

DESIGN AND IMPLEMENTATION OF A HEALTH RECOMMENDATION SYSTEM
FOR DRUG ADDICTS (ANTIDEPRESSANT DRUGS)

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DECLARATION

I hereby declare that this project has been written by me and is a record of my own research work. It has not been presented in any previous application for higher degree of this or any other University. All citations and sources of information are clearly acknowledged by my means of reference.

.....

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DATE

CERTIFICATION

This project titled, DESIGN AND IMPLEMENTATION OF A HEALTH RECOMMENDATION SYSTEM FOR DRUG ADDICT(ANTIDEPRESSANT), in partial fulfilment of the requirement for the degree of BACHELOR OF SCIENCE (Computer Science) is hereby accepted.

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DEDICATION

This project work is dedicated to the giver of life and wisdom: The Almighty God

ACKNOWLEDGEMENT

The success and final outcome of this project goes to the Almighty God for wisdom and understanding. I specially appreciate my Supervisor Dr. F. A. Kasali who took keen interest in my project work and guided me all along, and never relented to attend to me anytime I came to him for assistance.

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I extend my gratitude to Mountain Top University for setting greater heights for me. I say God bless you richly. I heartily would like to thank my parents, Mr and Mrs Eze and siblings, thank you all for your moral and financial support. I am grateful for all the investments into my education and future. I would not forget to remember all the students in the Department of Computer Science and Mathematics, for making my stay a worthwhile one, I say God bless you all.

ABSTRACT

With the rising populations of people today, huge quantity of data has been collected from clinical and hospital databases representing patients' health states (e.g., as laboratory results, treatment plans, medical reports). Health Information Systems are becoming an important platform for healthcare services. Health Recommender Systems increase usability of technologies and reduce information overload in processes. Health Recommender Systems (HRS) are presented as complementary tools in decision making processes in healthcare services. This project is based on the design and implementation of a health recommendation system for drug addict(antidepressant). It studies people with drug addiction issues and aims to help them maintain a healthy life style by recommending them to a working and efficient rehabilitation center, thereby aiding healthcare facilitators. The goal of this work is to develop a seamless, efficient and reliable health recommendation system that would diagnose and recommend drug addict to a nearest rehabilitation center for treatment. In order to achieve its aim and objective, data gathering techniques were employed, and a system was developed in the react native framework with JavaScript and the API which I developed.

TABLE OF CONTENTS

DECLARATION	ii
CERTIFICATION	iii
DEDICATION	i
ACKNOWLEDGEMENT	ii
ABSTRACT.....	iii
LIST OF FIGURES	vii
CHAPTER ONE.....	1
1.1 Background of Study	1
1.2 Statement of the Problem.....	3
1.3 Aim and Objectives.....	3
1.4 Proposed Methodology	4
1.5 Scope and Limitations.....	4
1.6 Significance of Study	5
1.7 Definition of Terms.....	5
CHAPTER TWO	8
LITERATURE REVIEW	8
Introduction.....	8
2.1 Drug Addiction.....	8
2.1.1 Types of Addictive Drugs.....	9
2.1.2 Antidepressant Drugs	12
2.2 Health Information System	18

2.2.1	Health information system in Nigeria	19
2.2.2	Benefits of health information system.....	21
2.3	A Recommender System.....	23
2.3.1	Various kinds of recommender systems	26
2.3.2	How the recommendation system works.....	29
2.3.3	How the recommender system operates	30
2.3.4	Recommendation systems: Benefits for Online Business	31
2.3.5	Health recommender systems.....	32
2.4	System Development Life Cycle.....	35
2.4.1	Phases of SDLC.....	35
2.4.2	Software development life cycle models.....	38
2.5	Unified Modelling Language (UML).....	45
2.5.1	Conceptual model.....	45
2.5.2	UML diagrams.....	46
2.6	Review Related works.....	47
CHAPTER THREE		49
Introduction.....		49
3.1 Method of Identification of User and System Requirement		49
3.1.1	Identification of system requirement	50
3.1.2	Identification of user requirements	52
3.2 System Design Methods		53

CHAPTER FOUR.....	56
4.0 Introduction.....	56
4.1 System Implementation	56
4.2 Database Implementation.....	56
4.3 Front End Implementation	57
4.4 Backend Implementation	57
CHAPTER FIVE	63
5.1 Summary.....	63
5.2 Recommendation for Further Study.....	63
5.3 Conclusion	63
REFERENCES	65

LIST OF FIGURES

Figure 2. 1 Health Recommendation system Diagram	34
Figure 2. 2 phases of SDLC	36
Figure 2. 3 waterfall model	39
Figure 2. 4 Iterative Model	41
Figure 2. 5 class diagram	47
Figure 3. 1 Admin case diagram.....	53
Figure 3. 2 Patients use case diagram	53
Figure 3. 3 Sequence diagram.....	54
Figure 3. 4 activity diagram	55
Figure 3. 5 Architecture diagram	55
Figure 4.4.1 sign up page.....	58
Figure 4.4.2 sign in page.....	59
Figure 4.4.3 Postman for communicating with the api.....	59
Figure 4.4.4 patients home page	60
Figure 4.4.5 diagnosis page	61
Figure 4.4.6 patient's dashboard.....	62

CHAPTER ONE

1.1 Background of Study

In 2014, There are around 246 million people on the world who have taken illegal substances in the previous 12 months (UNODC, 2017)) united nations office on drugs and crime. Cannabis, opiates (such as heroin), cocaine, and amphetamine-type stimulants are among the medications used. Hemp is one of the most often used illegal substances in the world today. Despite the fact that drug abuse is widespread in Nigeria, there are no official statistics on the number of drug users in the nation. Nevertheless, the numbers are big enough to be of worry, according to experts. Cannabis is the most often used illicit substance in Nigeria. Misconceptions abound when it comes to the kind of medications that individuals use and their adverse effects. Unpleasant youthful activities are widespread in Africa, particularly in Nigeria and this has been a major concern to government at all levels and the general public.

drug abuse is defined as the wilful overuse or misuse of a single drug, with or without a prior medical diagnosis from a certified healthcare professional. (Brown, 2012)Drug abuse is defined as the detrimental use of mind-altering substances. He clarified that the phrase generally alludes to a problem with illicit drugs, but that it may also apply to the misuse of legal prescriptions, such as self-medication. (Adelusi, 2012) Two hundred children were detained in a town named Ayeye in Ibadan, Oyo State, where they learnt how to smoke Indian hemp, according to reports. Some Nigerian teenagers are unknowingly reliant on one or more types of drugs for different everyday activities such as social, scholastic, political, and moral development. A study by (oshiokoya, 2006)

Dependence and addiction were recognized as one of the primary outcomes of drug misuse among Nigerian youngsters, defined by compulsive drug craving seeking behaviours that were utilized to persist even in the face of negative consequences. Individuals are put at danger by these behaviours, which are maladaptive and unsuitable for social or environmental contexts.

The amount of substance ingested or the frequency with which it is consumed has less to do with drug misuse and addiction than the effects of drug usage. You most certainly have a drug abuse or addiction problem if drug use is producing problems in your life, at job, school, home, or in your relationships, no matter how much or how little you use. (Adeleke, 2008) Addiction is a complicated condition defined by compulsive drug use, and each substance has various bodily repercussions. He went on to say that all misused drugs have one thing in common: they can change the way the brain appears and operates if they are taken repeatedly. When both disorders exist at the same time, the impact on mental health is severe. Many cases of drug misuse include abandonment as a contributing factor. Resolving the drug addiction problem will be aided by addressing an underlying abandonment issue.

In the addiction stage, the health recommender system provides higher personalization, which enhances the specifics of offered suggestions and improves users' comprehension of their medical condition.

These platforms also enhance the patient's experience, improve their health, and encourage them to stay fit and healthy.

1.2 Statement of the Problem

Misuse of drugs or self-medication has claimed the lives of many young people, and we are indifferent to the causes of the country's high death rate.

In turn, focusing on addiction prevention and recovery services is the most successful way to minimize all costs associated with substance abuse. It aids in the resolution of issues such as: inability to assess a patient's addiction stage, failure to discover a suitable rehabilitation clinic without needing to travel from one area to the other, and inability to arrange medical visits. Time wastage is an issue, such as the time between such a patient's diagnosis and a visit. Another contributing factor is overcrowding in recovery facilities, considering the current situation with the COVID-19 pandemic, an appointment system allows to spread out patient visits throughout the day to maintain social distancing and avoid crowding.

Furthermore, minimize the amount of time spent on administrative duties For hospitals, maintaining a manual appointment schedule is a time-consuming process. Hospitals can use an appointment system to allow people to make appointments online. The majority of appointment processing is automated, saving time for employees and allowing them to focus on other responsibilities inside the clinic.

1.3 Aim and Objectives

The goal of this project is to design and create a system that helps in correcting minuet stage of drug addiction (antidepressant drugs) and recommending critical stage of drug addition to rehabilitation center so as to provides a streamlined and appropriate forum for end users to communicate their health

concerns to the system and receive correct prescriptions and recommendations to solve problems.

The objectives of the system to be developed are:

1. Specify the type of information system to be developed
2. Design the already specified recommender health system
3. Implement the health recommender system
4. Test the already implemented health recommender system

1.4 Proposed Methodology

In order to meet the above-mentioned objectives, the following are the steps or method adopted:

1. A review of literature will be done so as to identify and understand the existing health recommender system.
2. An analysis will be done to elicit the requirement of the users and System via an informal interview or survey.
3. The system design will be implemented using the unified modelling diagrams including the entity relation diagram, use case diagram, class diagram etc.
4. The database will be implemented using NodeJS
5. The system will be tested using the alpha and beta testing methods.

1.5 Scope and Limitations

This research encompasses recommending drug addicts (hard drugs) at critical stage to rehabilitation center closest to them and prescribing possible ways to manage those at early stage.

The proposed system will be designed to correct drug addiction (hard drugs) at a preliminary stage (i.e., conditions at early stage, the system will prescribe ways to manage it) and recommend individuals in critical stage to the closest rehabilitation center. The most significant advantage of this system is that it only recommends users or individuals who are drug addicts to appropriate rehabilitation center.

1.6 Significance of Study

As healthcare services become more complex, the health recommender system (HRS) is becoming an increasingly essential platform. In this setting, health-recommendation systems will help recommend closest rehabilitation centers for people with extreme stage of drug addiction. The system also focuses on correcting the effect of drug addiction (hard drugs), where individuals who are drug addict at the late stage are recommended to rehabilitation center and those at early stage, the system prescribe ways to curb drug addiction.

This study benefits individuals who are struggling with the effects of drugs. The system collects detailed data on the current situation, checks the condition with the list of conditions in the system, then determines what stage of addiction and prescribe the recommended solution.

1.7 Definition of Terms

Recommender System: a recommender system attempts to predict the “rating” and “preference” a user will assign to an item by using a variety of methods.

Health recommender system: The key aim of health recommender systems are to collect reliable health information from the Internet, analyze which information is relevant to the user account, pick the best that can be suggested,

adapt their selection methods to the field of knowledge, and learn from the best recommendations.

Drugs: A drug is any substance (other than food and water) that, when ingested, changes the body's function, either physically or psychologically. Drugs can be lawful (e.g., alcohol, caffeine, and cigarettes) or illegal (e.g., heroin) (e.g., cannabis, ecstasy, cocaine and heroin).

Drug Addiction: Drug addiction, also known as substance use disorder, is a condition that affects the brain and behavior of a person, resulting in an inability to resist the use of a legal or illicit drug or medicine. Substances like alcohol, marijuana, and nicotine are also classified as drugs. When a person is addicted to a substance, he/she may continue to use it ignoring the harm it causes.

Substance Abuse: Substance abuse is simply a habit of hazardous usage of any substance for mood-altering objectives. Alcohol and other drugs (illegal or not) are examples of "substances," as are other substances that are not drugs at all.

Hard drugs: are substances that can cause physical and psychological addiction, as well as death. Any highly addictive substance of misuse that may force its user to conduct criminal acts in order to get the drug.

Rehabilitation: Rehabilitation is the way of helping someone recover from a serious accident, sickness, or surgery by helping them restore strength or relearn abilities.

A rehabilitation center is an institution that helps people recover from a range of diseases, some of which are medical and others of which are caused by substance addiction or mental illness. Some treatment facilities include residential quarters where patients can spend the night. Others are only available as outpatient services.

Antidepressants are medicines used to help treat major depressive disorder like anxiety disorders, chronic pain problems, and to assist in the management of other addictions.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter talks about the concepts of the study of this topic. The concepts discussed here, include, a definition of the kind of system the software system is, analyses the different kinds of systems that exist and expresses the system that the types of system that make up this software system. This study highlights software development life cycle (SDLC), its phases, and process models.it also review the related works of other work done.

2.1 Drug Addiction

Drug addiction is a disorder that disturbs a person's brain and behaviours, resulting in an inability to regulate use of any medication, legal or illegal. Drug addiction is also a complex neurological disorder that need adequate treatment of the mind, body, and soul. It is classified as a brain illness since medicines alter the structure and function of the brain. (care, 2018).

Drug addiction has less to do with the amount or frequency of substance used and more to do with the effects of drug usage. No matter how frequently or seldom you use drugs, if they are creating difficulties in your life, at work, school, home, or in your relationships, you most certainly do have drug misuse or addiction issue. (Adeleke, 2008) affirmed that addiction is a complex disorder characterized by compulsive drug use and that each drug produces different physical effects. He went on to say that all misused drugs have one thing in common: they can change the way the brain appears and works. Drug

use among youngsters should be a major concern for all Nigerians, particularly the government at all levels, school administrators, religious leaders, and nongovernmental organizations. Experimentation with drugs during childhood and adolescence is common as they try new things and use drugs for many reasons including curiosity, peer influence, to imitate, and the like. In a study by (oshiokoya, 2006) on drug misuse among Nigerian children, highlighted dependency and addiction as one of the primary outcomes, characterized by obsessive drug yearning seeking behaviours that are utilized to persist even in the scenarios of negative effects.

2.1.1 Types of Addictive Drugs

We have many forms of drug addiction which are:

- Stimulant
 - Hallucinogens
 - Opioids
 - Depressants
 - Antidepressant
-
- Stimulants: they are kinds of drugs which speeds up message between the brain and the body. They cause someone to feel energetic, alert, talkative, active and very excited.

Overdose of stimulant can cause dangerous harm to the body like causing anxiety, panic, seizures, headaches, stomach cramps, aggression and paranoia, death, coma, increased body temperature. stimulant can also cause numbers of adverse effect.

Stimulants includes; Amphetamines, Betel nut, Caffeine, Cocaine, ice, khat mephedrone, nicotine, synthetic cathinones, Adderall, Crack Cocaine, Concerta, Cream, Dexedrine, Diet Pills, Ecstasy, Flakka, Meth, Ritalin and Steroids.

Effect of Stimulants

Stimulant affect everyone based on

- size, weight and health.
 - if someone is used to taking it.
 - if other drugs are administered or taken a the same time and the amount taken.
 - the strength of the drug (varies from batch to batch with illegally produced drugs).
-
- **Hallucinogens;** Hallucinogens are a type of drug that causes deep imbalances in people's understanding of reality, resulting in hallucinations. Users who are under the effect of hallucinogens may see images, hear sounds, or feel sensations that appear to be real but are not. So, most hallucinogens are alkaloids that contain nitrogen. Many The chemical structures of hallucinogens are similar to those of natural neurotransmitters (acetylcholine-, serotonin-, or catecholamine-like). hallucinogens consist of: Ayahuasca, Bath Salt, DMT, GHB, Ketamine, D-lysergic acid diethylamide (LSD), Mescaline, PCP, Psilocybin Mu shrooms, Salvia, Toad Venom and marijuana.

- Opioids; are a group of drugs derived from the opium poppy plant that act on the brain to generate a range of effects, such as pain control. Opioids can be either prescription or illicit drugs. They give you a rush of enjoyment, transport you to a dreamlike state, and end up making you sleepy. At high doses, they are highly hazardous. They're extremely addictive. Opioids includes comprises of; Codeine, Darvocet and Darvon, Demerol, Dilaudid, Fentanyl, Heroin, Hydrocodone, Lean, Lortab, Methadone, Morphine, Oxycodone, OxyContin, Percocet, Prescription Opioids, Suboxone, Synthetic Opioids, Tramadol and Vicodin.
- Depressant: also have an effect on the CNS of the body, but in the opposite direction, trying to make users feel as though things are slowing down. As a result, they are frequently referred to as "downers" on the street. Alcohol, heroin, barbiturates, and other drugs have had the reverse effect as the past ones. These drugs work by "numbing" the nervous system, causing the person to undergo comfort, drowsiness, and an increase in sleep. People who consume large amounts of it become drowsy. High quantities can cause a fatal wrong medication because vital body systems, such as breathing, are slowed to the point of stopping.

Examples of depressant drugs are;

- Ethyl alcohol
- Barbiturates
- Benzodiazepines

2.1.2 Antidepressant Drugs

Antidepressants are medications that can help with a variety of conditions, including depression, social phobia, emotional problems, seasonal allergies, dysthymia, and patients with mild depression. Antidepressants are type of drugs which is used to treat a variety of mental health conditions, and They are most widely prescribed pharmacotherapeutics for the treatment of major depressive disorder. With a prevalence incidence of 14.4 percent, the most frequent mood illness in the United States is called depression. (Hillhouse, 2015)

They are designed to correct neurotransmitter chemical effect on the brain. that are believed to be responsible for changes in mood and behaviour. (sane.org, 2014)

Within 1950s, antidepressants were first established. Within the last 20 years, their utilization has become increasingly common. (NIMH, 2014)

According to the Centre's for Disease Control and Prevention (CDC), antidepressant use is prevalent among people aged 12 and up in the United States. The rate increased from 7.7% in 1999-2002 to 12.7 percent throughout 2011-2014. (CDC, 2014). Around twice as many females use antidepressants.

Types of anti-depressant drugs

Antidepressants can be classified into five categories:

- Serotonin and noradrenaline reuptake inhibitors (SNRIs)
- Selective serotonin reuptake inhibitors (SSRIs)
- Tricyclic antidepressants (TCAs)
- Monoamine oxidase inhibitors (MAOIs)

- Noradrenaline and specific serotonergic antidepressants (NASSAs) (rcpsych, 2014)

Antidepressants treat major depressive disorder and other conditions.

These are the most commonly prescribed type of antidepressant.

- I. Serotonin and noradrenaline reuptake inhibitors (SNRIs) are prescribed to treat major depression, mood disturbances, and possibly, but less frequently, attention deficit hyperactivity disorder (ADHD), obsessive-compulsive disorder (OCD), anxiety disorders, menopausal symptoms, fibromyalgia, and chronic neuropathic pain. SNRIs increase serotonin and norepinephrine levels in the brain, two neurotransmitters that are important for mood regulation. Duloxetine (Cymbalta), venlafaxine (Effexor), and desvenlafaxine (Desvenlafaxine) are just a few examples (Pristiq). Antidepressants that are most commonly prescribed are SSRIs (selective serotonin reuptake inhibitors). They treat depression effectively and have slight negative consequences than other antidepressants.
- II. Selective serotonin reuptake inhibitors (SSRIs) Stopping serotonin from becoming absorbed back inside the brain is how they work. This improves mood stability by makes it much easier for brain cells to receive or transmit signals. They're called "selective" because Serotonin is the only neurotransmitter that is affected, not other neurotransmitters.

Some side effects SSRIs and SNRIs include Hypoglycaemia (low blood sugar - is a condition in which the body's sugar levels are abnormally low.), sodium

intake is low, weight loss, sweating, tremor, sedation, sexual dysfunction, insomnia, headache, dizziness, anxiety, agitation.

Citalopram (Celexa), escitalopram (Lexapro), fluoxetine (Prozac, Sarafem), fluvoxamine (Luvox), paroxetine (Paxil), and sertraline (Sertraline) are some examples of antidepressants (Zoloft). People who take SSRIs and SNRIs, particularly those below the age 18, have been reported to have suicidal thoughts, particularly when they first start taking the drugs.

- III. Tricyclic antidepressants (TCAs) the chemical structure of tricyclic antidepressants (TCAs) has three rings. They are used to treat depression, fibromyalgia, anxiety, and chronic pain. Side effects of tricyclics include: seizures, Arrhythmia, or irregular heartbeat, is a condition that can cause insomnia, anxiety, arrhythmia., hypertension, rash, nausea and vomiting, abdominal cramps, weight loss, constipation and urinary retention. Amitriptyline (Elavil), amoxapine-clomipramine (Anafranil), desipramine (Norpramin), doxepin (Sinequan), imipramine (Tofranil), nortriptyline (Pamelor), protriptyline (Vivactil), and trimipramine are just a few of the medications available (Surmontil).
- IV. Monoamine oxidase inhibitors (MAOIs) Before the introduction of SSRIs and SNRIs, this type of antidepressant was commonly prescribed. Monoamine oxidase, a brain enzyme, is inhibited by it. Monoamine oxidase aids in the breakdown of neurotransmitters like serotonin. There will be more circulating serotonin if less serotonin is broken down. This, in theory, should result in more stable moods and less anxiety. Doctors If SSRIs haven't worked, MAOIs are now being used. Because MAOIs interact with a variety of other medications

and foods, they are typically reserved for cases where other antidepressants have failed. Some side effects include blurred vision, rash, seizures, edema, Weight gain or weight loss, sexual dysfunction, diarrhoea, nausea, and constipation, anxiety, insomnia and drowsiness, headache, dizziness, fainting or feeling faint when standing up arrhythmia, or irregular heart rhythm hypertension, or high blood pressure. Examples of Phenelzine (Nardil), tranylcypromine (Parnate), isocarboxazid (Marplan), and selegiline are examples of MAOIs (EMSAM, Eldepryl).

- V. V. Noradrenaline and specific serotonergic antidepressants (NASSAs) are antidepressants that are used to treat anxiety disorders, personality disorders, and depression. Constipation, dry mouth, weight gain, drowsiness and sedation, blurred vision, and dizziness are all possible side effects. Seizures, white blood cell reduction, fainting, and allergic reactions are among the more serious side effects. Mianserin (Tolvon) and Mirtazapine are two examples (Remeron, Avanza, Zispin

General side effects of Anti-Depressants.

Any adverse effects will most likely appear during the first two weeks and then fade away. Nausea and anxiety are common side effects, but they vary depending on the drug, as mentioned above. If the side effects are very unpleasant, or if they include thinking about suicide, the doctor should be informed at once. Furthermore, studies have linked the following negative effects to antidepressant use, particularly in children and adolescents.

- I. Mood elevation and behavior activation that is excessive

Mania or hypomania are examples of this. Antidepressants do not cause bipolar disorder; however, they may reveal a condition that has not yet manifested itself.

II. Suicidal thoughts

There have been a few reports of higher risk of having when first using antidepressants. This could be due to the drugs or other factors, such as the time taken for the medication to work, or possibly an undiagnosed bipolar disorder which may require a different approach to treatment. (courtet, 2017).

III. Withdrawal symptoms

Unlike some drugs, it is not necessary to keep raising the dose to get the same effect with antidepressants. In that sense, they are not addictive. When you stop taking an antidepressant, you will not encounter the same withdrawal symptoms that you would when quitting smoking, for example. However, nearly one-third of people who take SSRIs and SNRIs experience withdrawal symptoms after they stop taking them. The symptoms lasted anywhere from two weeks to two months and include;

- a. Anxiety
- b. Dizziness
- c. nightmares or vivid dreams
- d. d. sensations in the body that are similar to electric shocks
- e. flu-like symptoms
- f. abdominal pain

Doctors should reduce the dose gradually to minimize the risk of unpleasant withdrawal symptoms. (JAMA, 2006)

Uses of Antidepressant

These medications are used not only to treat depression but for other conditions too.

Antidepressants are used to treat the following conditions:

- I. agitation
- II. obsessive-compulsive disorders (OCD)
- III. Enuresis, also known as bedwetting, is a condition that affects children.
- IV. Major depressive disorder (MDD) and depression
- V. generalized anxiety disorder
- VI. bipolar disorder
- VII. posttraumatic stress disorder (PTSD)
- VIII. society anxiety disorder

Sometimes a medication is used “off-label.” This means the use is not approved by the FDA, but a doctor may decide that it should be used as it may be an effective treatment. (Offidani, 2013)

Off-label uses of antidepressants include:

- I. Insomnia
- II. pain,
- III. migraine

2.2 Health Information System

A health information system (HIS) is a data management system for healthcare. This can include systems to collect, store, maintain, and transfer a person's electronic medical record (EMR), as well as infrastructure that supports healthcare policy decisions.

Many users and a wide range of objectives are served by health information systems, which can be summarized as the creation of information to enable decision-makers at all levels of the health system to recognize issues and needs, make evidence-based choices on health policy and allocate limited resources optimally.

Developing countries are faced with a wide range of health-related difficulties including the limited resources and capabilities (Davari M, 2012). The health-care systems that deal with these issues have inevitably shifted their focus to taking full advantage of limited resources and finding ways to make health systems functions as efficiently as possible. (Stansfield SK, 2006.)

In order to ensure Public health professionals are increasingly expected to engage in evidence-informed decision making as a more responsible use of financial and human resource investments, (Yost J, 2014) which is critically dependent on the timely availability of sound and accurate data and information. (Raeisi AR, 2013) This information is not only required for health policymakers to make more accurate decisions, but it is also required by the public., (Uneke CH, 2011)but Health front-line providers can also use it to improve the effectiveness and quantity of health interventions. (Oduro-Mensah E, 2013) Obviously, data and information

provide knowledge and developing and managing the knowledge will provide power to construct effective interventions (Zack, 1999). HIS aims to improve the processes of data management in order to extract useful information for health planning, decision-making, and resource allocation through different sources to provide quality services. (Norway, 2003)

The HIS is a functional entity within the framework of the comprehensive health system to improve the well-being of the population. In this regard, the HIS structure should allow the generation of necessary information for use in decision-making at each health-care system's level with a given number of resources (Tsiknakis M, 2005).

2.2.1 Health information system in Nigeria

These organizations and systems don't communicate or share data with one another on a regular basis. (Asangansi I. , 2012). Previous research has identified inadequate HIS leadership and governance, neighbourhood conflicts, unclear roles and responsibility assignments, a lack of financial objectives, and low technical capabilities; the absence of interpersonal coordination and collaboration has been connected to HIS barriers and inefficiencies. (Asangansi I. &., 2010). Furthermore, recent national policy advice on HIS centered mostly on the Ministry of Health, with no adequate connection of affiliated organizations. The growing availability and usage of ICT for consolidating the administration of these many data sources need improved collaboration and coordination. Due to the limited availability of financial and technical resources across government departments, resources must be properly utilized and paid attention on parts and activities which have the greatest impact. Likewise, long underappreciated,

appropriate connectivity and teamwork among all organizations involved in health information systems is likely to significantly lessen duplication and resource waste.(Makinde, 2016) . as a response to income loss and a desire to increase the application of evidence in decision-making, the government decided to examine Nigeria's HIS. The research was focused on the national HIS strategy, emphasising the program's underlying shortcomings and exploring policy implementation options that take advantage of emerging trends ICT infiltration in Nigerian health systems is increasing. It included an investigation of possibilities for standardisation and system interconnectivity making plans, both of which were outlined at the World Health Assembly's sixty-sixth session (World Health Assembly World Health (WHO, 2013)).

Nigeria is a federal republic of 36 semi-autonomous states and a Federal Capital Territory with a population of more than 180 million people and a GDP per capita of \$2450 in 2016. (Federal Government of Nigeria, 1999; The World Bank, 2016). Because health is not on the Federal Government's exclusive list of problems to solve, the Federal Government of Nigeria (FGN) creates health policies and regulations that states may adopt for implementation at their discretion. (Onyemelukwe, 2016). States also oversee Local Government Areas which are within them smaller organisation units. The FMOH, Federal Ministry of Education, Federal Ministry of Agriculture, Federal Ministry of Budget and National Planning (formerly National Planning Commission), National Health Insurance Scheme, National Primary Healthcare Development Agency, National Agency for Food, and the National Agency for Food and Drug Administration are among the Nigerian ministries, departments, and agencies responsible for the health system, the National Population Commission (NPC), the Nigerian Institute

for Medical Research, and the National Bureau of Statistics, to name a few. Also every agency has its own set of duties that have an impact on the national HIS.

2.2.2 Benefits of health information system

- I. Organized & Collaborative Treatment Process - A health information system (HIS) is a technology-based system that makes sharing protected health information (PHI) between organizations and providers a breeze. Patients can also receive seamless and coordinated treatment from healthcare providers thanks to this system. Patients with diagnoses that necessitate cross-specialty treatment coordination and extensive medical information management benefit the most from HIS. Above all, it improves the quality of care provided to patients as well as their outcomes.
- II. Improved Patient Safety - With the support of Health Information Systems, you can gain easy access to patients' data and save and share information across multiple databases to improve patient safety. You can also receive alert notifications whenever there is a problem with a patient's health. For example, if a patient has xthat without being prescribed, healthcare providers may receive an alert from program security checking about the harmful effects that patient may experience on that medicine. This way, you'll be able to avoid making any major errors as a result of a lack of information when making decisions.
- III. Betterment in Patient Care - Health Information Systems provide healthcare providers with a complete and orderly framework by collecting and saving patient information such as diagnosis reports, medical history, allergy reactions, vaccinations, treatment information plans, test results, and so on.

This allows them to interact with their patients more effectively and deliver care to them more efficiently.

- IV. Hassle-free Process of Performance Analysis - Using Health Information Systems allows you to access your staff's performance, analyze patient care, and assess your organization's efficiency and stability. HIS reduces paperwork and converts all records to computers. Based on your staff's skill sets, you can make any decision you want. You can also make decisions based on previous performance details. With HIS, your patients can provide feedback on the level of care they are receiving from your staff, allowing you to keep track of their performance and assess the effectiveness of your organization.
- V. Clinical Procedures Transfiguration - With HIS, you can deal with any type of stressful situation for your patients. You can see a virtual representation of patient flow and what each patient goes through during their appointments with health care providers, administrative staff, lab technicians, and financial assistants. Paying close attention to this will help you identify areas where you can make a difference.
- VI. Avoiding Medical Errors - You get error-free reports and information because Health Information Systems keeps less paperwork and makes everything computerized and automated. As a result, a variety of medication errors can be avoided, and the safety of patients can be ensured.
- VII. Instant & Seamless Accessibility to Patients' Details - "The Health Information System collects data from the health sector and other relevant sectors, analyses the data and ensures their overall quality, relevance, and timeliness, and converts data into information for health-related decision-

making," according to a report published by the World Health Organization (WHO). And the more reliable the data, the better your chances of making an informed decision, implementing a policy, enforcing a regulation, conducting health research, training, and development, and monitoring service delivery.

- VIII. **Minimized Operational Expense - Information Systems for Health Allow** health organizations to allocate resources in a planned manner, potentially saving significant amounts of money, energy, and supplies. In a nutshell, you can improve your healthcare service while saving a significant amount of money.
- IX. **Saving of Time - Health Information Systems** not only save money, but they also save time. HIS saves a significant amount of time in coordinating patient care and hospital management by making all of the patients' information computerized and personal activities automated.
- X. **Improved Patient Satisfaction -** By providing value to the process of care, healthcare systems not only make healthcare professionals' and administrators' jobs easier, but they also improve patient. Patients can trust your service, and once you establish yourself as a trustworthy name in your field, you will attract more clients and see a significant return on investment.

2.3 A Recommender System

All around world, there has been an increase in the demand for health information and a shift in information needs.(V.Z.Gavani, 2010). Recent surveys show 81% of US 59 percent of adults use the Internet. claim they have searched for health information on illnesses, diagnosis and various treatments

online (pewinternet, 2014). As educated patients raise questions or discuss treatment options, such effects have an impact on the patient-physician relationship. (McMullan.M, 2006)]. Thus, Patients are more likely to become willing members in decision-making. Patient empowerment is a term used to describe this shift in mindset. (Funnell.M.M, 2004)

Nevertheless, big data and irrelevant data are major roadblocks to making informed decisions about one's own health and taking appropriate action. (Abel.T, 2009)When confronted with a large amount of medical information available through various channels (e.g., news sites, web forums, etc.), users frequently become lost or uncertain when conducting their own research. The amount of medical data available for patient-centered decision-making has increased dramatically, but it is often dispersed across multiple websites. (Muller.H, 2012). As a Personal health record system (PHRS) are designed to centralize an individual's health information and provide access to both the owner and authorized health professionals. (Tang, 2006).

Today, information technologies have led to number of innovations and developments in number of fields. In this context, Recommender systems (RS) have been a cutting-edge development in the service industry y (Karlsen, 2009). In the case of RS's web-based services seek to increase product ease of access and provide options for potential customers. Many variations of RS have been used in online stores (such as eBayTM and AmazonTM), and it is being heavily adapted by a large number of organizations on the internet. However, RS is not limited to marketing products online. On the other side, RS serve to decision support mechanism by providing options (substitutes) to decision makers (Ricci, 2011). In the health industry, RS has a significant role in terms of assisting

decision making processes about individuals' health. It is an acceptable outcome in the field of HRS in which resources are limited. However, it is very prominent to introduce a set of knowledge for researchers who are interested in HRS studies.

543. Recommender Because of the need to navigate through a sea of content, systems became a good feature. There is a lot of stuff available online, and many users have a hard time not only finding something they want but even figuring out what it is that they want in the first place. So, the recommender system is a sensitive system for connecting customers with relevant content.

Types of Recommendations

There are three types of recommendations:

- I. Personalized content feed the most fundamental method. It entails customizing the platform's content distribution based on user preferences. Take, for example, YouTube's "home" and "subscriptions" sites. In this situation, the feed is equally selected by the platform and the user. On the one hand, the user may choose the type of material he wants to see. The system, on the contrary, is hunting for comparable items That are up for suggestion.
- II. On-site recommendations - That is to say, everything that occurs on the platforms. It might be "you might also enjoy" recommendations, a "people are also purchasing" column, or other sorts of useful alerts (depending on the context in which material is offered).
- III. Off-site recommendations - Suggestions are given through several ways. It may be a push notice on mobile apps, email newsletters, or social media

chatbot messaging. These suggestions are frequently grouped together in the same way as on-site recommendations are, and they are frequently accompanied by special offers.

2.3.1 Various kinds of recommender systems

I. Collaborative Recommendation Engine

In this sort of recommendation engine, the user's input serves as the foundation for subsequent suggestions.

The collaborative recommendation is based on the platform's history of user interactions. Here's how it works:

First, the system aggregates the user output - various kinds of search history, ratings, comments, and recommendations of products or pieces of content in a big dataset.

Then, it compares the output of different users for specific products, finds common elements, and calculates matches between different pieces of content.

This type of recommender system is common in the eCommerce marketplaces. For example, a variation of the collaborative recommendation system algorithm is currently used on Amazon.

Overall, a collaborative system is straightforward in method use to provide consumers with useful ideas. On the other side, it's an excellent approach to figure out which goods people like and to what extent they prefer them over other products.

II. Content-based recommender system

As opposed to collaborative, systems, content-based recommendations travel in the opposite way. The content-based recommendation is constructed around the item inventory (items, content) and attribution comparison, rather than the users' behaviour.

In this case, if the user is looking for IBM "Think" computers, the system will likely suggest laptops of similar size and tech specifications.

Keywords that describe items lay the foundation for the suggestions, and each product usually has more than one keyword to make the matching easier and more precise. These keywords, coupled with the user activity, form the scope of the product recommendation.

This type of recommender engine is widely used in niche eCommerce stores (Disco's and Artsy use this approach) and also on content aggregation websites with extensive selections of specific content to work around (such as Mashable and The Next Web).

My application will take the form of a content-based recommendation system, which is a sort of recommendation system. That is, it will recommend drug addict or patients based on the features of the drug being picked such as the symptoms and then diagnose the patients or drug addict for recommendations.

III. Demographic-based Recommender System

The demographic-based system makes suggestions based on the characteristics of specific target audiences.

This type of recommendation engine takes user data (age, gender, location, and so on), classifies it into specific audience segments, and then fills in the gaps with a larger picture. Demographic-based suggestions are widely used on content-aggregation websites and in the general eCommerce marketplace. Usually, this type of recommendation provides a background operation in case there aren't any alternative information available.

The demographic-based system is considered one among the simpler types of recommendation systems that require a limited set of data to deliver broad suggestions. As such, it is less dependent on user data. However, to make it work, this system requires full-on market research as a foundation.

IV. Utility-based Recommender System

The utility-based recommendation attempts to determine the effectiveness of a specific product predicated on the expressed preferences of the users.

Because of the many additional variables in the equation, it is more difficult to adjust than the others. You'll need the following information to calculate the product's usefulness:

- the correlation of the search query
- comparison with the similar considered products
- Product availability

- vendor's ranking and other relevant elements
- Utility-based recommendations require a broad scope of user information available to provide engaging suggestions.

As such, it is used for suggesting niche products on multi-purpose eCommerce marketplaces such as Amazon and also on the niche stores for hardware and other products.

V. Knowledge-based Recommender System

The knowledge-based system took a deep dive into the user behavior to calculate the suggestions out of recorded interactions and assumed needs and preferences.

In contrast to the other types of recommender systems, knowledge-based calculates match and possibilities and attempts to predict the most potent ones.

To do that, the system:

- takes available user information;
- processes it through a combination of predictive and prescriptive machine learning algorithms.
- Assesses how a specific product meets user preferences.
- The result is a more accurate suggestion with a more substantial potential of getting a conversion.

2.3.2 How the recommendation system works

Recommender systems use information filtering and matching algorithms to bring two parties together: the user and the content.

Two forms of user data are at the centre of the recommendation process:

A user generates explicit data by taking a specific action that expresses his or her preferences (for example, ranking the particular product)

The majority of the user profile is made up of implicit behavioural data (i.e., user behaviour) (for example, what kind of products user views the most)

2.3.3 How the recommender system operates

Overall, the recommender engine operates like this:

Gathering user data;

Finding patterns in user behaviour and actions;

- a. Extracting valuable insights;
- b. Calculating probabilities;
- c. Comparing them with the available item inventory;
- d. Presenting the most plausible matches.

When building a recommendation system, consider that Data Mining algorithms handle the first three phases of the operation. Then this raw material is shaped into the user profile, which forms the backbone for the recommendations. Subsequent results are incorporated into the user's perspective in the form of handy suggestions of various kinds. In addition to that, the machine learning element upgrades the system on the go.

2.3.4 Recommendation systems: Benefits for Online Business

1. Content Discovery - It's always a plus when a user discovers exactly what he's looking for, plus a little bit extra. The latter element is significant since it allows for a continuation of the experience. That is why recommender systems are so useful in the workplace.

The existence of recommendation system algorithms is due to content discovery. Suggestions and personalisation remove the tedious aspects of content discovery (such as sorting through irrelevant information) and focus the user's attention on consuming and obtaining more content.

Through the other routes, it can be offered as an on-site suggestion or a distilled selection (email newsletter or social media chatbot). On the whole, the recommender system perpetuates a loop incited by the user. What started as a single organic discovery of a piece evolved into a narrative of its own by suggesting new pieces that move the user further down the rabbit hole on the particular website.

An excellent example is the Spotify recommendation engine with Machine Learning. Their suggestions are aimed not only at satisfying the user's direct queries but also recommending something the user will be interested in further exploring, which makes the person use the platform more.

- I. Dynamic Audience Insights - The installation of the recommender system benefits more than just users. On the opposite side of the system, your firm gains vital audience data, allowing you to tailor your whole operation to the wants and demands of your target audience. What's more, these

perceptions are always changing. As a result, you get to monitor and alter performance on the go without worry of missing the target. The following is how it works:

- a. Users can get suggestions from the system.
- b. Users respond to ideas in one of two ways: favourably or negatively (following or not following the lead).
- c. The interactions' outcomes are evaluated, and the system is automatically changed. This information provides a substantial competitive advantage in audience research, in addition to the ongoing development of the system. This information will be useful to the marketing department.
- d. Improved User Retention & Engagement - User engagement and retention are the direct results of giving relevant content and gaining audience information. The following is how it works: We can retain user attention by providing a steady supply of adaptive ideas.

The logic behind this type of interaction is simple: if a resource gives the audience exactly what they want plus a little bit more, and it all adds up to a happy experience, why not utilise it more to get more of it? As a result, users keep coming back to your website for more, and they check for changes through various channels on a frequent basis.

2.3.5 Health recommender systems

Health Recommender Systems are a type of recommendation system used in the healthcare industry. Physicians have used it for diagnostic help, while individuals

have utilized it for personal health advice. (Rokach, 2011). As the communication platform, Internet has been the main source for users to access health information and recommendations. Fernandez et al. grouped the health information that is found on internet as following (L. Fernandez-luque, 2009) Image, videos, web blogs, forums, tutorials, etc. Publications by medical organizations, patients, governments, etc

A health recommender system (HRS) is a subset of a recommender system (RS) as described by (Rokach, 2011). A recommendable item of interest in the context of an HRS is a piece of non-confidential, scientifically proven or at least widely accepted medical data that is unrelated to a person's medical records. However, Individualized health data, such as that documented in a personal health record, drives HRS recommendations (PHR).

An HRS's objective is to provide its user with medical information that is extremely relevant to the medical progress of the patient connected with that PHR. Medical information related to the provided PHR may be recommended to health professionals who work on or with it, but it may also be recommended to laypeople checking their own PHR. An HRS should propose medical information that is understandable to a user based on that user's medical knowledge. It is critical to examine the HRS's system setting for productive incorporation into any health-related information system.

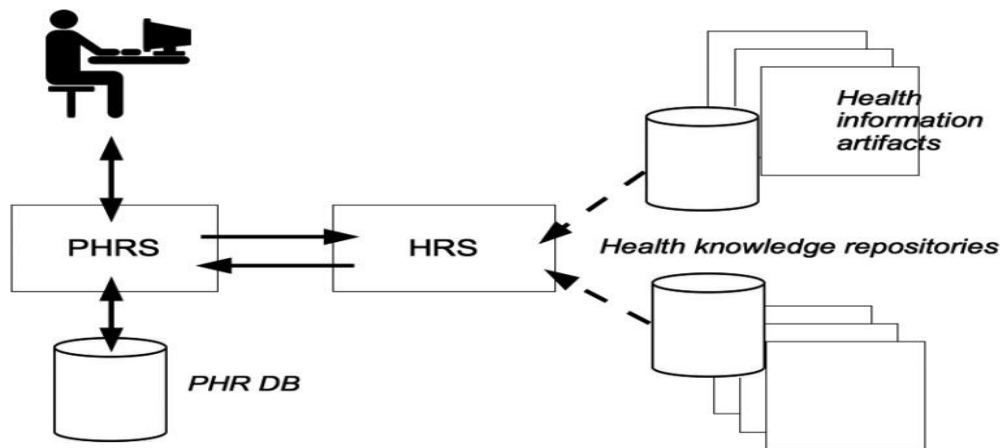


Figure 2. 1 Health Recommendation Diagram

(Pfeifer, 2014)

A PHR database entries of data indicate a PHR owner's medical history (DB). Using medical data, an HRS generates a list of possibly relevant things of interest for a targeted audience (e.g., a PHR owner or an authorised health professional). When he or she analyses the PHR online, he or she may see these articles, which originate from trustworthy health information archives. At least two distinct use cases may be established, depending on the expert level of a PHR user:

Use Case A = health professional

In this example, a health practitioner uses an HRS to obtain extra information for a specific instance.

Furthermore, layman-friendly papers can be obtained for direct distribution (i.e., as a printout) to a patient when They're inside a doctor's office for consultation. As a result, a user can receive high-quality information to help him or her manage with a condition or change his or her living choices.

Patient as end-user (case B)

A layman interacts with an HRS-enabled PHR in this scenario without the assistance of a physician. The technology generates layman-friendly material based on the person's long-term medical history. The relevant items are displayed in the user interface of the PHR system. By selecting the highest-ranking in terms of health information acquisition, a patient is empowered by documents or media content. Thereby, it's possible that the risk of retrieving "incomplete, misleading, and inaccurate" content via well-known search engines will be reduced. Both scenarios aim to reduce the effects of information overload caused by an increase in the amount of data available of health-related data.

2.4 System Development Life Cycle

The software development life cycle (SDLC) is a work flow method for identifying the phases and activities that take place during development cycles. It may be used by system analysts, designers, and developers should plan and build applications, as well as to deliver systems and on-time delivery of products on budget. It also refers to a technique for developing high-quality software that includes well defined procedures. It is never simple to pick an acceptable approach, and mixing and matching various techniques to fit into a single project is often unavoidable.

2.4.1 Phases of SDLC

The SDLC technique consists of the following software phases in detail. development. Which are;

- i. Software design

- ii. Plan
- iii. Software development
- iv. Testing
- v. Deployment

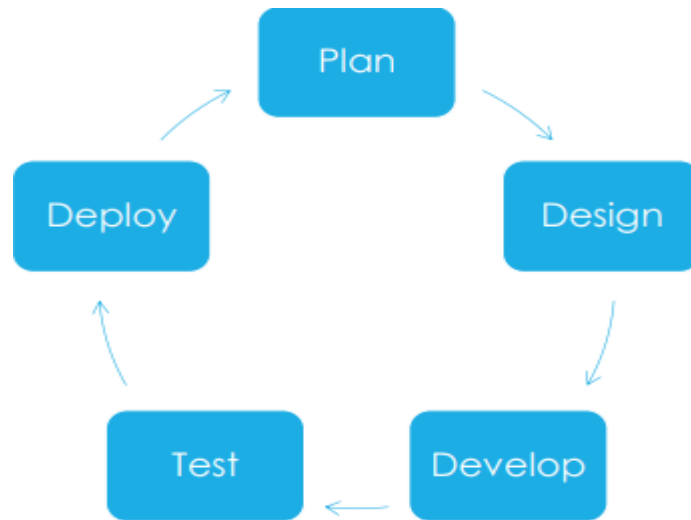


Figure 2. 2 phases of SDLC

Phase 1 – Planning

Planning usually happens after there is an innovation or initiation that come up from a group of business end -users or a sponsor whom identify a need or an opportunity. within this stage some things are defined such as scope of or boundary of concept are defined, product feasibility study in financial, operational and technology areas will be conducted by the senior participants of the team, as well as business users' input at this point, a Business Case Documentation (BSD) ought to be ready to sum up all of the ideas and provide an overview of the entire plan.

Phase 2 – Design

This talks about how the software is designed by the software engineer or developer where by the software product begins with a well-defined set of requirements. software requirements specification of (SRS)document which includes all of the product's requirements, must be approved by the client or the customer before product designs can commence. With SRS in hands, more than one design of the product architecture will be proposed based on the requirements in SRS. They will be documented in a Design Document Specification (DDS) by the junior members of the team and passed to the senior members, project stakeholders for review.

Phase 3 – Development

So, after the best or the most appropriate design has been selected. implementation starts immediately. Programmers should create software in accordance with the design document specification and, at same time, strictly adhere to the organizations' coding standards.

Phase 4 – Test

Software testing should be carried out at all stages as a sub-stage. Nevertheless, out of all testing stages two should be done by programmers, end-users and quality assurance experts. The reason is that programmers know the best of how the programs work and can identify the most vulnerable areas of the software. End-users would give greater attention to their routine work, ensuring that the software can meet their needs of the requirements. Then quality insurance they examine the whole software from both perspectives. as a result, a few various

types of tests plans should be prepared for the three groups of testers to conduct at all the test stage.

Phase 5 – Deployment

First thing to do at this stage is to check all the test cases and run for effective software execution, correctness and comprehensiveness. at this stage this talks about if the project will be approved by the management. all the well-defined deployment plan document must be approved to make any necessary changes that we need to make in this stage. Guideline documentations Configuration, for example, administration guide and user guide should be prepared. and questions would be thrown at the supporting team members and they should indeed be prepared to answer any and all questions about the software. (Tiky, 2016)

2.4.2 Software development life cycle models

There are a multitude of distinct sorts of software development life cycles models defined which are designed for different purposes and types of project. Each model goes through a series of unified steps that are tailored to the specific sort of project that needs to be completed and ensure the software development process's accomplishment. They are listed below;

- I. Waterfall
- II. iterative
- III. Agile
- IV. Rapid Application Development (RAD)

these models listed above are identified as the most popular models being used in the industry and they will be introduced one by one in details.

Waterfall Model

The waterfall model is the oldest, most well-known, and widely utilized approach. It is straightforward to comprehend and use since it follows a basic routine. Each of these phases should be finished before having to move on to the next, which implies there can be no overlap. It is an illustration of a process that is guided by a plan. Each stage's output becomes the following stage's input. Definition, development, validation, and evolution are portrayed as discrete process stages including set of requirements, software engineering, and application, testing, and so on.

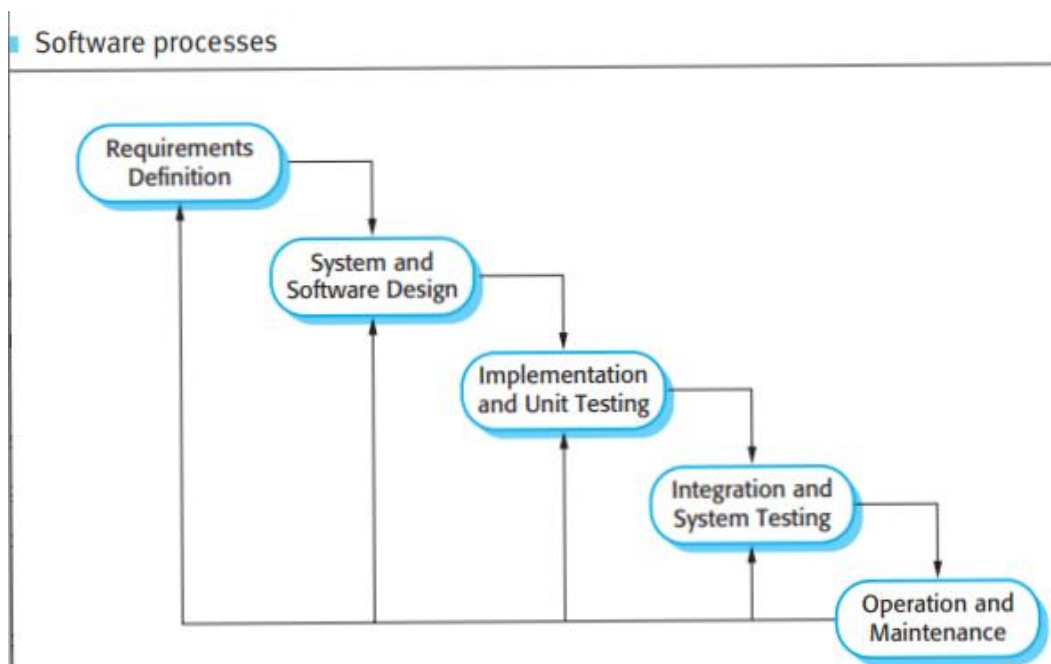


Figure 2. 3 waterfall model

(sommerville, 2011)

1. Requirement's analysis and definition; interaction with system users to determine system services, limitations, and goals. They're then carefully described and used to create a system specification.

2. System and software design; By creating an overarching system architecture, the process of system designs is assigns either hardware or software requirements systems. Identifying and defining the underlying Abstract concepts in software systems and their connections is part of software design.

3. Unit testing and implementation; A sequence of programs or program units are used to implement the software design at this level. Unit testing entails ensuring that each unit satisfies its requirements.

4. System integration and testing; Individual program modules or programs are integrated and was put to the test as a whole to guarantee that software requirements are satisfied. After testing, the software system is delivered to the customer.

5. operation and maintenance; The most time-consuming part of the life cycle is usually (but not always) operation and maintenance. The system has been installed and put to use. Repairing faults that were not detected earlier in the life cycle is part of maintenance., When new requirements emerge, improve system unit implementation and upgrade system services.

Iterative Model

The iterative model technique begins with the Implementation of a small set of rules in a simple way software requirement in an iterative model and gradually expands the versions until the entire system is ready to use. The iterative life cycle method doesn't begin with a detailed statement of requirements. Instead, development begins with a portion of the program being specified and developed, that is then examined to establish additional needs. At the conclusion of each model iteration, this procedure is repeated to create a new software version. Each

iteration improves the design and introduces additional features. This method's key idea is that a system with a cycle of iterations and tiny pieces should be created a similar time (increments).

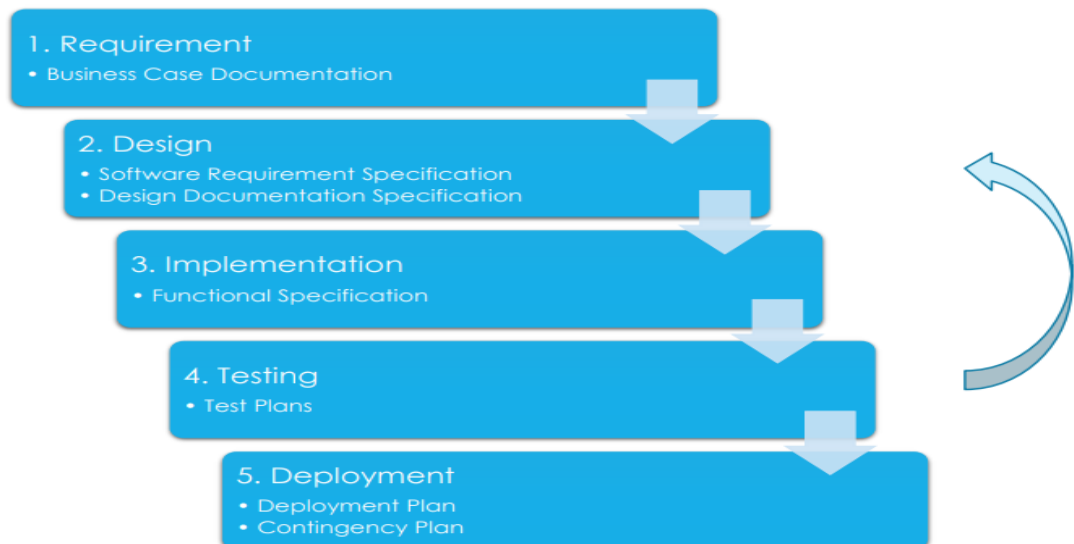


Figure 2. 4 Iterative Model

(Tiky, 2016)

1. Requirement the Requirement Phase, like the Waterfall Model, focuses on engaging with business users and preparing the Business Case Documentation.

2. Design Business Analysts and System Analysts work on the logical and physical designs, respectively, to create the Software Requirement Specification and Design Specification Document, in the same way as in the Waterfall method does. There is, however, a design that completely records how the software will be built, and there are many subsets of designs for programmers to go through the implementation and testing, each of which is separated from the others. Furthermore, after each cycle of construction, the subset of designs may be changed. As a result, the subset of designs isn't completed until the Deployment Phase.

3. Implementation Programmers create software based on the subset of designs that made it through the Design Phase. Each subset of implementation will have its own functional specification.

4. Testing For each subset of testing, programmers, business users, and quality assurance specialists will all be involved. Business users, on the contrary, will simply focus on the restricted scope covered in the current release, whereas programmers and Q C specialists must cover all implemented functions every time. Furthermore, for the final build before progressing on to the Deployment Phase, the three parties must not only perform the subset of testing, but they must also perform the testing as a full system test.

5. Deployment Similarly to the Waterfall approach, everything should be ready for release by this phase, including a Deployment Plan. The Software Development Life Cycle describes the steps involved in developing software.

6. Maintenance Every program, like the Waterfall Model, will need to be maintained at some point. As a result, the Maintenance Phase will involve a subset of the SDLC Iterative Model.

Agile Model

The Agile SDLC model is a hybrid of a Model of iterative and incremental process that emphasizes process flexibility and customer satisfaction by delivering usable software solutions quickly. Agile development approaches divide the product into smaller, incremental builds. These builds are delivered in stages. Each round typically lasts one to three weeks. Each iteration entails a multi-functional team working on multiple aspects of the project at the same time, such as planning, requirements analysis, design, coding, unit testing, and

acceptance testing. The work product is visible to the client and key stakeholders at the conclusion of the iteration. According to the agile approach, every project must be handled differently, and current procedures should be tweaked to better meet project objectives. Tasks are split into time periods (short spans of time) in Agile, and each time period provides unique capabilities for the launch. It employs an iterative method, with each iteration resulting in a working software build. In terms of functionality, each build is progressive. All of the functionality you require are included in the final version. Because of its agility and adaptability, the Agile thinking process began early in software development and grew in popularity over time.

Rapid Application Development

Prototyping-based and iterative, the Rapid Development Application (RAD) paradigm does not contain comprehensive designs. The manufacturing of the programmed itself necessitates the necessary planning for the product's manufacture. Customers may assess prototypes early using iterative ideas, re-use existing prototypes (components), and continue with rapid application development by gathering consumer demands trainings or a focus group. Prioritize targeted integration and quick delivery. The term "quick application development" refers to the process of creating software quickly. strategy that emphasizes quick prototyping while minimizing planning. A prototype is model that is working and functionally comparable to a product component. Functional modules are concurrently generated as prototypes and integrated to construct a whole product under the RAD paradigm, allowing for quicker product delivery. There is no substantial pre-planning This makes it simpler to incorporate changes into the development process. With a small team of developers, domain experts,

clients, and IT workers in charge of resources in stage on components or prototypes, the RAD project follows an iterative and in-depth process. The prototype's reusability is the very vital part of this model's success.

The RAD method divides the stages of analysis, design, building, and testing into steps of simple, iterative cycles. The following are the several stages that consist of the model called RAD model:

- i. **Business Modeling:** The commercial model used for the product under construction is designed to facilitate the information flow and dissemination through multiple business channels. Conduct an audit of your company to identify information that is critical to your performance, as well as how and when it is gathered and the elements that make the information flow successful.
- ii. **Data Modeling:** The data gathered during the phase of business modeling will be evaluated and analyzed to generate a collection of key business data items. The characteristics of all data sets are described and defined. The business model's connections between these data pieces are created and specified in great detail.
- iii. **Process Modeling:** According to the business model, data object sets established during data modeling phase must be updated to build the flow of the business information necessary for a specific business purpose. The process model for modifying or extending a set of data items is defined at this step. Describes the way of adding, deleting, retrieving, or changing data objects.

- iv. iv. Application Generation: The system is constructed and code is carried out using automated tools by changing the process and the data model into actual prototypes.
- v. v. Testing and Turnover: At each iteration, the prototype is tested separately, reducing the overall test time for the RAD model. With comprehensive test coverage, all of the parts must be adequately assessed for their data flow and interaction. The majority of the programming components have been thoroughly tested, lowering the risk of major issues.
- vi.

2.5 Unified Modelling Language (UML)

The Unified Modeling Language (UML) also known as a standardized modeling language that consists of an integrated collection of diagrams that allow software and system developers to not only describe, visualize, generate, and document their system artefacts. UML represents a set of established best practices in the design of large, complicated systems. object-oriented development and development process of software relies heavily on UML.

2.5.1 Conceptual model

The conceptual model assists in comprehending how organizations interact in a system. An analyst, designer, coder, tester, quality assurance, customers, and technical writers may all watch a system from different angles. These individuals are all interested in various aspects of the system and demand different degrees of knowledge. For example, before the system is turned over to the designer, the analyst must have a thorough understanding of how it works.

In order for a writer to gain a better understanding of how the system works, a coder must first understand the system architecture.

2.5.2 UML diagrams

In UML there are fourteen types of diagrams which are classified into 2 categories, they are: structure diagram and behavioral diagram.

a. Structure Diagram: The structure diagram depicts the system's static aspects, including multiple levels of abstraction, implementation, and how they interact. It stresses elements that must be included in the modeling system. This diagram is mostly used during system software architecture description since it depicts the system's structure. The diagram comprises of three parts: a class diagram, a component diagram, and an item diagram.

b. Class Diagram: A class diagram describes structural diagram that shows the classes, characteristics, functional areas, and interconnection of a system..

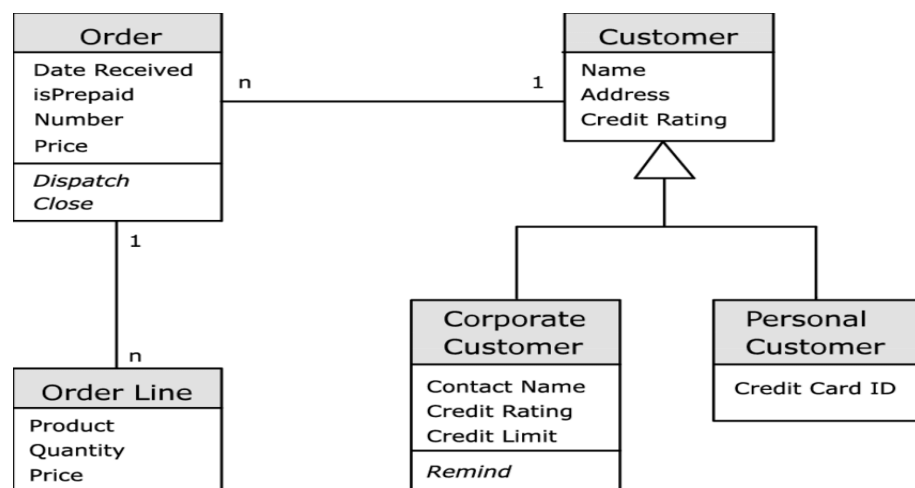


Figure 2. 5 class diagram

- b. Component Diagram: They are used for envisioning, specifying, and describing component-based systems, as well as for forward and reverse engineering to create executable systems.

2.6 Review Related works

(tretter, 2011) worked on a model of the health-care system and drug addicts He used qualitative and quantitative model to create a worldwide model based on regional data from Munich, Germany. He used heroin users as an example and calculated that despite a highly specialized care system in place, around 2-4 percent of addicts in Germany still die. He modelled the care system, conducted a mathematical analysis and concluded that the relationship between the actors, healthcare facilitators and system are not organized enough.

(Ozkan, 2013) conducted a systematic literature review on Health Recommender Systems and presented the results She believes that these systems are a hopeful development since they are becoming more and more integrated into the health-care system. She did say, however, that because it is a new sector, it would take a lot of time and effort to develop it and enhance filtering algorithms. It also has a number of privacy concerns to address.

(Santos, 2020) design and implementation: a computerized drug information management system drug procurement and distribution tracking system. Visual Basic

was used to create the system. She devised a method that allows for precise drug tracking and the avoidance of expired medicine sales. This ensures that users have permission to quality health care and that the medications they get are authentic and safe.

(Rana, 2016) developed a Food Recommendation System with the use of a Content Based Filtering Algorithm. It discusses food item list recommendations and showing the results based on the nutritional value of each food item. Two websites, www.livestrong.com and www.nutritiondata.self.com, were used to compile the list of foods and their nutritional worth. It was built with the use of Content Based Filtering Algorithm: which he talked about the attribute of what makes the food and Calculate the weight of each feature, namely Calories, that has the lowest value. Keywords or attributes are used to describe items in a content-based recommender system.

(Bolanle Ojokoh, 2018) developed a user-centric housing recommender system which will help buyers and tenant that have the potentials to buy or rent house and to provide list of houses of their preference. This system was built with the aid of fuzzy logic and item-based collaborative filtering.

CHAPTER THREE

Introduction

This chapter of this project describes the methodology of the HRS to be built. The presentation of this chapter begins with the flowchart, use case diagrams, design details, software and the methods of data collection.

3.1 Method of Identification of User and System Requirement

Although several ways of user and system identification are available, the major source of user identification and system requirements employed in this project are:

- a Primary source: this talks about a technique of collecting information in which the requirements or data were gathered via the utilization of an empirical technique, such as an informal survey or a personal interview
- b Secondary source: Secondary sources of information included journal articles, library resources, periodicals, and newspapers, among other sources.

Informal survey: The informal survey is also a method used in the collection of user and system requirement. Informal survey involves observation of already existing system.

- i. Personal interview: It is a technique of collecting information from a responder by directly addressing questions to the respondent and gathering information with the goal of promoting comprehension. The interviewing process for the proposed took place between the researcher, a drug counsellor, and a recovering drug addict patient, among others. On the basis of the questions posed throughout the

system's development, reliable responses that aid in the understanding of the system's and user's requirements were gathered and evaluated.

3.1.1 Identification of system requirement

System requirements are more detailed definitions of the functions, services, and operational restrictions of a software system. They are also called functional specifications. The system requirements document, also known as a functional specification, should specify precisely what is to be implemented in the system under consideration.

The computer system is made up of many components that work together to accomplish a common purpose or objective. The following are the requirements for putting the system into operation:

- i. Functional Requirement of the System
 - ii. Non-Functional Requirement of the system
 - iii. Software Requirement
 - iv. System Requirement
-
- a. Functional Requirement

These are descriptions about the services that the system should offer, how the system should respond to specific inputs, and how the system should behave in specific scenarios. The functional requirement of the system developed are:

- i. Drug addict should be able to sign up and sign in to the system
- ii. Drug addict should be able to retrieve password if forgotten

- iii. Drug addict should be able to view the available drug that he or she is addicted to.
- iv. Drug addicts should be able to select drugs that he or she is addicted to.
- v. The system is supposed to diagnose the patient based on the symptoms ticked by the patient.
- vi. The admin should be able to add, delete and update drugs on the system.
- vii. System must be able to recommend the drug addict to the nearest rehabilitation centre.

b. Non-Functional Requirement

Limitations on the system's services or functions, such as time, development process, and standard constraints. The system's non-functional requirements are as follows:

- i. The system should diagnose the drug addict and give him a feedback in 5seconds.
- ii. The system will check if user information correlate with the one in the database before providing access to other functionality of the system.
- iii. The system will permit only the admin manager to create and edit drug.
- iv. The system will permit drug addict to view their own page and not others.
- v. During registration, the system will check if user id (drug addict) correlate with generated one's by the admin.
- vi. The system will be maintained by the admin manager.
- vii. The system will be accessible to the patient.

c. Software Requirement

For the effective and efficient implementation of the system, the following software were installed and used:

- i. Web browser
- ii. Visual Studio Code

d. System Requirement

For the successful implementation of the system, the system requirement used is;

- i. Systems with internet connection

3.1.2 Identification of user requirements

The health recommendation system must provide certain requirement for the user.

The users of the system are:

- a. Drug addict
 - i. Patient can sign up
 - ii. Patient can sign in
 - iii. Patient can manage their account
 - iv. patient can view displayed drugs
- b. Admin
 - i. Removing patient
 - ii. Registering patients
 - iii. Manage patients

3.2 System Design Methods

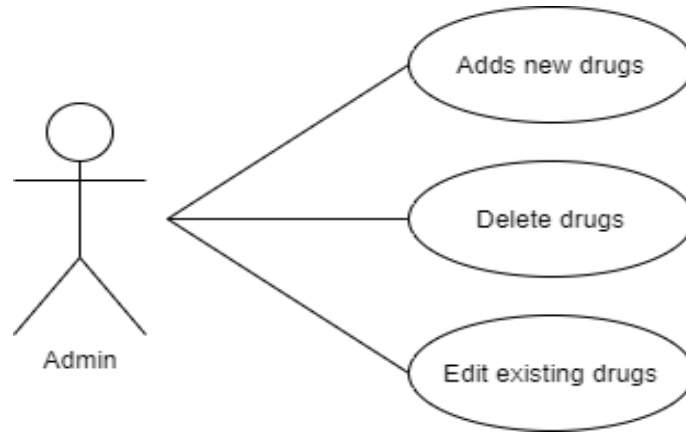


Figure 3. 1 Admin case diagram

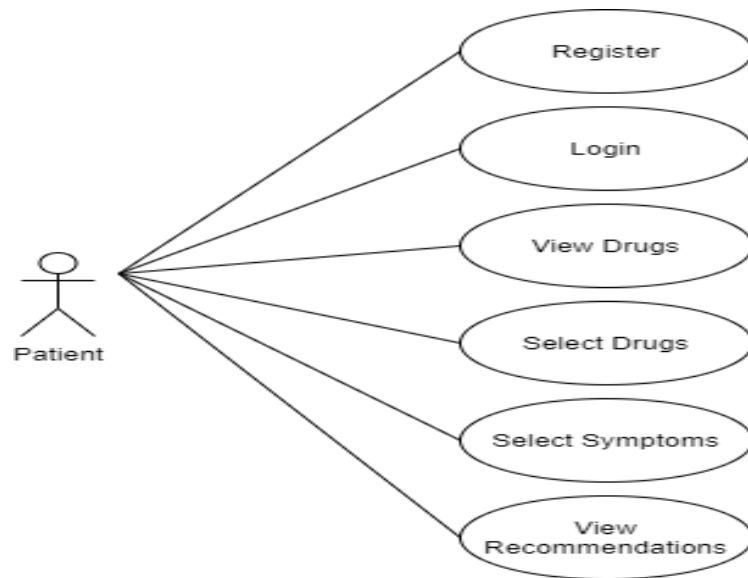


Figure 3. 2 Patients use case diagram

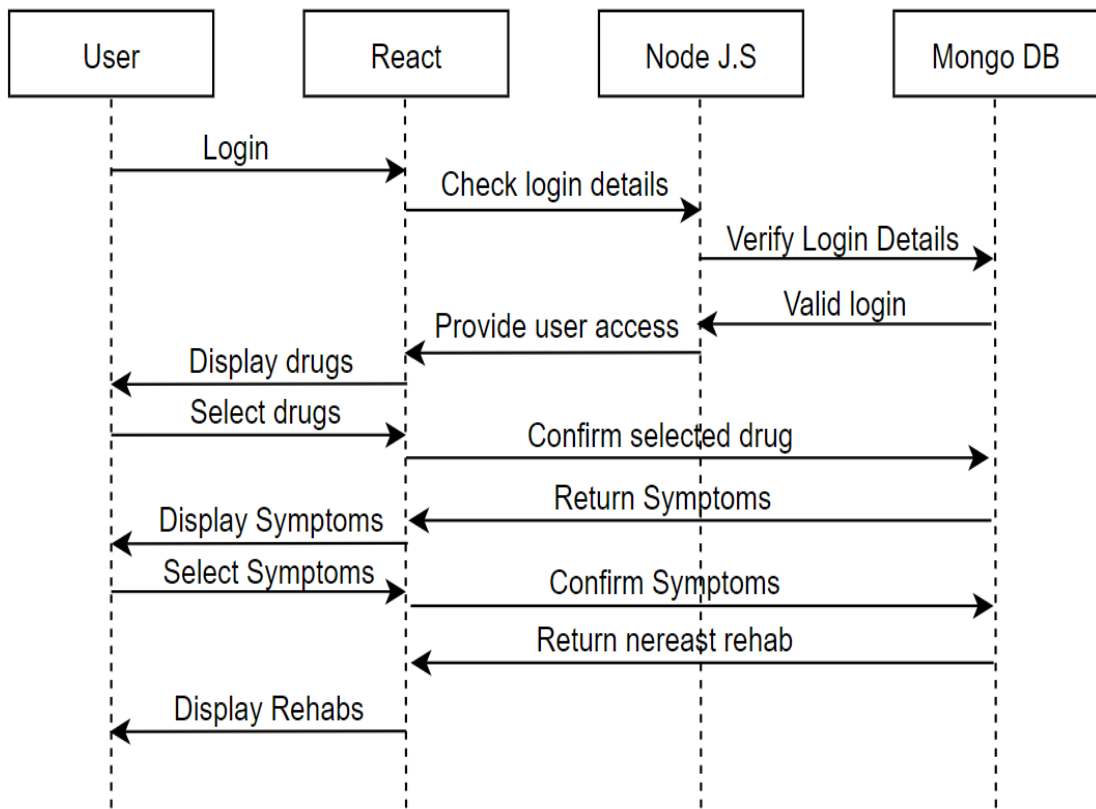


Figure 3. 3 Sequence diagram

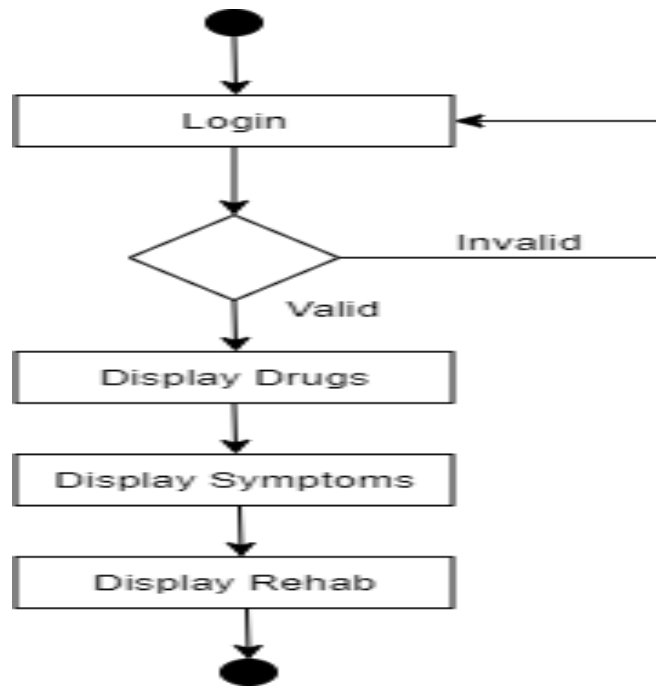


Figure 3. 4 activity diagram

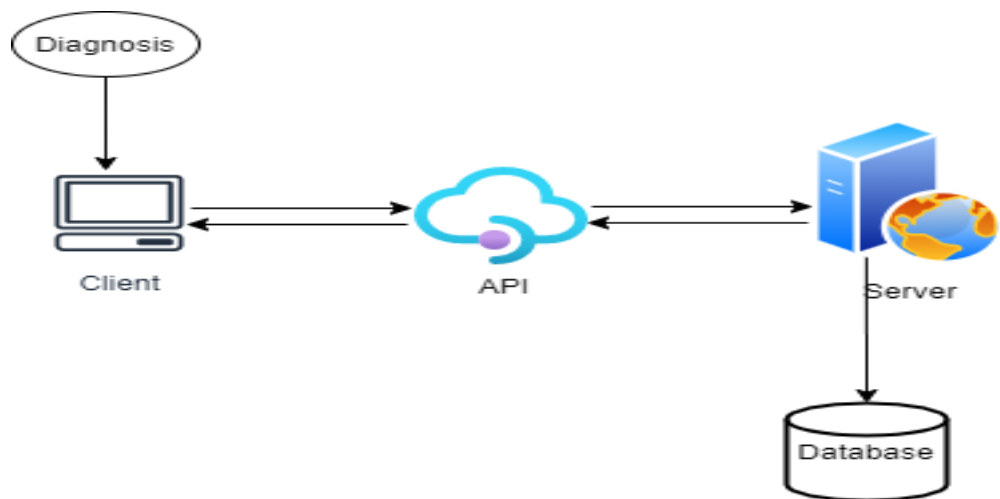


Figure 3. 5 Architecture diagram

CHAPTER FOUR

4.0 Introduction

This chapter illustrates the implemented system. The first section provides in detail information about the backend implementation of the system. The backend was built with the aid of node.js and mongo DB. Later sections provide details on the front-end design of the system which was built using react a JavaScript framework. Screenshots from the system are also illustrated to show the implemented functionalities

4.1 System Implementation

The implementation of this system begins by converting the system's logical structure into physical architecture through coding and development of the system. The system was implemented using the following:

- i Language: java scripts programming language
- ii Database: node
- iii User Interface: React
- iv Operating System: Windows 8 or higher version.

4.2 Database Implementation

The database of the system was developed using mongo db. The Mongo Database is a cloud-hosted NoSQL database that stores and syncs data between users in real-time (i.e., a real-time document store). The database of the developed system contains details of the users (drug addict patient) during registration. The database also contains drugs that are available for view by admin manager.

4.3 Front End Implementation

The design of how the system user interface began with drawing of the user interface on paper. Later the sketched user interface was designed using Adobe XD, a software for user interface design. The designed UI was then implemented using react framework with the integration of java script programming language while the output user interface was viewed with and android studio emulator.

The software used during the implementation was Visual Studio Code, with an extension of react native framework integrated to it.

4.4 Backend Implementation

The backend of this project was implemented with the use of NodeJS and Mongo dB, the server was aided by a JavaScript library package called express. Node and mongo dB formed the full backend for the implementation of the project.

a. Authentication page

The authentication page consists of the sign in and the sign-up page

b. Sign up page

This is the page that appears when the URL of the HRS is typed in any browser.

The signup form is used to register users' credentials so they can be given permission to their privileges. The signup form contains a field for the email and password. When the signup form is submitted, the system redirects the users to the home page respectively.

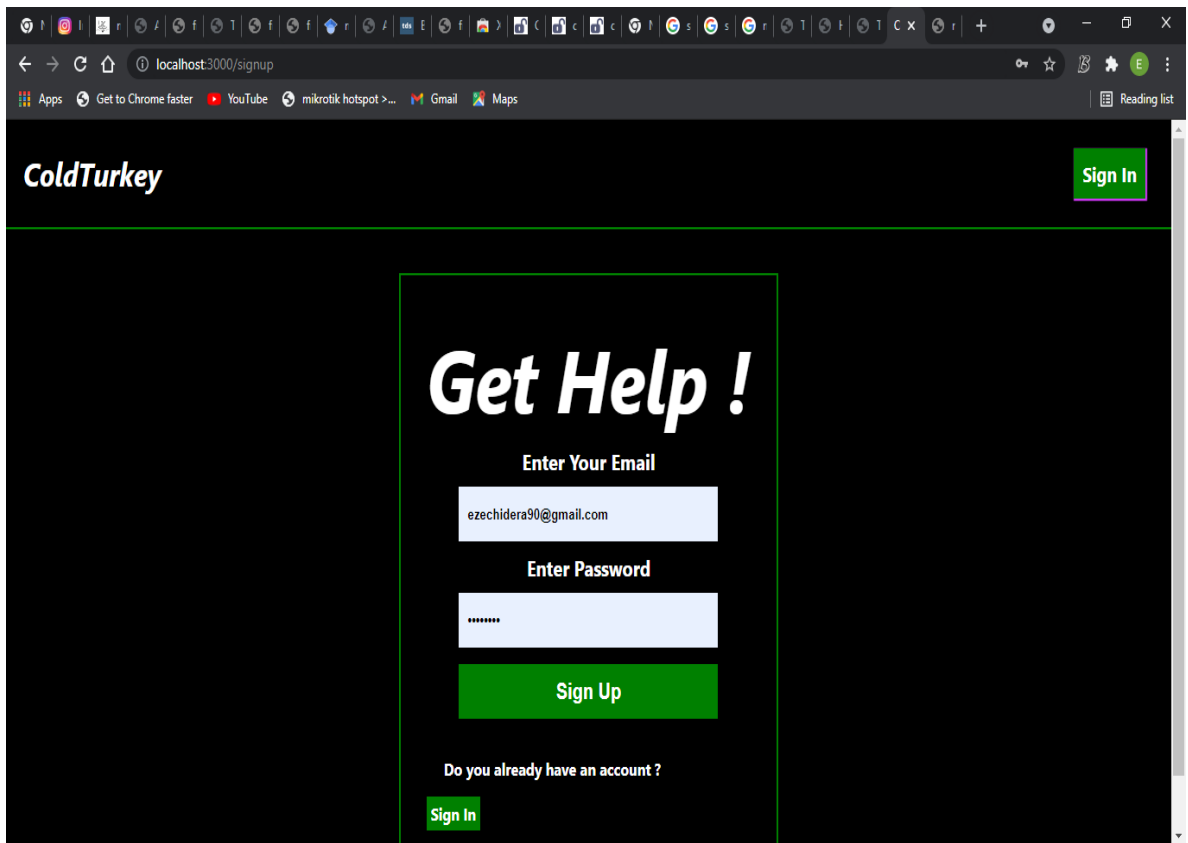


Figure 4.4.1 sign up page

c. sign in page

The login form is used to authenticate users' credentials before they are allowed to the rights that they have. The sign in form contains a field for the email and another for the password. When the sign in form is submitted, the code checks that the credentials are authentic, given the user access to the restricted page. If a user is unauthenticated correctly, they will not be able to proceed past the login form.

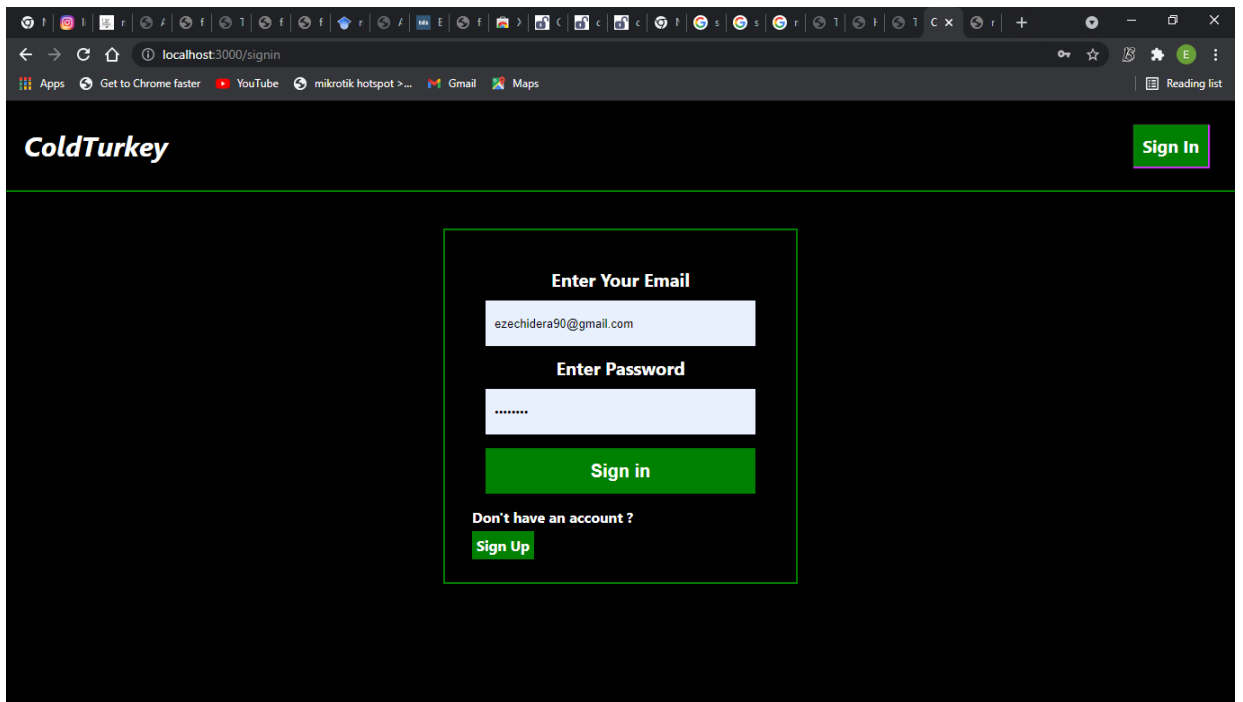


Figure 4.4.2 sign in page

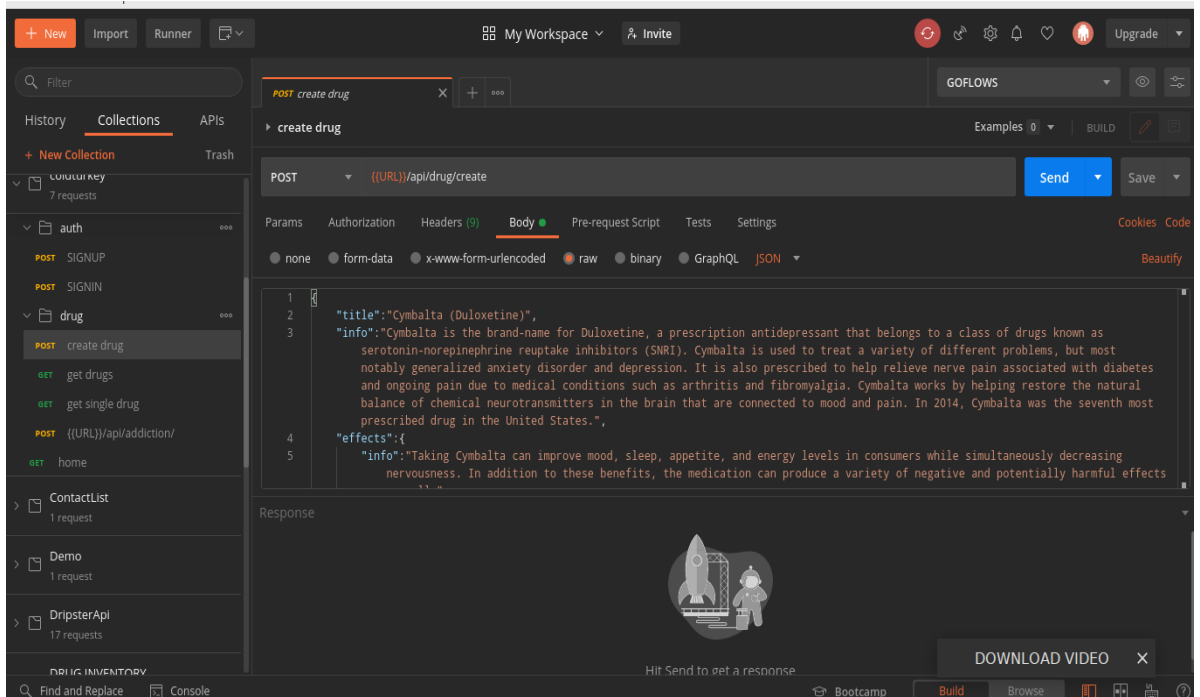


Figure 4.4.1 Postman for communicating with the api

For patients

This interface shows the patients homepage, where the patients can view list of drugs and are able to select drugs they are addicted to.

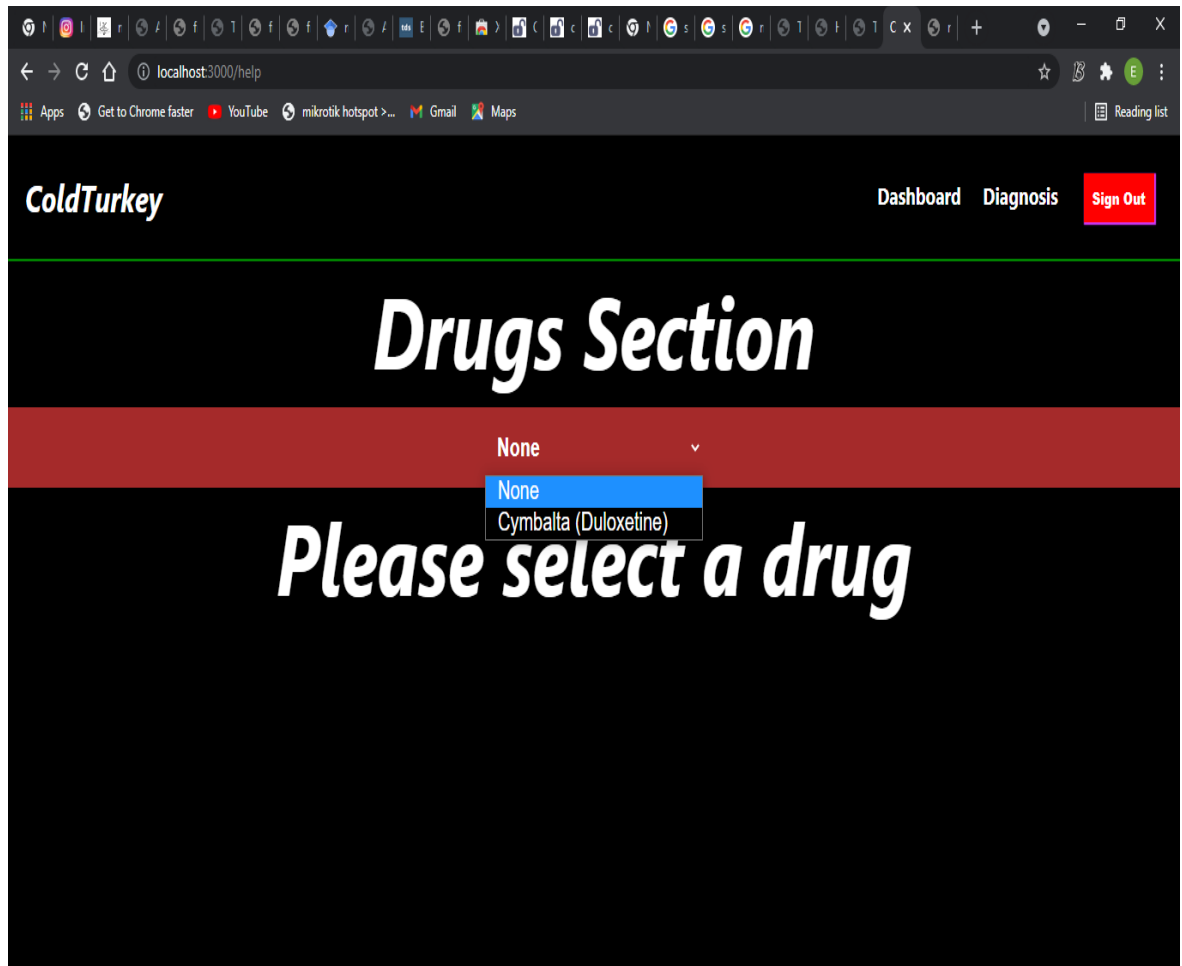


Figure 4.4.2 patients home page

d. Diagnosis page:

this shows the patient diagnosis page where by patients are ask to select the symptoms shown on the page in order to be diagnosed. This also can allow a person to add the diagnosis result to their respective dashboard

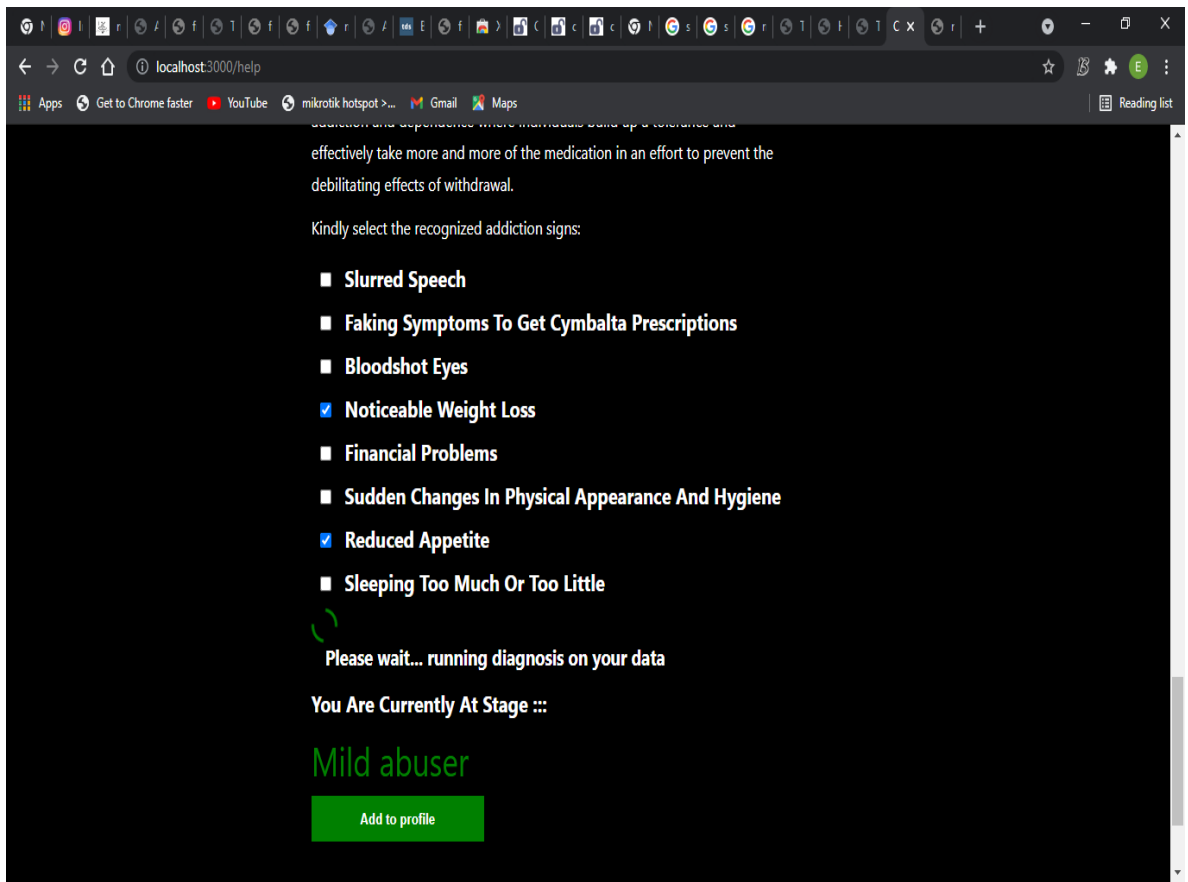


Figure 4.4.3 diagnosis page

e. Patient dashboard

This shows the interface from which patients can view their prescription, their medical data, their rehabilitation Centre recommendations.

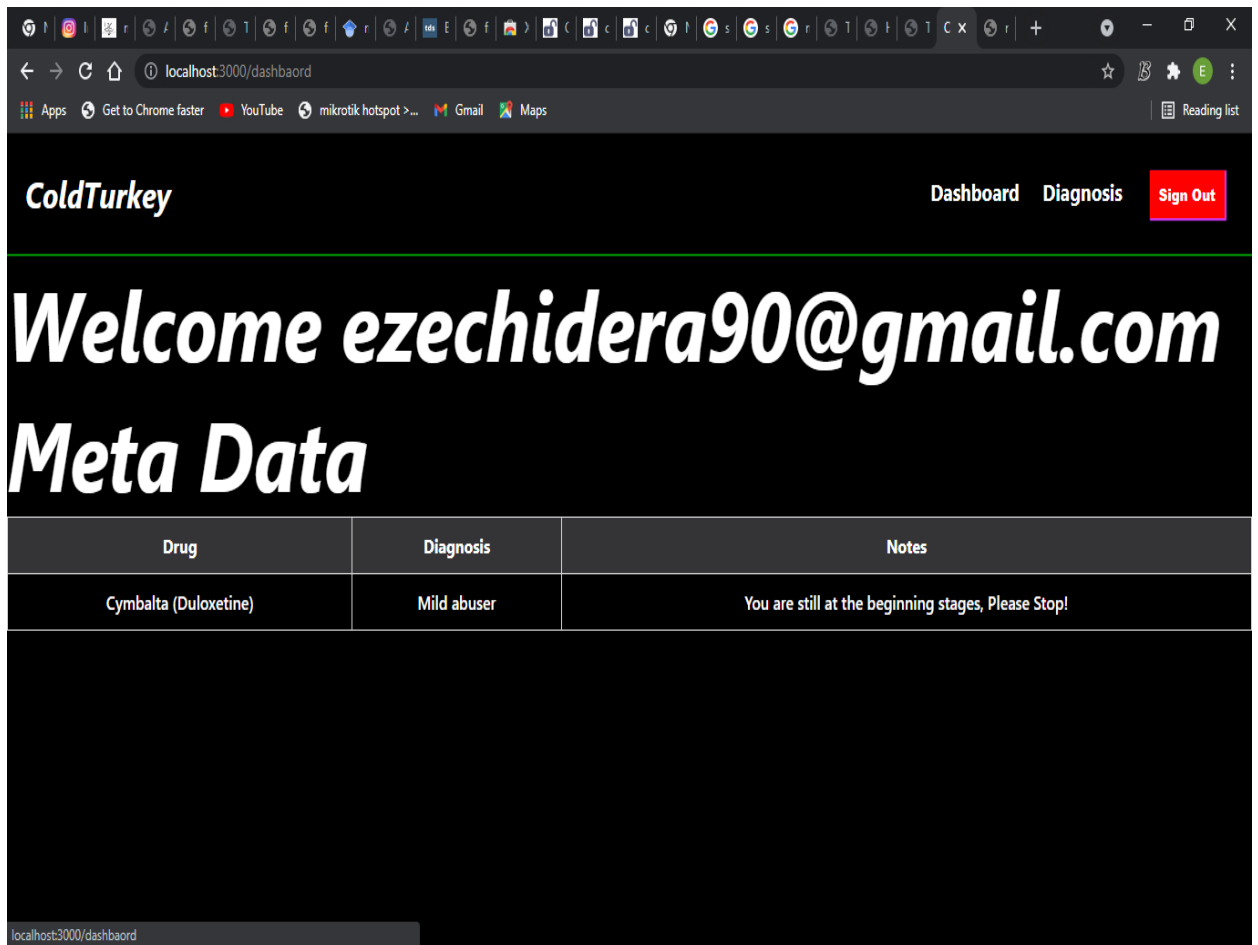


Figure 4.4.4 patient's dashboard

CHAPTER FIVE

5.1 Summary

Having reviewed the challenges encountered throughout the locomotive movement of individuals from one place to another to locate a working and efficient rehabilitation centre and also the period of time in between the patient's diagnosis and an appointment, scheduling appointments with medical professionals, and after gathering of data for the establishment of this project through scouring the internet for correct and vital information, it was concluded that by the introduction of Health Recommendation System for drug addicts (antidepressant) this project will help drug addict by reducing the stress associated with finding the right rehabilitation centre and effective avenues for medical professionals to follow up from the diagnosis result of the patient.

5.2 Recommendation for Further Study

In future I intend to update the implementation of my work so recommendations can be made for addicts of other types of drugs and not just users of antidepressants. Discussions would be held with healthcare practitioners so as to properly define the requirements and/or functionalities of the system.

5.3 Conclusion

This project helps to review the various problems associated with the undeveloped system which are unable to locate a working and efficient rehabilitation centre and also the time wastage that is time between the patient's diagnosis and an appointment, unable to schedule appointments with medical professionals with all, these problems being critically analysed, a solution was embarked on to eliminate these problems. With the design of a health recommendation system for drug addict (antidepressant) such problems are considered to be eradicated. In conclusion a health recommendation system

for drug addict (antidepressant) not just provides the opportunity for drug addict to help improve their health but also to assist the nation by reducing chocked transportation on road and also helping Nigeria drug agency to be capable of lowering the rate of drug abusers.

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