third of preventable cancer deaths. *Grady (2013)*

2.1.4 Mental health

The majority of mental health services is provided by 8 regional psychiatric centers and psychiatric departments and medical schools of 12 major universities. A few general hospitals also provide mental health services. The formal centers often face competition from native herbalists and faith healing centers.

There is a best prospect industry sector for this country. Includes a market overview and trade data.

Table 2.1: A market overview of trade data (www.health.gov.ng).

	2017	2018	2019	2020(estimated)
Total market size	119,538	232,148	220,000	250,000
Total local production	0	0	0	0
Total export	0	0	0	0
Total import	119,538	232,148	220,000	250,000
Imports from the us	8,720	8,754	7,256	10,000
Exchange rate: 1	367	362	360	379.5

usd				

Total Market Size = (Total Local Production + Total Imports) – (Total Exports)

Compared to South Africa's sophisticated healthcare infrastructure, the most advanced on the continent, the Nigerian medical system is still underdeveloped and lacks modern facilities. There is a wide lack of qualified medical professionals, with the country having 35,000 doctors despite needing 237,000, according to WHO figures, partially due to massive migration of healthcare workers overseas in search of greener pastures. As a result, Nigeria loses at least 1.5 billion dollars every year to medical tourism according to the Nigerian Medical Association (NMA). Of this figure, India accounts for more than half from nearly 5,000 Nigerian patients. To reverse this trend and ensure access to health for all Nigerians, the Nigerian government In February 2017, approved the second National Strategic Health Development Plan (NSHDP II). According to Prof. Isaac Adewole who was the Minister of Health, the policy provides direction necessary to support the achievement of significant progress in terms of improving the performance of the national health system. It also lays emphasis on primary healthcare as the bedrock of national health system in addition to providing financial risk protection to all Nigerians, particularly poor and vulnerable populations. An Oxford Business Group report on the Nigerian healthcare sector indicates that the Nigerian Sovereign Investment Authority (NSIA) in partnership with the Federal Ministry of Health (MoH), has signed a series of agreements to modernize and expand health care services through private sector participation. The agreements look to develop the capacity of specialist hospitals and diagnostic centers to ensure they can provide advanced medical care services. So far, a total of ten memorandums of cooperation have been signed between the NSIA, the MoH and various health care facilities throughout the country's six geopolitical zones, with six of the agreements already in advanced stages. For example, President Muhammadu Buhari in February 2019 commissioned the newly built Lagos University Teaching Hospital (LUTH) Cancer Care Center in Lagos with equipment supplied by Varian Inc. USA. In addition to its collaboration with the NSIA, the MoH has also set ambitious new targets to increase access to health facilities, with a specific aim to increase the number of primary health care centers (PHCs). As part of its goal to ensure access to health care for 100m Nigerians, the MoH plans to build 10,000 PHCs throughout the country with at least one PHC per ward to facilitate health care access across a wide geographic area.

In addition to improving the quality of care and expanding infrastructure, the government is also looking to reduce barriers to insurance coverage. Although Nigeria's National Health Insurance Scheme (NHIS), introduced in 1999, targets universal coverage, penetration remains persistently low. Less than 5% of the population is currently enrolled in the NHIS, and an estimated 120 million Nigerians currently do not have

health insurance coverage according to local media while other sources cite even less at just 10% of the population. Payment for treatment is largely out-of-pocket for most of the population. One major impediment to increasing participation rates is the non-mandatory nature of health insurance in Nigeria according to the NHIS. While most employees in the federal civil service are currently subscribed to the program, the NHIS has yet to capture most citizens, including those individuals working in the country's large informal sector. Stakeholders in the health insurance sector such as the NHIS and health maintenance organizations (HMOs) are also calling for legislation that would make it mandatory for employers with more than 10 employees to provide health insurance. Meanwhile, the competitive nature of the insurance market means that HMOs often cut prices to gain market share, which in turn results in poorer quality services for patients. According to the NHIS, there are 40 accredited HMOs in Nigeria, with each vying for greater market share.

In response to the Covid-19 pandemic, the government through the National Center for Disease Control (NCDC) rolled out the "National Strategy to Scale up Coronavirus Disease Testing in Nigeria". This plan includes, expanding existing NCDC laboratory network for molecular RT PCR, leveraging capacity within the HighThroughput HIV molecular testing laboratories, repurposing Point of Care tuberculosis testing GeneXpert machines for COVID-19 testing, engaging private sector clinics and laboratories and using antigen and antibody tests to learn more about the disease. According to the NCDC, the rapid investment in establishing molecular laboratories highlights the critical need for a well-defined hub and spoke model for public health laboratories in Nigeria. The goal is to ensure that every state in the country establishes a molecular laboratory, which will be linked to the NCDC National Reference Laboratory in a hub and spoke model. The molecular lab in each state will also serve as a state-level hub, to ensure that every state has a well-coordinated structure for other disease specific laboratories such as for HIV and tuberculosis.

2.1.5 Leading Sub-Sectors

Most private clinics cannot afford new equipment and therefore settle for used ones. The United States is competitive with medical devices such as diagnostic equipment, Magnetic Resonance Imaging (MRI), Computed Tomography scan (CT), Digital X-Ray, Mammography and Ultrasound Scans. Test kits, especially those for testing for malaria parasites, drug abuse, and infectious diseases such as HIV/AIDS and tuberculosis will also do well in Nigeria. With respect to vitamins, the United States has a better opportunity than most countries due to the quality of U.S. medicines. China is a dominant offshore supplier of very basic, low tech instruments which most private clinics can afford. All medical devices and medicines entering Nigeria must first be registered with the National Agency for Food and Drug Administration and Control (NAFDAC) and the Standards Organization of Nigeria (SON) prior to import.

2.1.6 Opportunities

As part of its health sector intervention for the Covid-19 pandemic, the Nigerian government through its national oil company, the National Petroleum Corporation (NNPC), plans to build 14 medical centers as well as expand and upgrade two Intensive Care Units (ICU) in the country's six geopolitical zones. The project will cost about $58 million. With the government lacking the funds to implement its health sector plans, the private sector is emerging as the indispensable player to improve Nigeria's healthcare fortunes. Federal and state governments are using the Public Private Partnership (PPP) model to attract private sector participation in health projects. For example, Lagos State plans to build a 120-150 hospital bed Medical Park (MediPark) through a PPP to offer a full spectrum of excellent quality high technology cutting edge specialist medical and diagnostic services. The project will cost US$247.3 million and will be developed on an 18,750.15 square meter site previously used for the Lagos State School of Nursing.

Most Nigerian hospitals still store patient records manually using traditional paper methods. This indicates a good market opportunity for simple and affordable Electronic Medical Record (EMR) systems. Medical expertise remains in short supply. Therefore, medical training and education services will do well. Prospects are also emerging in hospital administration, management and consulting services. The Covid-19 pandemic has uncovered opportunities for telemedicine. E-health service providers have reported a surge in new subscription levels. They say more people are turning to telemedicine platforms for medical consultation with doctors to avoid visiting hospitals for fear of getting infected. The government, which before the pandemic paid little attention to telemedicine, has begun adopting the technology as part of its public health intervention programs. E-health professionals foresee a continuing upsurge in demand for telemedicine services after the pandemic, a trend they say would be sustained through persistent user engagement and education on the importance of telemedicine.

2.1.7 Challenges

Medical devices and pharmaceutical products must be registered with the National Agency for Food and Drugs Administration and Control (NAFDAC) before they can be imported into Nigeria. This process can be painfully long, rigorous and involves the submission of several documents. Product counterfeiting is rampant and rights enforcement is weak. Nigeria is experiencing declining revenues due the fall in oil prices and this is affecting the government's ability to fund its healthcare procurements and projects. Therefore, U.S. companies must plan to back their project propositions with financing to be competitive.

2.2 MEANING OF CLINIC

A clinic is a health care institution providing patient treatment with specialized staff and equipment.

Clinics are usually funded by the public/private sector, by health organizations (for profit or nonprofit), by health insurance companies, or by charities, including direct charitable donations. Historically, hospitals were often founded and funded by religious orders or charitable individuals and leaders.

Today, hospitals are largely staffed by professional physicians, surgeons, and nurses, whereas in the past, this work was usually performed by the founding religious orders or by volunteers.

2.3 ADVANTAGES OF CLINIC

i. Improve patient safety and satisfaction through the immediate availability of specialists in the management of high-risk obstetric encounters and emergencies.
ii. Prevent the loss of physicians and delivery volume (knowing that a loss of obstetric volume will most likely be associated with a loss in elective surgery volume).
iii. Retain transports (which increase patient satisfaction and revenue).
iv. Increase market share by reaching out to physicians who are splitting deliveries with their competition or who are exclusive with their competition.
v. Increase market share by reaching out to family practitioners, mid-level providers and clinics.

vi. Grow their high-risk service and become known as the leader in obstetrics for their market.

vii. Foster the relationship with obstetric patients so that they choose the hospital for their other healthcare needs (and those of their families).

2.4 DISADVANTAGES OF CLINIC

i. It's too expensive. People who are low in income will have greater burden of medical fees than those with high income. For example, Private hospital

ii. No proper treatment. For example, Public hospital

iii. No hygiene. For example, Public hospital

iv. Doctors are not available on time. For example, Public hospital

v. Hospitals are always messed up. For example, Public hospital

vi. No vacancies for emergency cases. For example, Public hospital

vii. No proper cure and worried about allergies and side effects. For example, Public hospital.

2.5 ORIGIN OF UNIVERSITY OF BENIN TEACHING HOSPITAL (UBTH)

University of Benin Teaching Hospital (UBTH) is a premier and multi-specialty healthcare service provider in West Africa. The Hospital is located in Ugbowo, Benin City and was established on May 12, 1973 following the enactment of an edict (number 12) of the Nigeria National Health Act.

As the sixth of the 1st generation Teaching Hospitals in Nigeria, its establishment was also to complement her sister institution, University of Benin, and to provide secondary and tertiary care to the then Mid-

western Region (now Edo and Delta State) and its environs. It also provides necessary facilities for training of high and middle-level workforce for the health industry and spearheads research opportunities for lecturers in the University and other interested persons with economic morbidity burden as research question(s).

Through the Community Health Centres in Ogbona and Udo, and the General Practice Clinic that came on stream later, UBTH equally provides some avenues for primary health care to the immediate communities.

The University of Benin Teaching Hospital was taken over by the Federal Government on April 1st, 1975 as the fifth teaching hospital coming after Ibadan Teaching Hospital and Lagos Teaching Hospital.

The Institution has been decisively responding to challenges as they arise, to the extent that the UBTH could boastfully say that it has effectively discharged its Mandate.

For over forty years now, the Tertiary Referral Hospital, widely acknowledged as a Centre of Excellence, has remarkably and effectively served as the last port of call for expert management of diverse and varied disease conditions in Edo, Delta, part of Kogi and Ondo state which largely form its catchment area and sometimes further away. With an initial bed capacity of 360 when it was officially opened on May 12th, 1973, the UBTH of today boasts of a bed capacity of over 860 as at August 2017 and still increasing with a multiplicity of departments offering a wide range of services all of which combined to make the Institution the Centre of Excellence as its stands today.

Besides the enviable achievements of its main traditional clinical departments, there has also been a remarkable development of its subspecialties. Mention must be made of the eminent doctors, scholars and managers who have played pivotal roles as helmsmen of the veritable health institution.

Today, the UBTH boasts of a Dialysis Centre, CT Scanning Service, a fully integrated Accident center and a fully functional Oxygen production plant to effectively meet the need of the hospital. In areas of training and research, The UBTH is at the forefront in West Africa. After 35 years of remarkable

healthcare advances, UBTH will continue to spearhead innovation in research, clinical services and compassionate care.

2.6 DEPARTMENTS OF UBTH

The department in UBTH is divided into two namely:

CLINICAL DEPARTMENT

1 Obstetrics & Gynaecology

2 Family Medicine (Non-Medical department)

3 Internal Medicine

4 Child Health

5 Pharmacy

6 Surgery

7 Occupational Therapy

8 Orthopaedics & Traumatology

9 Radiotherapy & Clinical Oncology

10 UBTH Paramedic Program

11 Physiotherapy

12 Radiology

13 Community Health

14 Dental Oral & Maxillofacial Surgery

15 Dental Preventative Dentistry

16 Dental Restorative Dentistry

17 Dietetics & Nutrition

2.7 MEDICAL AND LABORATORY DEPARTMENT

(i) Medical Microbiology

(ii) Chemical Pathology

(iii) Histopathology (Morbid Anatomy)

2.8 INFORMATION SYSTEM

According to Wikipedia, Information systems (IS) are formal, sociotechnical, organizational systems designed to collect, process, store, and distribute information. In a socio-technical perspective, information systems are composed by four components: task, people, structure (or roles), and technology. Any specific information system aims to support management, operations and decision making. An information system is the information and communication technology (ICT) that an organization uses, and also the way in which people interact with this technology in support of business processes.

Information systems will continue to dominate the technological front in the coming decades.

Information systems in health care organizations over the past decade have been primarily in the areas of financial, accounting, and human resource management. This emphasis will continue and become more refined in assisting management with making budget-related decisions and with reporting specific information for the new requirements established by Medicare and Medicaid CMS (2015). Current emphasis is on the design and implementation of a universal electronic data interchange system for processing health care claims. This system necessitates the development of a common language for

hospitals, the federal government, and insurers, along with standardization of core financial information. Most hospital billing departments do not find it easy to accommodate a common language or method because of the lack of integration of computer systems and the large volume of services billed. This type of common claims processing will make it increasingly necessary for hospitals to improve their current computer systems.

Health information management systems is defined as the comprehensive and integrated, structure that collects, collates analyses, evaluates uses, and manages, disseminates, stores all health and health-related data and information (HIS strategic plan, 2009-2014). Health systems, like any software, consist of parts which are interrelated, interdependent and work towards a common goal. In general, the system is the combination on health (morbidity and mortality statistics, service statistics) and on management (human resources, financial, fixed assets and infrastructure, drugs and supplier's logistics) and performs comparative analysis with population-based data from various surveys.

Health system is the powerful tool for making health care delivery more effective and efficient in hospitals (HIS, 2008). Statistical constituencies of this system are: civil registration process whose vital events include registration of live births, deaths, marriages, divorces, adoptions, recognition and legitimating.

2.9 Management Information System

A Management Information System (MIS) is an information system used for decision-making, and for the coordination, control, analysis, and visualization of information in an organization. In a corporate setting, the ultimate goal of the use of a management information system is to increase the value and profits of the business. The main purpose of the MIS is to give managers feedback about their own performance; top management can monitor the company as a whole. Information displayed by the MIS typically shows "actual" data over against "planned" results and results from a year before; thus it measures progress against goals.

The following are types of information systems used to create reports, extract data, and assist in the decision-making processes of middle and operational level managers.

(a) Decision support systems (DSS) are computer program applications used by middle and higher management to compile information from a wide range of sources to support problem solving and decision making. A DSS is used mostly for semi-structured and unstructured decision problems.

(b) Executive information systems (EIS) is a reporting tool that provides quick access to summarized reports coming from all company levels and departments such as accounting, human resources and operations.

(c) Marketing information systems are management Information Systems designed specifically for managing the marketing aspects of the business.

(d) Accounting information systems are focused accounting functions.

(e) Human resource management systems are used for personnel aspects.

(f) Office automation systems (OAS) support communication and productivity in the enterprise by automating workflow and eliminating bottlenecks. OAS may be implemented at any and all levels of management.

(g) School Information Management Systems (SIMS) cover school administration, often including teaching and learning materials.

(h) Enterprise resource planning (ERP) software facilitates the flow of information between all business functions inside the boundaries of the organization and manages the connections to outside stakeholders.

(i) Local Databases can be small, simplified tools for managers and are considered to be a primal or base level version of a MIS.

2.9.1 DECISION SUPPORT SYSTEM

A decision support system (DSS) is a computerized program used to support determinations, judgments, and courses of action in an organization or a business. A DSS sifts through and analyzes massive amounts of data, compiling comprehensive information that can be used to solve problems and in decision-making Segal (2019).

Typical information used by a DSS includes target or projected revenue, sales figures or past ones from different time periods, and other inventory- or operations-related data.

2.9.2 UNDERSTANDING A DECISION SUPPORT SYSTEM

A decision support system gathers and analyzes data, synthesizing it to produce comprehensive information reports. In this way, as an informational application, a DSS differs from an ordinary operations application, whose function is just to collect data.

The DSS can either be completely computerized or powered by humans. In some cases, it may combine both to become hybrid. The ideal systems analyze information and actually make decisions for the user. At the very least, they allow human users to make more informed decisions at a quicker pace.

2.9.3 NOTABLE POINTS

1 A decision support system (DSS) is a computerized system that gathers and analyzes data, synthesizing it to produce comprehensive information reports.

3 A decision support system differs from an ordinary operations application, whose function is just to collect data.

4 Decision support systems allow for more informed decision-making, timely problem solving, and improved efficiency in dealing with issues or operations, planning, and even management.

2.9.4 USING A DECISION SUPPORT SYSTEM

The DSS can be employed by operations management and other planning departments in an organization to compile information and data and to synthesize it into actionable intelligence. In fact, these systems are primarily used by mid- to upper-level management.

For example, a DSS may be used to project a company's revenue over the upcoming six months based on new assumptions about product sales. Due to a large number of factors that surround projected revenue figures, this is not a straightforward calculation that can be done manually. However, a DSS can integrate all the multiple variables and generate an outcome and alternate outcomes, all based on the company's past product sales data and current variables.

2.9.5 CHARACTERISTICS OF A DECISION SUPPORT SYSTEM (DSS)

The primary purpose of using a DSS is to present information to the customer in an easy-to-understand way. A DSS system is beneficial because it can be programmed to generate many types of reports, all based on user specifications. For example, the DSS can generate information and output its information graphically, as in a bar chart that represents projected revenue or as a written report.

As technology continues to advance, data analysis is no longer limited to large, bulky mainframe computers. Since a DSS is essentially an application, it can be loaded on most computer systems, whether on desktops or laptops. Certain DSS applications are also available through mobile devices.

The flexibility of the DSS is extremely beneficial for users who travel frequently. This gives them the opportunity to be well-informed at all times, providing the ability to make the best decisions for their company and customers on the go or even on the spot.

2.9.6 SCHEDULING ALGORITHMS

Scheduling can be described as the process of assigning jobs to resources for some duration.

For the better understanding of the difficult set of rules and procedures which are used to run the order in which tasks are executed by the processor we need scheduling algorithms. Many CPU scheduling algorithms have been established for the modern multiprogramming operating system Silberschatz et al (2009).

Issues in scheduling algorithms:

Different issues as described below,

- Processor can migrate from one class to another.
- Distribution in shortest possible time.
- Utilizing all the resources.
- Circulation of processes without any progress.
- Requirement of fair scheduling.
- Non-uniform and non-pre-emptive nature of distributed system.

Arrangement based on pre-emption:

Preemptive Scheduling: When a higher priority job arrives in a system it can interrupt the system's current flow of execution. This type of scheduling is present in all kind of systems. Figure 1 shows the preemptive scheduling.

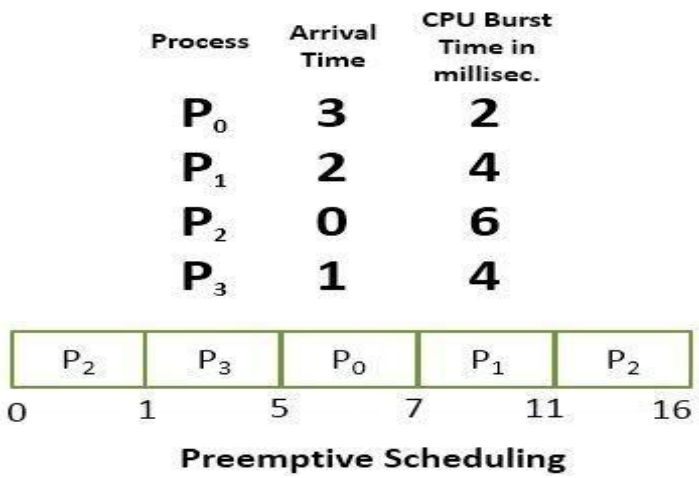


Figure 2.0 shows the preemptive scheduling.

Non-Preemptive Scheduling: When a higher priority job arrives in a system it cannot interrupt the system's current flow of execution. FCFS is a non-pre-emptive type of scheduling. Figure 2 shows the non-preemptive scheduling:

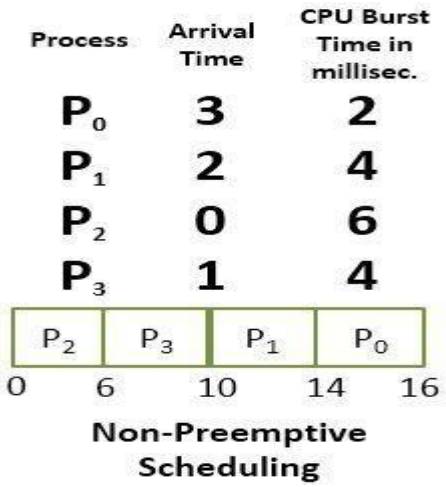


Figure 2.1 shows the non-preemptive scheduling:

2.9.7 Basic Scheduling Algorithms:

Some basic scheduling algorithms are discussed below:

I. First Come First Serve Algorithm.

II. Shortest Job First Algorithm.

III. Priority based Algorithm.

IV. Round Robin Algorithm.

1. First Come First Served Scheduling

In this algorithm the jobs are processed in the order of in which they appear in the ready queue. All the jobs are put into one ready queue. The PCB is linked onto the tail of the queue. In this type of algorithm, the waiting time is very long.

2. Shortest Job First Scheduling:

This algorithm takes into account the burst of next process to be executed. CPU is assigned to the process that has smallest burst time. If the burst of two processes is same then FCFS criteria can be used. For given processes the SJF generates minimum average waiting time. The only complexity with this algorithm is that it's hard to find out the burst of next process.

If short term scheduling is required then this algorithm can be implemented. This algorithm is either preemptive or non-preemptive.

3. **Priority Scheduling:**

Priority is given to every process according to any criteria i.e., it can be numbers like 0 to 20 or alphabets A to B. Process with highest priority will get the CPU. FCFS criteria can be followed if two processes with similar priority are encountered. This algorithm can either be preemptive or non-preemptive. Process with highest priority will be pre-empted other it will be placed on the head of the ready queue. This algorithm suffers from indefinite blocking i.e., starvation.

4 **Round Robin Scheduling**:

This is one of the fairest algorithms of all the other algorithms and yet very simple. In this algorithm time quantum is defined which is basically a time interval for which the process will have CPU allocated to it. A circular queue of all the incoming processes is maintained and the scheduler goes round the queue to pick the process and execute it for a time slice. Process will give up the CPU voluntarily if its time is completed. If the process still needs more time it will be attached to tail of the circular queue. This algorithm has maximum average waiting time. Below chart explain the process adequately. Time quantum is 4ms.

Table 2.1 shows the process execution.

Process	Burst time	Waiting Time	Turnaround time
P1	48	12	60
P2	6	8	14
P3	6	14	20
Average	-	11.33	31.33

Following Gantt chart can be obtained in RR algorithm:

P1	P2	P3	P1	P1	P1	P1	P1

0 4 7 10 14 18 22 26

30

QUALITATIVE PARAMETERS

Following are the parameters used to judge the efficiency of above written algorithms.

I. CPU Utilization/Efficiency: Utilization of the CPU to its full potential.

II. Throughput: maximizing the throughput is the motive.

III. Turnaround time: Minimize the time between a process is submitted and processed.

IV. Waiting time: The time spent in the ready queue should be minimized.

V. Response Time: Minimizing response to a process.

VI. Fairness: Every process should get fair share of the process.

Benefit of Using Round Robin Scheduling:

After analysis of above-mentioned algorithms, it's made quite clear that the algorithm is said to be efficient if it executes job in a fair manner and result in less avg. waiting and turnaround time.

Now we have established in coming literature survey that time quantum and priority serve as a bottleneck for efficiency of various scheduling algorithm. How two or more algorithm works together based on dynamic properties is another concept. What should be the limit of time quantum for optimality of RR algorithm is perplexed question to encounter. Another question of dynamicity comes which is not easy task to take under consideration. But the solution should satisfy performance goals and should be accepted by operating system.

Researches shows that although the so much efforts have been put into taking response time and other related factors to be first criteria but vast amount of work has been done to select right time quantum and dynamic properties. For these reasons RR and PS scheduler are the first algorithm to choose from.

Also, we must add that processes are different types like I/O bound and CPU bound etc. so efficiency of an algorithm is highly subjective and an efficient algorithm is represented by goal it is meant to achieve.

2.9.8 RELATED WORKS

Adebayo et al (2014): This research presents an online outpatient medical appointment booking system where patient can access and view any available personnel or doctor schedule in order to book an appointment with corresponding time as specified by the available doctor.

Nirmalya et al (2014): "The author conducts the time motion study to know the time taken in different service delivery point in OPD and to assess the perception of beneficiaries regarding the total time spent in the OPD. Time Motion study is required for proper time management in different health care delivery

system and subsequent remedial steps can be taken accordingly.

Swabik et al (2014): appoint scheduling and medicine collection system is developed. This system is not supporting for walk in patients as well as cancellation and rescheduling of appointment.

Sreekala et al (2015):. This research paper present study to determine the average waiting time of patients reported in the emergency department and to assess the factors responsible for the waiting period of patients in emergency department.

Sri Gowthem1, and Kaliyamurthie (2015):. This research represents an electronic paper less application designed with high flexibility and ease of usage for patients to book their appointment within the scheduled appointment slots according to

their preference. This system serves in managing appointments and provides patient to cancel or reschedule appointment by integrating distributed clinical systems into a set of consistent and convenient services accessible via a web browser.

Godphrey et al (2015): In this paper researcher present a mobile based application scheduling system for managing patient appointments.

Verma, and Risha (2015): The paper is based upon the monitoring the waiting time of patient visiting the Outpatient department of a hospital using the concept of Time and Motion study.

Kamna Sharma (2015): This paper design to solve patient waiting time problem in the clinic or hospital. The problem can be with scheduling algorithm like round robin, priority scheduling and shortest job first.

Tochukwu et al (2016): In this the author analyzed the queuing of patients in different hospital. The results of the analysis showed that average queue length, congestion and waiting time of patients in the system and queue could be cut down when the service capacity level of doctors at the hospitals are increased at a lowest expected total cost.

Sherly et al (2016): This research represent online Appointment reservation and scheduling systems in healthcare are used to maintain and manage the access to the hospitals. This system allows individuals to securely and safely make their appointment reservations online.

Obulor and Eke. (2016): This research presents an efficient queuing model for proper appointment system to give the solution to the long waiting times in the hospitals. This system provides better utilization of resources and reduces patients waiting times in the general OPD before consultation with the Doctor.

Nidhi and Belwal (2016): This paper given a complete idea about the patients' demographic characteristics, nature of their illness, time they spent before reaching the hospital, on the queue to see the doctor and with the doctor. It also describes the patient's view about queue and their behavior in the

queue.

CHAPTER THREE

METHODOLOGY

This chapter provides a general overview of the data gathering methods which were used to collect data for designing and implementing the topline application. The clinical scheduling gives a description of the existing system, explains data flow diagrams of the current system, focuses on system flow of the proposed system. This work present a qualitative method of data collection because:

i. data is usually gathered from few individuals or cases therefore; findings and outcome cannot be spread to a larger population. However, findings can be transferred to another settings.

ii. The direction and framework of research can be revised quickly as soon as fresh information and findings emerge.

iii. The data in qualitative research depends on human experience and this is more compelling and powerful than data gathered through quantitative research, this was a big advantage to my research.

iv. Issues and subjects covered can be evaluated in dept and in details. With this type of research, the researcher will have a clear vision on what to expect and collect data in a genuine effort of plugging the data to a bigger picture.

In this system analysis and design, it was deemed good and preferrable to use System Development Life Cycle (SDLC) as a means of developing the new system mainly because it follows the traditional phase with specific activities allocated to each phase of development as seen in this chapter. This provides a better approach in order to comfortably develop the system therefore its use.

3.1 SAMPLE POPULATION:

This study was done using the university of Benin teaching hospital.

3.2 DATA COLLECTION

Data collection is the process of gathering quantitative information on specific variables with the aim of evaluating outcome of gleaning actionable insights. Good data collection requires a clear process to ensure the data you collect is clean, consistent, and reliable. Data is one of the most valuable resources businesses of today grow upon. Primary data refers to data you collect yourself rather than data gathered after another party initially recorded it. The information used for this work was obtained directly from the source. The secondary data refers to data obtained by the researcher from magazines, journals, online articles.

Data is divided into two categories, qualitative and quantitative data. Quantitative data is data in the form of numbers, quantities and values. It describes things in easily measurable terms. Example, the number of customers who bought a specific product. Qualitative data is descriptive, rather than numeric. It is less easily measurable and may contain descriptive phrases and opinions. Example, an online review a customer writes about a product.

Data collection is an essential component which is used in conducting research. In order to collect data, the researcher should be able to access the data that needs to be collected for the study of an existing system. How do you collect data? There are various data collection methods. They include; observation,

schedule, questionnaire, projective techniques, surveys, case study and interview. For this project work, the observation and interview was conducted.

3.2.1 Methods of data collection used.

I. Observation

II. Interview

I. **Observation:** Observation is a fundamental way of finding out about the world around us. As human beings, we are very well equipped to pick up detailed information about our environment through our senses. An observation was carried out in the General Practice Complex (GPC) & Obstetrics & Gynaecology (O & G) department of the university of Benin Teaching Hospital. It was observed that both departments still have the same process of scheduling.

II. **Interview:** Interviewing involves asking questions and getting answers from participants in a study. Interviewing has a variety of forms including: individual, face-to-face interviews and face-to-face group interviewing. Interview could either be oral or electronic e.g use of telephone and others electronic devices.

oral interview

This method of data collection can be defined as the systematic way of collecting data or information from a respondent through asking questions from the respondent and collecting information with the aim of understanding the current system in use. The oral interview was done between the researcher, the General Practice Complex (GPC) & Obstetrics & Gynaecology (O & G) department of the university of Benin Teaching Hospital. The facts were obtained strictly from the respondent and patients. The interview helped me in starting the work and also helped in the area of presenting a solution of the new design.

Some of the questions asked while conducting the interview are:

1. What is the procedure for scheduling
2. The maximum time spent between a doctor and a patient.

3. Why patient stay longer in the hospital.
4. What are the other means of scheduling an appointment
5. What do you think about the professionalism of the doctors

3.3 SYSTEM ANALYSIS AND DESIGN

This chapter gives the system analysis and overview of the system design, providing the system development process using OOAD which happens to be one of the popular approach for developing software specifications in terms of a software system's object model, which comprises of interacting objects.

3.4 SYSTEM ANALYSIS

It is a process of collecting and interpreting facts, identifying the problems, and decomposition of a system into its components. The main focus of system design is to supplement the system architecture, providing information and data useful and necessary for implementation of system elements. it defines the components, modules, interfaces, and data for a system to satisfy specified requirements. This section consists of the various modules, interfaces and data required for the design of a Patient appointment and Scheduling system.

3.5 SYSTEM DESIGN

It is a process of planning a new business system or replacing an existing system by defining its components or modules to satisfy the specific requirements. Before planning, you need to understand the old system thoroughly and determine how computers can best be used in order to operate efficiently.

System Design focuses on how to accomplish the objective of the system.

3.6 System Design Tool – UML

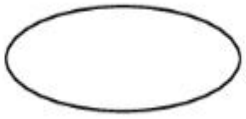
The Unified Modelling Language (UML) was selected as a tool for modelling the designs for the software application. In order to design the system for implementation, selected components of UML, were used:

use case, activity and class diagrams. These components were selected due to the fact that it's self-illustrative if properly designed, simple and suits the nature of the system (ie usability). Unlike many other modelling techniques, the non-technical stakeholders (e.g. end users, school management etc.) are also able to understand the model for the software system.

3.7 UML Design

The system employs the use case tools due to the fact that it provides a comprehensive summary of the whole software system in a single illustration, identifying the different types of users of the system and are mainly composed of narrative text. A use case is a list of action or event steps, typically defining the interactions between a role (known in the Unified modeling Language as an actor) and a system, to achieve a goal. The actor can be a human, an external system, or time. A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved.

Table 3.1. Use case diagram notations and descriptions

Objects	Symbol	Description
Actor		Actors are the users of a system. It performs role in a given system. This could be a person, organization or an external system.
Use case		**Use case** is a list of steps, typically defining interactions between an actor and a system, to achieve a goal.
System		A system in a **UML Use Case Diagram** is a rectangle spanning all the use cases in the system that defines the scope of your system. Anything

		within the box represents functionality that is in scope and anything outside is not.
Relationship	<<include>> <<extend>> 	Illustrate relationships between an actor and a use case with a simple line.

Although use case diagrams can be used for various purposes there are some common guidelines you need to follow when drawing use cases. Nishadha (2015) gave some rules for actors, cases, relationships (between actors and use cases) and use cases. These include naming standards, direction of arrows, placing of use cases, usage of system boxes and also proper usage of relationships.

3.7.1 Use Case Diagram

A use case is a methodology used in system analysis to identify, clarify, and organize system requirements. The purpose of a use case diagram in UML is to demonstrate the different ways that a user might interact with a system. it describes the functional roles of the different actors(users) of a system. Thus, diagram in figure2 depicts the use case diagrams for the various users in the proposed system

Figure 3.1 Use case diagram for the proposed Patient Appointment and Scheduling System

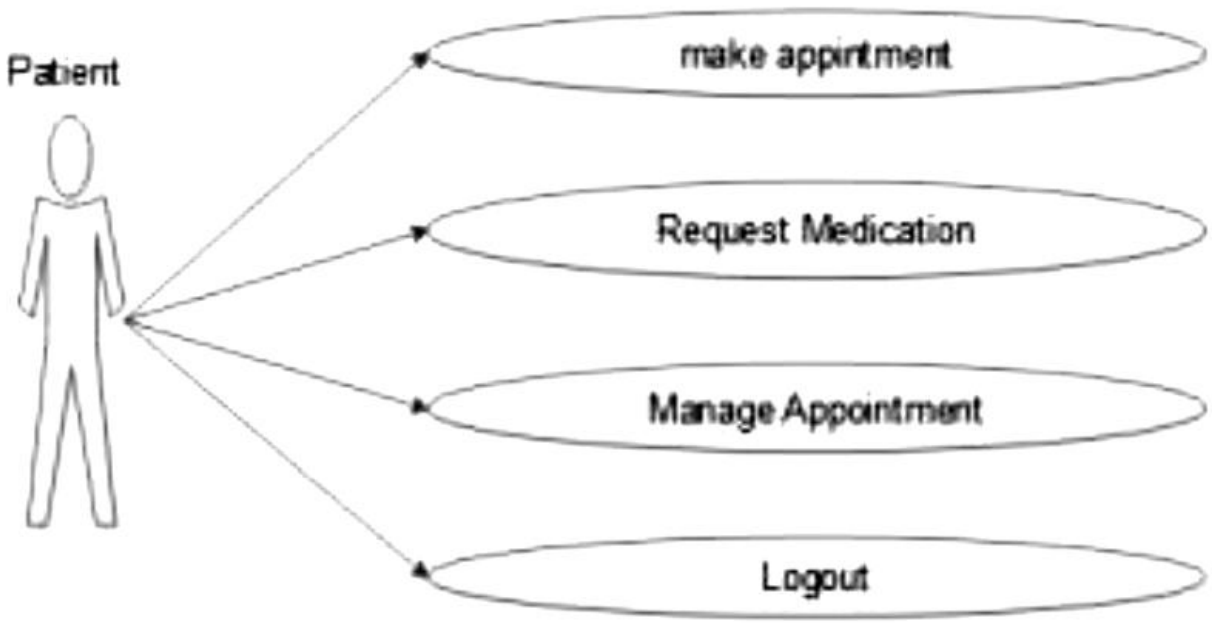


Figure 3.2 Use case diagram for Patient

Figure 3.3 Use case diagram for Receptionist

.

Figure 3.4. Use case diagram for Doctor

3.8 DATABASE DESIGN

Database is the platform used to store data in most information systems which stores the data. It is regarded as the "heart" of most systems. Database design follows a sequential order. These include the inflow schema, Entity Relationship diagram and Relational data model.

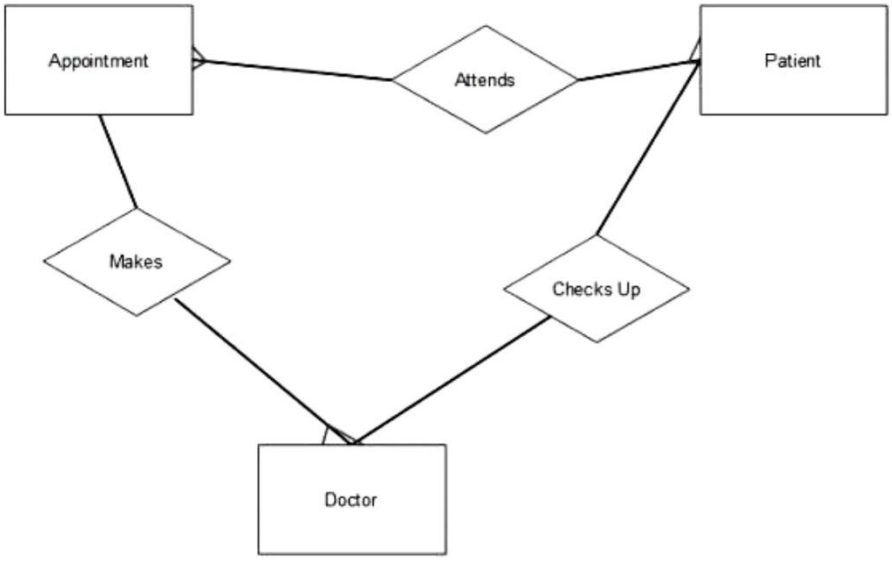


Figure 3.5 Entity Relationship Diagram for the proposed system

The database was designed using MYSQL due to the level of functionalities both databases can offer. MYSQL offers a higher level of control over the operations of stored data and structural communication between the backend languages. It also offers expansive control using , HTML 5, JAVASCRIPT, CSS, JQuery AND PHP

Relational Data Model

Table 3.1 Appointment table NAME DATATYPE OTHER ATTRIBUTES

NAME	DATATYPE	OTHER ATTRIBUTES
doctor_id	INTEGER	Pry key Not Null
doctor_name	VARCHAR (100)	Not Null

Table 3.2 Appointment table

NAME	DATATYPE	OTHER ATTRIBUTES

appointment_id	INTEGER	Pry Key Not Null
appointment_start	DATETIME	Not Null
appointment_end	DATETIME	Not Null
appointment_patient_name	VARCHAR (100)	Null
appointment_status	VARCHAR (100)	Not Null
appointment_patient_session	VARCHAR (100)	Null
doctor_id	INTEGER	Not Null

3.9 ANALYSIS OF EXISTING SYSTEM

An analysis of the existing system was carried out from the data collected and gathered was based on the interview & observation method and Based on the interview and observation carried out. The current scheduling procedure used by the UBTH is first-come-first-serve basis, Although it's a computerized system, the scheduling process is still done manually. First the patient will have to see the Audit and tell he/she that they want to see a doctor/consultant then the Audit gives them a go ahead. Next they go to the revenue section to make payment. After payment is done, they queue up on the record queue where the record personnel takes their record (name, address, age). After that, a slip is printed for the patient and the patient takes the printed slip back to the audit who then take the slip to the nurse on the desk. The nurse

will then take the vital signs of the patient and return the slip to the audit who then takes the slip to the doctor before the doctor can see the patient.

The maximum time spent is between 30-40 minite. Patient spend more time in the clinic as a result of the following:

I. If the patient is a first timer in the clinic
II. Lack of cooperation between the patient and doctor
III. Lack of expressivity of patient with doctor during scheduling section, etc.

Also the clinics provide opportunity to make appointments by placing a phone call.

3.9.1 LIMITATIONS TO EXISTING SYSTEM

1.Time consuming process.

2. reduction in efficiency.

3. long waiting time of patient in the clinic.

4. congestion of patient.

3.9.2 PROPOSED SYSTEM

The proposed system is the new or the system to be implemented. The proposed algorithm eliminates the manual system of registration and its drawbacks, by implementing a simple round robin (RR) architecture in real time system which introduce a concept of assigning different time quantum to different rounds of RR scheduling algorithm. functionalities of registration of patient data in the database and scheduling of patient. The system is designed to enable a more efficient patient clinic section with an improved organization setting by maximizing the throughput.

I. Minimize the time between a patient and doctor.
II. The time spent in the waiting queue will be minimized.

III. Minimizing response to a process.

IV. Increasing the number of patients attended to

V. Improve work efficiency.

The proposed web-based scheduling system is implemented using various web development tools namely HTML5, JAVASCRIPT, CSS, MYSQL AND PHP

3.9.3 WATER FALL MODEL

The Waterfall Model was adopted when designing this system. It is also referred to as a linear-sequential life cycle model. It is very simple to understand and use. In a waterfall model, each phase must be completed fully before the next phase can begin, hence the name waterfall. This type of model is basically used for the project which is small and there are no uncertain requirements. At the end of each phase, a review takes place to determine if the project is on the right path and whether or not to continue or discard the project. In this model the testing starts only after the development is complete. In waterfall model phases do not overlap.

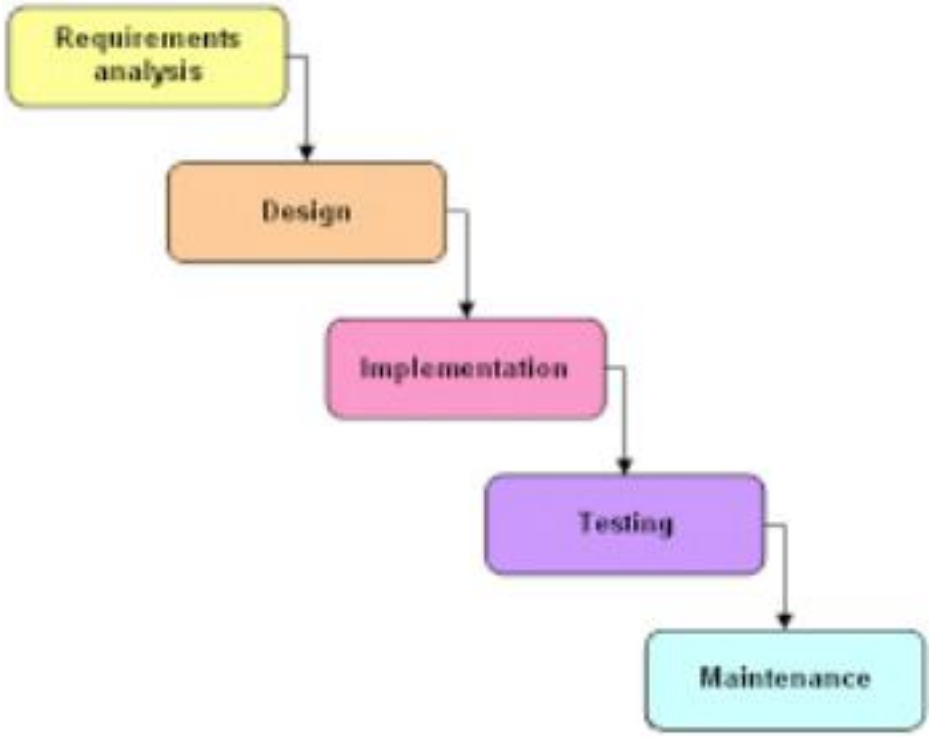


Fig 3.5 Typical waterfall model

3.9.4 PHASES OF WATERFALL MODEL

i. **Requirement Gathering and analysis**

All possible requirements of the system to be developed are captured in this phase and documented in requirement specification documents.

ii. **System Design**

The requirement specifications from first phase are studied in this phase and system design is prepared. System Design helps in specifying hardware and system requirements and also helps in defining overall system architecture

iii. **Implementation**

With inputs from system design, the system is first developed in small programs called units, which are integrated in the next phase. Each unit is developed and tested for its functionality which is referred to as

Unit Testing.

iv. **Integration and Testing**

All the units developed in the implementation phase are integrated into a system after testing of each unit. After integration of various units the entire system is tested for any faults and failure.

v. **Deployment of system**

Once the functional and non-functional testing is done, the product is deployed in the customer environment or released into the market.

vi. **Maintenance**

There are some issues which come up in the client environment. To fix those issues patches are released. Also to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment.

3.9.5 Advantages of waterfall model:

i. This model is simple and easy to understand and use.
ii. It is easy to manage due to the rigidity of the model – each phase has specific deliverables and a review process.
iii. In this model phases are processed and completed one at a time. Phases do not overlap.
iv. Waterfall model works well for smaller projects where requirements are very well understood.

3.9.6 Disadvantages of waterfall model:

i. Once an application is in the testing stage, it is very difficult to go back and change something that was not well-thought out in the concept stage.
ii. No working software is produced until late during the life cycle.
iii. High amounts of risk and uncertainty.
iv. Not a good model for complex and object-oriented projects.
v. Poor model for long and ongoing projects.
vi. Not suitable for the projects where requirements are at a moderate to high risk of changing.

3.9.7 When to use the waterfall model:

i. This model is used only when the requirements are very well known, clear and fixed.
ii. Product definition is stable.
iii. Technology is understood.
iv. There are no ambiguous requirements
v. Ample resources with required expertise are available freely
vi. The project is short.

Less customer interaction is involved during the development of the product. Once the product is ready then only it can be deemed released to the end users. Once the product is developed and if any failure occurs then the cost of fixing such issues are very high, because we need to update everywhere from document till the logic.

Many projects fail because the implementation of the system is pursued without understanding the reason for the system in the first place Ramakrishnan (2012). This concept is equivalent to purchasing lumber (wood intended as a building material) for a new home without even having discussed the required size or style of the structure. While no one would start a house project by purchasing lumber without some planning, many IT projects have been initiated by purchasing software or hardware without fully considering the needs of the organization Ramakrishnan (2012). Obviously, there are many ways to go about developing an IT system. Likewise, there are many SAD methodologies Ramakrishnan (2012). For example, the spiral methodology or Extreme Programming techniques can also be employed in the place of waterfall model. The spiral model iterates several times through the phases and includes some additional items. This model builds on the waterfall model concepts. The spiral model is intended for large software development projects, thus it would be overkill to use this methodology for a small project Ramakrishnan (2012). Extreme programming is considered an agile development methodology tailored

for small and medium sized projects. It streamlines the development process, but does not eliminate the fundamental steps of planning, analysis and design Ramakrishnan (2012).

3.9.8 Requirements Planning

The requirements planning stage consists of a view of the areas immediately associated with the proposed system. This review produces a broad definition of the system requirement in terms of the functions the system support. The deliverables from the requirements planning stage include an outline system area model (entity and process models) of the area under study, a definition of the system's scope and cost justification for the new system.

The objectives of the Requirement Planning stage are:

1 To establish a general understanding of the business problems that surrounds its development and eventual operation.
2 To become familiar with existing systems and.
3 To identify the business processes that will be supported by the proposed application.

The requirement planning stage begins with a

3.9.9 Prototype model

Is a partial complete form of system that is hastily design to look into certain parts of system requirements which are not to be considered using at the final stage? User Prototyping poses it usefulness when it allows how the proposed system will look like as well as it operational functionality prior to the possible users. This method is considered fast and reliable for designing efficient systems.

3.9.9.1 User Characteristics

Every user should be:

(a) Comfortable of working with computer,

(b) He must have knowledge in medical field,

(c) He must also have basic knowledge of English too.

The requirement planning stage begins with a meeting between the KWH administration and HMS project researchers for the needs of the proposed HMS system project. During this stage, an outline of the system area and definition of the system scope are developed.

The tasks of these stages are:

3.9.9.2 Research of Current Situation

This task initiates the requirements planning stage for the proposed system by researching the current environment. The information developed in the initial discussions provides a starting point for this investigation. This research is conducted for preparing the requirements definition through Joint Requirements Planning workshops. The project team members become familiar with the current situation by investigating current systems, the information available in any existing CASE repositories, and by looking at more advance system.

3.9.9.3 Define Requirements

The outline system area model and scope of the proposed system are developed in this task. The functionality of the system is expressed in terms of the hospital processes and the data that the system will support. Management issues that affect subsequent development and transition activities are also identified. Deliverables of this task are accomplished via a series of Joint Requirement Planning Meetings.

3.9.9.4 Finalize Requirements

In this task, the scope of the proposed system is formally documented. An estimate of the cost and duration to implement the system is prepared. Sometimes, the cost and duration may already be fixed when the project commences. In this case, the scope must be well defined such that the project is still viable with the cost and duration provided. Approval to proceed with the implementation is then obtained.

3.9 .9.5 User Design

The User Design stage consists of a detailed analysis of the hospital activities related to the proposed system. Key users, meeting with researchers, decompose hospital functions and define entity types associated with the system. They complete the analysis by creating action diagrams defining the interactions between processes and data. Following the analysis, the design of the system is outlined. System procedures are designed, and preliminary layouts of screens are developed. Prototypes of critical procedures are built and reviewed. A plan for implementing the system is prepared.

3.9.9.6 Technology Overview

An important issue for the development of a project is the selection of suitable front-end and back-end. When we decided to develop the project, we went through an extensive study to determine the most suitable platform that suits the needs of the organization as well as helps in development of the project.

The aspects of our study included the following:

3.9.9.7 FRONT-END SELECTION:

1 It must have a graphical interface that assists employees that are from IT background

2 Scalability and extensibility

3 Flexibility

4 Robustness

5 According to the organization requirement and the culture

6 Platform independent

7 Easy to debug and maintain

8 Event driven programming facility

9 Front-end must support some popular back end like SQL

Therefore, according to the above listed features we selected *VB 2010 as the front-end for developing our project.

3.9.9.8 BACK-END SELECTION:

10 Multiple user support

11 Efficient data handling

12 Provide inherent features for security

13 Efficient data retrieval and maintenance

14 Stored procedures

15 Popularity

16 Operating system compatible

17 Easy to install

18 Various drivers must be available

19 Easy to implant with the front-end

3.9.9.9 METHODOLOGY OF THE PROPOSED SYSTEM

The system was designed using HTML5, CSS3 and JAVASCRIPT as the front end and the Backend was written using PHP while the database is MYSQL and it is managed with PHPMYADMIN.

HTML5: HTML5 is a Hypertext Makeup Language software solution stack that defines the properties and behaviors of web page content by implementing a markup based pattern to it. HTML5 is the fifth and current major version of HTML, and subsumes XHTML.

CSS3: Cascading Style Sheet 3 is a software version Language that is used to style HTML document. It can also be used to describe which HTML element to be displayed. **CSS3** is the latest evolution of the Cascading Style Sheets language and aims at extending CSS2. It brings a lot of long-awaited novelties, like rounded corners, shadows, gradients, transitions or animations, as well as new layouts like multi-columns, flexible box or grid layouts

JAVASCRIPT: JavaScript, often abbreviated as JS, is a high-level, just-in-time compiled, object-oriented programming language that conforms to the ECMAScript specification. JavaScript has curly-bracket syntax, dynamic typing, prototype-based object-orientation, and first-class functions. This is a scripting programming language for HTML and the web. It is quite easy to learn.

PHP: Hypertext Preprocessor is a server side or backend scripting language and a powerful tool for making dynamic and interactive web pages. PHP7 is the latest stable release and it is widely used, free and efficient alternative to competitors such as Microsoft Application Service Provider (ASP). The web server combines the results of the interpreted and executed PHP code, which may be any type of data, including images, with the generated web page. PHP code may also be executed with a command-line interface (CLI) and can be used to implement standalone graphical applications.

MYSQL: MySQL is an open-source relational database management system. Its name is a combination of "My" the name of co-founder Michael Widenius's daughter, and "SQL", the abbreviation for Structured Query Language. It is a Structured Query Language for manipulating, storing and retrieving data in database. Other database system include SQL server, MS access, Oracle, Sybase, Informix and Postgres.

PHPMYADMIN: phpMyAdmin is a free and open-source administration tool for MySQL and MariaDB. As a portable web application written primarily in PHP, it has become one of the most popular MySQL administration tools, especially for web hosting services. PHPMyAdmin supports a wide range of operations on MySQL and MariaDB. Frequently used operations (managing databases, tables, columns, relations, indexes, users, permissions, etc.) can be performed through the user interface, while you still have the ability to directly execute any SQL statement.

CHAPTER FOUR

IMPLEMENTATION

4.0 INTRODUCTION

According to the Oxford English dictionary, Implementation is the process of moving an idea from concept to reality. In other words, it is more of the building process than the design process (Architecture). A number of frameworks or typologies have been proposed for organizing our knowledge about Decision Support Systems (DSS) Bhargava (2007). In the expanded framework, the two most widely implemented approaches for delivering decision support are called data-driven and model-driven DSS. Data-driven

DSS help managers organize, retrieve, and analyze large volumes of relevant data using database queries and Online Analytical Processing (OLAP) techniques Bhargava (2007). Model-driven DSS use formal representations of decision models and provide analytical support using the tools of decision. The primary decision support tools in use included ad hoc query and reporting tools, optimization and simulation models, online analytical processing (OLAP), data mining, and data visualization. Understanding web technologies can influence the development, deployment and use of Decision Support System Bhargava (2007). The impact of these technologies on Web-based DSS remains uncertain. It seems plausible that due to these technology developments, decision support systems can utilize far larger and more complex models and much larger data sets at dramatically lower costs. Integrated development environments such as the LAMP Web development environment which combines the LINUX operating system, Apache Web server, the MySQL database application and PHP middleware) have also become more common as a DSS development environment. Today, the Web is the platform of choice for building DSS Bhargava (2007).

Interface, functionality, and databases are some of the components which need to be considered when we design a system. The architecture of DSS can be viewed as a client side structure. The interface that is designed by the server side is displayed for viewing by the client side.

4.1 HARDWARE REQUIREMENT

Processor – 1GHZ Speed

Memory (RAM) – 4G RAM

Hard Disk Drive Storage Space- 10G hard drive

Display- Any Monitor can serve purpose

4.2 SOFTWARE REQUIREMENT

Operating system – windows 2000 or later

Database Management System – My SQL

Front End – HTML, CSS ,JAVASCRIPT AND JQUERY

Backend – PHP

Web Browser – Any web Browser e.g. Firefox, Google chrome or internet explorer.

Runtime Environment- Xampp Server

4.3 CHOICE OF PROGRAMMING LANGUAGE

The choice of programming language for a project is different from the one to learn as the project determines the choice of programming language based on certain industrial standard since it will impact the main constraint of the project such as time, budget, resources and maintainability e.t.c. PHP on PC based system and Javascript was chosen as the programming language which serves as the client to enable me to create the input and output forms while the MySQL database was used as the database server.

For most software applications there exists a wide variety of languages in which the application may be implemented. Apart from use of PHP there is the use of other scripting language like JavaScript and CSS to support HTML generation by PHP.

4.4 SYSTEM IMPLEMENTATION

This describes the tools used to implement the Graphical User Interface (GUI) and the database. HTML, Javascript and CSS were used for the GUI or front end, PHP was used for the server side or back end while SQL was used to create and connect relational tables to the database.

4.5 SOFTWARE TESTING

This defines the test requirement, which the software should meet and it is progressively integrated into complete package. The process of test plan is concerned with providing that a package produces correct and expected result for all possible input data.

For this software testing, we have three basic testing that should be adopted viz:

a. Module Testing

b. Integrated testing and

c. System testing

Module Testing

In this design we have many modules which when triggered up at certain events perform a specific function. So, module testing involves testing of each of the modules in software to verify that they meet their respective objective module testing were carried out to ensure that information properly flows into and out of the program module under test.

THE INTEGRATION TEST

So far, the various modules have been tested and each proved efficiency as an entity. (i.e. module). Though sometimes, the modules can perform their respective functions but when put together, they can function together. So this test therefore checks that when the modules are integrated they can combine to perform their respective functions. Hence, integration testing was done to entire program structure to uncover errors associated with interfacing. These errors were debugged to produce desired results. The essence of integration testing is to ascertain that these modules do not lose their efficiency and reliability. The Integration involved the main form which serves as coordinator and driver for other module.

4.6 USER INTERFACE:

User interface is the system by which users interact with a machine. The user interface includes hardware and software components. User interfaces exist for various systems and provide a means of:

(a) Input, allowing the users to manipulate a system.

(b) Output, allowing the system to indicate the effects of the user's manipulation.

The main aim of human-machine interaction is to produce a user interface which makes it easy, efficient enjoyable for humans to operate a machine in a way which produces the desired result.

i. **GRAPHIC USER INTERFACE**: This type accepts input via devices such as computer keyboard and mouse and provides articulated graphical output on the computer monitor.

ii. **WEB-BASE USER INTERFACES**: Accepts input and provide output by generating web pages which are transmitted via the internet and viewed by the user using a web browser program.

iii. **TOUCH USER INTERFACE**: These are graphical user interfaces using a touch screen display as a combined input and output device.

iv. **NATURAL LANGUAGE INTERFACE**: Natural language interface is used for search engines and on Webpages. The user types in a question and waits for a response.

In this design, ease of use was paramount; robust input procedures, error checking procedures, system e.t.c were included in implementation to ensure easy and efficient use of the software. This of course was achieved at the cost of bulkier code and resulting in increase of occupied memory space. The trade-off, however is justified as most target users may have little or no computer training and, thus require a very simple and straight forward user interfaces.

4.7 SECURITY

Quality control on the implementation was enhanced by the use of structural techniques as well as subjective testing for all stages and modules of the software system. Unauthorized access to data was handled by the inclusion of password protection for all sensitive modules of the system; thereby reducing the probability of inadvertent or malicious access to the sensitive area of the system. However, for the hospital management system, there are two major categories of security deployed thus;

i. **CLIENT SOFTWARE SECURITY**: This level of security ensures that only authorized persons such as doctors, nurses, consultants etc can have access to the system. The system therefore presents a login box requesting for the users user name and password. The username and password information are both stored in the database. Hence, during login, the entered information must be validated in comparison with the account information in the database. The above means that only authorized users can have access to the software.

ii. **DATABASE SERVER SECURITY:** The database is MYSQL and thus maintains an architectural security enabled profile. As a result, at run-time a connection must be established from the client software to the database server. This is a one-way connection and authentication is required. Full access to the MYSQL database also requires that the connection in client (user) must have the following information's

(a) Correct username and password

(b) MYSQL server link or URL usually local host for Private web server3 Correct port number of the server

Incorrect supply or error in the above information will lead to access denial to the MYSQL database. This also enhances the security detail of the system.

4.8 SOFTWARE TESTING/VERFIFICATION

In this stage, the software design is realized as a set of programs or program units. Each unit is tested to verify that it meets its specific action. This exercise proves the correction of the software application. Three different approaches can be used to demonstrate that the codes are correct:

Test based purely on structure, test based purely on function and a formal proof of correctness. Each approach leads to the conclusion that complete testing on the sense of a proof is not theoretically possible. Again to completely ascertain the software throughput, various testing method were utilised. Each method is categorically deployed to check for reliability, strength, weakness, and efficiency of the software. Among the testing methods used includes;

4.9 DEBUGGING

This test was carried out before the final compilation of the project for final publishing. This testing was used to check for code and syntax errors.

4.9.1 OPERATIONAL FLOW TESTING

This test was mainly used ensure that the program at runtime follows the proper flow system. Here common issues like false links and broken hyperlinks were checked.

4.9.2 DATA INTEGRITY AND FORMAT TESTING

This testing was used to check for data validation. The make sure the system accepts only the set data format and to report error when wrong data is keyed in.

4.9.3 LOAD TESTING

This is an efficiency test. The system is subjected to high operating condition and the behavior of the software monitored. Several assumptions were also made; this includes the average number of users accessing the data at a time and the number of concurrent connections to the MYSQL database server.

Finally, the above test methods generally provides the analytical result on the performance and integrity of the software

4.9.4 PROJECT COST

Cost in a project of this nature can be classified either as recurring or nonrecurring cost. Recurring costs are costs associated with on-going use of the system once it comes on screen and include consumables, the cost of operating the system as well as the cost for dedicated labour (staff time)

Non-Recurring costs are costs incurred in system development or facilitation of system environment for instance providing hardware for the users. Part of it is development cost, which includes the cost of staff and all consumables used, computer and so on.

4.9.5 CLIENT SIDE/ HOMEPAGE

This is the first page you see when you start up the software program using a Xampp as a local host server which contains the Homepage, Register and Login buttons.

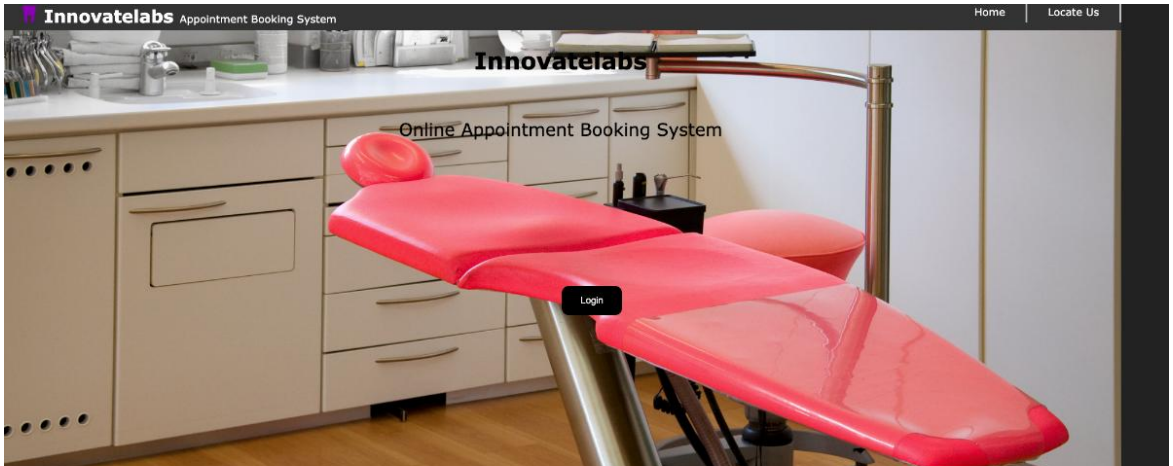


Fig 4.1 Homepage Interface

4.9.6 REGISTER INTERFACE

This is where the patient can sign up or register as a requirement to order for meal which contains all unique information of the patient to be stored and retrieved in the database.

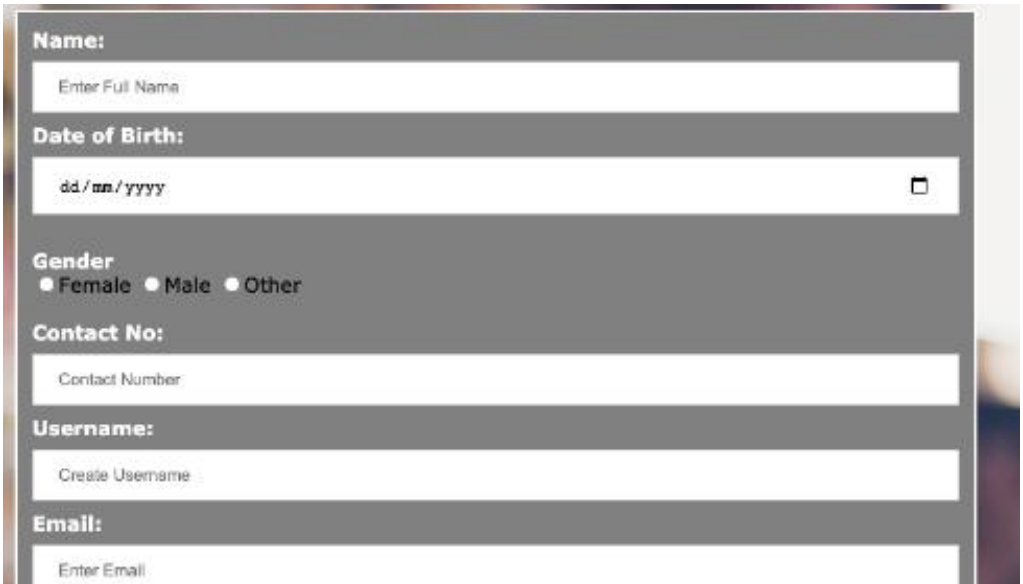


Fig 4.2 Register Interface

4.9.7 LOGIN INTERFACE

This is the interface where an outpatient visits after registration to access his/her page. It contains the Email and Password buttons.

Fig 4.3 Login Interface

4.9.8 POST LOGIN: This is the page accessible to an inpatient which contains his/her unique details such as name, birthdate and phone number after login to book appointment.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.0 SUMMARY

The primary goal of a web based decision system is to present information to the patient in an understandable manner using the web or client/ server side system. A WDSS is beneficial to the user because it can be programmed to generate many types of reports based on user's specification. The proposed system was able to perform it said function so as to satisfy patient hospital bill and minimize time spent in the waiting room, and increasing the number of patient attended to also improving work satisfaction .

5.1 CONCLUSION

The system was able to register outpatient information and help patient in making clinic appointments shouldn't be hard, but often due to the manual way of making appointments, patients find it's hard to make appointments with their desired doctor. Often patients have to wait in long queues and yet sometimes they won't be able to book their appointments. Clinic Appointment System is an easy solution for such patients. They don't have to wait in endless queues or ask someone to do them a favour, because Clinic Appointment system has everything, they need to make an appointment with their desired doctor. Clinic Appointment System comes with a clean and responsive interface, so that user can make appointments from every device, all they need is an internet connection.

5.2 RECOMMENDATION

Based on the remarkable success of the proposed system, this system can be recommended to the University of Benin Teaching Hospital (UBTH) to help outpatient book appointment and thereby leading to patient satisfaction with hospital bill and also minimize time wastage.

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Appendix

```
<html>
<head>
        <link rel="stylesheet" href="main.css">
</head>
<body style="background-image:url(images/signup.jpg)">
<div class="header">
                                <ul>
                                        <li style="float:left;border-right:none"><a
href="cover.php" class="logo"><img src="images/cal.png" width="30px"
height="30px"><strong> Innovatelabs </strong>Appointment Booking System</a></li>
                                        <li><a href="locateus.php">Locate Us</a></li>
                                        <li><a href="cover.php">Home</a></li>
                                </ul>
</div>
<form action="signup.php" method="post">
        <div class="sucontainer">
                <label><b>Name:</b></label><br>
```

```
                <input type="text" placeholder="Enter Full Name" name="fname"
required><br>

                <label><b>Date of Birth:</b></label><br>
                <input type="date" name="dob" required><br><br>

                <label><b>Gender</b></label><br>
                <input type="radio" name="gender" value="female">Female
                <input type="radio" name="gender" value="male">Male
                <input type="radio" name="gender" value="other">Other<br><br>

                <label><b>Contact No:</b></label><br>
                <input type="number" placeholder="Contact Number" name="contact"
required><br>

                <label><b>Username:</b></label><br>
                <input type="text" placeholder="Create Username" name="username"
required><br>

                <label><b>Email:</b></label><br>
                <input type="email" placeholder="Enter Email" name="email"
required><br>

                <label><b>Password:</b></label><br>
                <input type="password" placeholder="Enter Password" name="pwd" id="p1"
required><br>

                <label><b>Repeat Password:</b></label><br>
                <input type="password" placeholder="Repeat Password" name="pwdr"
id="p2" required><br>
                <p style="color:white">By creating an account you agree to our <a
href="#" style="color:blue">Terms & Conditions</a>.</p><br>

                <div class="container" style="background-color:grey">
                        <button type="button"
onclick="document.getElementById('id02').style.display='none'"
class="cancelbtn">Cancel</button>
                        <button type="submit" name="signup" style="float:right">Sign
Up</button>
                </div>
  </div>

</form>
</body>
</html>
<html>


<head>

<link rel="stylesheet" href="adminmain.css">

</head>

<body background= "clinicview.jpg" behavior="fixed">

<ul>

<li class="dropdown"><font color="yellow" size="10">ADMIN MODE</font></li>
```

```
<br>
<h2>
 <li class="dropdown">
 <a href="javascript:void(0)" class="dropbtn">Doctor</a>
  <div class="dropdown-content">
    <a href="adddoctor.php">Add Doctor</a>
    <a href="deletedoctor.php">Delete Doctor</a>
    <a href="showdoctor.php">Show Doctor</a>
          <a href="showdoctorschedule.php">Show Doctor Schedule</a>
  </div>
 </li>

 <li class="dropdown">
 <a href="javascript:void(0)" class="dropbtn">Clinic</a>
  <div class="dropdown-content">
    <a href="addclinic.php">Add Clinic</a>
    <a href="deleteclinic.php">Delete Clinic</a>
    <a href="adddoctorclinic.php">Assign Doctor to Clinic</a>
          <a href="addmanagerclinic.php">Assign Manager to Clinic</a>
          <a href="deletedoctorclinic.php">Delete Doctor from Clinic</a>
          <a href="deletemanagerclinic.php">Delete Manager from Clinic</a>
          <a href="showclinic.php">Show Clinic</a>
  </div>
 </li>
 <li class="dropdown">
```

```
  <a href="javascript:void(0)" class="dropbtn">Manager</a>
    <div class="dropdown-content">
      <a href="addmanager.php">Add Manager</a>
      <a href="deletemanager.php">Delete Manager</a>
            <a href="showmanager.php">Show Manager</a>
    </div>
  </li>
   <li>
          <form method="post" action="mainpage.php">
          <button type="submit" class="cancelbtn" name="logout" style="float:right;font-
size:22px"><b>Log Out</b></button>
          </form>
  </li>
</ul>
</h2>
<center><h1>ADD CLINIC</h1><hr>
<form method="post" action="<?php echo htmlspecialchars($_SERVER["PHP_SELF"]);?>">
  CID:<input type="number" name="cid" required>
  <br>
  Name: <input type="text" name="name" required>
  <br>
  Address: <input type="text" name="address" required>
  <br>
  Town: <input type="text" name="town" required>
  <br>
  City: <input type="text" name="city" required>
  <br>
  Contact no.: <input type="number" name="contact" maxlength="10" minlength="10" required>
  <br>
  <button type="submit" name="Submit">REGISTER</button>
</form>
</font></b>
</center>
<?php
session_start();
if(isset($_POST['logout'])){
```

```
		session_unset();
		session_destroy();
		header( "Refresh:1; url=alogin.php");
	}
function newclinic()
{
	include 'dbconfig.php';
		$cid=$_POST['cid'];
		$name=$_POST['name'];
		$town=$_POST['town'];
		$city=$_POST['city'];
		$contact=$_POST['contact'];
		$address=$_POST['address'];
		$sql = "INSERT INTO clinic (CID, Name, Address, Town, City, Contact) VALUES ('$cid','$name','$address','$town','$city','$contact')";

	if (mysqli_query($conn, $sql))
	{
		echo "<h2>Record created successfully!! Redirecting to Admin mainpage page....</h2>";
		header( "Refresh:3; url=addclinic.php");

	}
	else
	{
   echo "Error: " . $sql . "<br>" . mysqli_error($conn);
	}
}
function checkcid()
{
	include 'dbconfig.php';
	$cid=$_POST['cid'];
	$sql= "SELECT * FROM clinic WHERE cid = '$cid'";

	$result=mysqli_query($conn,$sql);

		if(mysqli_num_rows($result)!=0)
     {
			echo"<b><br>CID already exists!!";
     }
	else
		if(isset($_POST['Submit']))
	{
		newclinic();
	}


}
```

```
if(isset($_POST['Submit']))
{
	if(!empty($_POST['cid'])&&!empty($_POST['name'])&&!empty($_POST['address'])&&!empty($
_POST['town'])&&!empty($_POST['city']) && !empty($_POST['contact']))
			checkcid();
	else
		echo "EMPTY VALUES NOT ALLOWED";
}

?>

</body>
</html>
<html>
<head>
<link rel="stylesheet" href="main.css">
<script src="https://code.jquery.com/jquery-2.1.1.min.js" type="text/javascript"></script>
</head><?php include "dbconfig.php"; ?>
<style>
table{
   width: 100%;
   border-collapse: collapse;
	border: 4px solid black;
   padding: 1px;
	font-size: 25px;
}

th{
border: 1px solid black;
	background-color: #4CAF50;
   color: white;
	text-align: left;
}
tr,td{
	border: 1px solid black;
	background-color: white;
   color: black;
}
</style>

<body style="background-image:url(mgrchange.jpg)">
	<div class="header">
		<ul>
			<li style="float:left;border-right:none"><a href="ulogin.php" class="logo"><img
src="../images/cal.png" width="30px" height="30px"><strong> Innovatelabs </strong>Appointment
Booking System</a></li>
			<li><a href="mgrmenu.php">Home</a></li>
```

```
            </ul>
        </div>
        <form action="changebookingstatus.php" method="post">
        <div>


            <label style="font-size:20px"><b>Doctor:</b></label><br>
            <select name="doctor" id="doctor-list" class="demoInputBox"
style="width:100%;height:35px;border-radius:9px">
            <option value="">Select Doctor</option>

            <?php
            session_start();
            $mid=$_SESSION['mgrid'];
            $sql1="SELECT * FROM doctor where did in(select did from doctor_availability where
cid in (select cid from manager_clinic where mid=$mid));";
      $results=$conn->query($sql1);
            while($rs=$results->fetch_assoc()) {
            ?>
            <option value="<?php echo $rs["did"]; ?>"><?php echo "Dr. ".$rs["name"]; ?></option>
            <?php
            }
            ?>
            </select>
     <br>

            <label><b>Date:</b></label><br>
            <input type="date" name="dateselected" required><br><br>
            <br>
                <button type="submit" style="position:center" name="submit"
value="Submit">Submit</button>
                </form>
<?php
if(isset($_POST['submit']))
{

            include 'dbconfig.php';
            $did=$_POST['doctor'];
            $cid=1;
            $dateselected=$_POST['dateselected'];
            $sql1 = "select * from book where DOV='". $_POST['dateselected']."' AND DID= $did
AND CID= $cid order by Timestamp ASC";
             $results1=$conn->query($sql1);
                require_once("dbconfig.php");
?>
                        <form action="changebookingstatus.php" method="post">;
                        <table>
```

```
                        <tr>
                        <th>UserName</th>
                        <th>First Name</th>
                        <th>DOV</th>
                        <th>Timestamp</th>
                        <th>Status</th>
                        </tr>
<?php
                while($rs1=$results1->fetch_assoc())
                {
                        echo "<tr>";
                                echo '<td><input type="text" name="username[]" id="username"
value="'.$rs1["Username"].'" readonly></td>'
                                .'<td><input type="text" name="fname[]" id="fname"
value="'.$rs1["Fname"].'" readonly></td>'
                                .'<td><input type="date" name="dov[]" id="dov"
value="'.$rs1["DOV"].'" readonly></td>'
                                .'<td><input type="text" name="timestamp[]" id="timestamp"
value="'.$rs1["Timestamp"].'" readonly></td>'
                                .'<td><input type="text" name="status[]" id="status"
value="'.$rs1["Status"].'"></td></tr>' ;
                }
?>
                </table>
                <button type="submit" style="position:center" name="submit2"
value="Submit">Submit Changes</button></form>
<?php
}
require_once("dbconfig.php");
                if(isset($_POST['submit2']))
        {
                $usrnm=$_POST["Username"];
                $fnm=$_POST["Fname"];
                $tmstmp=$_POST["Timestamp"];
                $stts=$_POST["Status"];
                $dt=$_POST["DOV"];
                $n=count($usrnm);
                for($j=0;$j<$n;$j++)
                {
                        $updatequery="update book set Status='$stts[$j]' where
Username='$usrnm[$j]' and Timestamp='$tmstmp[$j]'";
                        if (mysqli_query($conn, $updatequery))
                        {
                                        echo "$fnm[$j] :Status updated successfully..!!<br>";

                        }
```

```
                        else
                        {
                                echo "Error: " . $sql . "<br>" . mysqli_error($conn);
                        }
                }
        //      echo "Redirecting.....";
        //      header( "Refresh:3; url=changebookingstatus.php");


        }
?>

</body>
</html>
<?php
session_start();
?>
<html>
<head>
<link rel="stylesheet" href="main.css">
<script src="https://code.jquery.com/jquery-2.1.1.min.js" type="text/javascript"></script>
</head><?php include "dbconfig.php"; ?>
<script>
function getTown(val) {
        $.ajax({
        type: "POST",
        url: "get_town.php",
        data:'countryid='+val,
        success: function(data){
                $("#town-list").html(data);
        }
        });
```

```
}
function getClinic(val) {
	$.ajax({
	type: "POST",
	url: "getclinic.php",
	data:'townid='+val,
	success: function(data){
		$("#clinic-list").html(data);
	}
	});
}
function getDoctorday(val) {
	$.ajax({
	type: "POST",
	url: "getdoctordaybooking.php",
	data:'cid='+val,
	success: function(data){
		$("#doctor-list").html(data);
	}
	});
}
function getTime(val) {
	$.ajax({
	type: "POST",
	url: "getClinic.php",
	data:'townid='+val,
	success: function(data){
		$("#time-list").html(data);
	}
	});
}
```

```
function getDay(val) {
	var cidval=document.getElementById("clinic-list").value;
	var didval=document.getElementById("doctor-list").value;
	$.ajax({
	type: "POST",
	url: "getDay.php",
	data:'date='+val+'&cidval='+cidval+'&didval='+didval,
	success: function(data){
		$("#datestatus").html(data);
	}
	});
}


</script>
<body style="background-image:url(images/bookback.jpg)">
	<div class="header">
		<ul>
			<li style="float:left;border-right:none"><a href="login.php" class="logo"><img src="images/cal.png" width="30px" height="30px"><strong> Innovatelabs </strong>Appointment Booking System</a></li>
			<li><a href="book.php">Book Now</a></li>
			<li><a href="login.php">Home</a></li>
		</ul>
	</div>
	<form action="book.php" method="post">
	<div class="sucontainer" style="background-image:url(images/bookback.jpg)">
		<label><b>Name:</b></label><br>
		<input type="text" placeholder="Enter Full name of patient" name="fname" required><br>

		<label><b>Gender</b></label><br>
		<input type="radio" name="gender" value="female">Female
```

```
<input type="radio" name="gender" value="male">Male
<input type="radio" name="gender" value="other">Other<br><br>

<label style="font-size:20px" >City:</label><br>
<select name="city" id="city-list" class="demoInputBox" onChange="getTown(this.value);" style="width:100%;height:35px;border-radius:9px">
<option value="">Select City</option>
<?php
$sql1="SELECT distinct(city) FROM clinic";
$results=$conn->query($sql1);
while($rs=$results->fetch_assoc()) {
?>
<option value="<?php echo $rs["city"]; ?>"><?php echo $rs["city"]; ?></option>
<?php
}
?>
</select>
<br>

<label style="font-size:20px" >Town:</label><br>
<select id="town-list" name="Town" onChange="getClinic(this.value);" style="width:100%;height:35px;border-radius:9px">
<option value="">Select Town</option>
</select><br>

<label style="font-size:20px" >Clinic:</label><br>
<select id="clinic-list" name="Clinic" onChange="getDoctorday(this.value);" style="width:100%;height:35px;border-radius:9px">
<option value="">Select Clinic</option>
</select><br>

<label style="font-size:20px" >Doctor:</label><br>
```

```
<select id="doctor-list" name="Doctor" onChange="getDate(this.value);" style="width:100%;height:35px;border-radius:9px">

<option value="">Select Doctor</option>

</select><br>


<label><b>Date of Visit:</b></label><br>

<input type="date" name="dov" onChange="getDay(this.value);" min="<?php echo date('Y-m-d');?>" max="<?php echo date('Y-m-d',strtotime('+7 day'));?>" required><br><br>

<div id="datestatus"> </div>


<label style="font-size:20px" >Time:</label><br>

<select name="time" id="time-list" class="demoInputBox"style="width:100%;height:35px;border-radius:9px">

<option value="">Select Time</option>

<?php


$sql1 = "SELECT * FROM time WHERE book_time NOT IN (SELECT book_time FROM book)";

$result=$conn->query($sql1);

while($rs=$result->fetch_assoc()) {

?>

<option value="<?php echo $rs["book_time"]; ?>"><?php echo $rs["book_time"]; ?></option>

<?php

}

?>

</select>

<br>

<div class="container">

<button type="submit" style="position:center" name="submit" value="Submit">Submit</button>

</div>

<?php
```

```
if(isset($_POST['submit']))
{
		include 'dbconfig.php';
		$fname=$_POST['fname'];
		$gender=$_POST['gender'];
		$username=$_SESSION['username'];
		$cid=$_POST['Clinic'];
		$did=$_POST['Doctor'];
		$dov=$_POST['dov'];
		$status="Booking Registered.Wait for the update";
		$timestamp=date('Y-m-d H:i:s');

	$book_time=$_POST['time'];
		$sql = "INSERT INTO book (Username,Fname,Gender,CID,DID,DOV,Timestamp,book_time,Status) VALUES ('$username','$fname','$gender','$cid','$did','$dov','$timestamp','$book_time','$status') ";

	if(!empty($_POST['fname'])&&!empty($_POST['gender'])&&!empty($_SESSION['username'])&&!empty($_POST['Clinic'])&&!empty($_POST['Doctor']) && !empty($_POST['dov']))
		{
			$checkday = strtotime($dov);
			$compareday = date("l", $checkday);
			$flag=0;
			require_once("dbconfig.php");
			$query ="SELECT * FROM doctor_availability WHERE DID = '" .$did. "' AND CID='".$cid."'";
			$results = $conn->query($query);
			while($rs=$results->fetch_assoc())
			{
				if($rs["day"]==$compareday)
				{
					$flag++;
```

```
                                        break;
                                }
                        }
                        if($flag==0)
                        {
                                echo "<h2>Select another date as Doctor Unavailable on ".$compareday."</h2>";
                        }
                        else
                        {
                                if (mysqli_query($conn, $sql))
                                {
                                        echo "<h2>Booking successful!! Redirecting to home page....</h2>";
                                        header( "Refresh:2; url=login.php");

                                }
                                else
                                {
                                        echo "Error: " . $sql . "<br>" . mysqli_error($conn);
                                }
                        }
                }
                else
                {
                        echo "Enter data properly!!!!";
                }
}
?>
        </form>
</body>
```

</html>