# ZIMBABWE NATIONAL FAMILY PLANNING COUNCIL (ZNFPC) CLIENT MANAGEMENT SYSTEM


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By

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# ABSTRACT

The chief purpose for this research was inclined towards solving the challenges that were being faced with regards to manual client tracking and updating at the Zimbabwe National Family Planning Council (ZNFPC). The new ZNFPC Client Management System is a web based system that utilizes internet facilities to deliver on the routine recording, tracking and updating service records and statistics at the organization. At the organization comes new and old clients for different family planning (FP) methods / services as well as other sexual reproductive health (SRH) services. Within the heath fraternity, it is of paramount importance to take and/or keep an accurate track of all clients' medical history and health services history, and ZNFPC as a wing under the ministry of health (MoH) is not excluded. Facts pertaining to the settings and way of doing things that were prevailing in the council were gathered through the use of several fact finding methods that included interviews, questionnaires and observations amongst others. Discoveries through these fact finding methods laid the basis for the development of the new system that would solve the major problems of the old system. It was gathered without doubt from the clients that they solely desire that the council implement an efficient way of updating its clients on individuals' next check-up or service dates as well as other general updates. This move would greatly reduce missed check-up / review dates and ultimately reduce unintended defaults and unplanned families. The system would be mainly used by the service providers in the council to capture clients' personal details, medical history and services rendered on any particular day. Clients on the other side would receive updates via emails and SMSs. Service statistics generated by the system are also an important Management Information Systems tool that would aid managers and directorate in decision making. This documentation gives a detailed description of the functionality of the ZNFPC Client Management System.

# DECLARATION

I, **Mugwenhi Tafirei Samson,** do hereby declare that I am the sole author of this dissertation. I authorise the Midlands State University to lend this dissertation to other institutions or individuals for the purpose of scholarly research.

Signature……

Date ……. /…….. /20…...**.**

# APPROVAL

This dissertation entitled "**Zimbabwe National Family Planning Council (ZNFPC) Client Management System**" by **Mugwenhi Tafirei Samson (R156224Q)** meets the regulations governing the award of the degree of BSc Honors Degree in **Information Systems** of the **Midlands State University**, and is approved for its contribution to knowledge and the literary presentation.

Supervisor……

Date…….

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## LISTS OF ACRONYMS AND ABBREVIATIONS

**ANSI-SPARC-** American National Standards Institute Standards Planning and Requirements Committee

**CBA-** Cost Benefit Analysis

**CMS-** Client Management System

**DBMS-** Database Management System

**DDL-** Data Definition Language

**DFD-** Dataflow Diagram

**DOB-** Date of Birth

**DVD-** Digital Versatile Disk

**EERD-** Enhanced Entity Relationship Diagram

**ER-** Entity Relationship

**ERD-** Entity Relationship Diagram

**FP-** Family Planning

**GB-** Gigabyte

**GUI-** Graphical User Interface

**HDD-** Hard Disk Drive

**HP-** Hewlett Packard

**HTML-** Hyper Text markup language

**IT-** Information Technology

**LAN-** Local Area Network

**MIS-** Management Information Systems

**MISO-** Management Information Systems Officer

**NPV-** Net Present Value

**PBP-** Payback period

**PHP-** PHP Hypertext Processor

**PM-** Provincial Manager

**RAM-** Random Access Memory

**ROI-** Return on Investment

**SDC-** Service Delivery Coordinator

**SDLC-** Software Development Lifecycle

**SDP-** Service Delivery Point

**SRH-** Sexual Reproductive Health

**SQL-** Structured Query Language

**TB-** Terabyte

**WAN-** Wide Area Network

**ZNFPC-** Zimbabwe National Family Planning Council

# CHAPTER ONE: INTRODUCTION

## 1.1 Introduction

With regards to the provision of health services in Zimbabwe, proper clients' record keeping for tracking and service continuity has been a challenge. Thus, the inclusion of Information and Communication Technologies in this area may significantly contribute to a greater efficiency and effectiveness in the health services provision fraternity. This project intends to investigate, plan and develop a computerised web based Zimbabwe National Family Planning Council (ZNFPC) Client Management System for the provision of family planning services in the country. The proposed system is tipped to counter the limitations of, and adds value to, the current manual client management system by Family Planning service providers in the country. Family Planning service providers currently utilises a paper based manual system of handling and manipulating its records, a system which is prone to a lot of errors. In this introductory chapter, the project's problem definition, the main system's development aim, the system's expected functional areas with regards to specified objectives, instruments to be used in the development of the system and the system development rationale will be given.

## 1.2 Background

The background section gives a brief narration of the organisation in question zeroing in towards the problem statement.

### 1.2.1 Background of the Organisation

The Zimbabwe National Family Planning Council (ZNFPC) was established in 1985 by an "ACT of Parliament". Its core mandate is to coordinate the provision of Family Planning (FP) and Sexual Reproductive Health (SRH) services in the country. The organisation has its head office in the capital city of Zimbabwe as well as provincial centres in all the country's provinces. To reach out to almost every client in need of its services, the organisation operates in all districts of the country. Like any other institution offering health services, ZNFPC keeps track of its FP and SRH clients

for continuity of services. Such records are kept in manual registers at all Service Delivery Points (SDPs). However individual client tracking is somehow difficult with this current system in place.

### 1.2.2 Organisational Structure

The structure of an organisation defines how control I exercised through the ranks within an organisation. It shows the levels of authority and delegative powers endowed at each individual level. Collins (2001) states that the organisational structure ensures that the aim and objectives of the organisation are achieved by way of productively utilising the available human resource base. An organisational structure determines or shows how tasks are allocated and coordinated as well as how information flows within the company. The structure helps define the roles and responsibilities of members of a department, work group or organisation (Sullivan, 2017).

There are basically several types of organisational structures which organisations can implement depending on their culture. These include the functional structure, divisional or multi-divisional structure, matrix structure and the project organisation structure. The Zimbabwe National Family Planning Council implements the functional structure which groups people who do similar tasks and with similar skills or job specifications into a single functional unit. Figure 1.1 shows the structure of the Zimbabwe National Family Planning Council (ZNFPC).

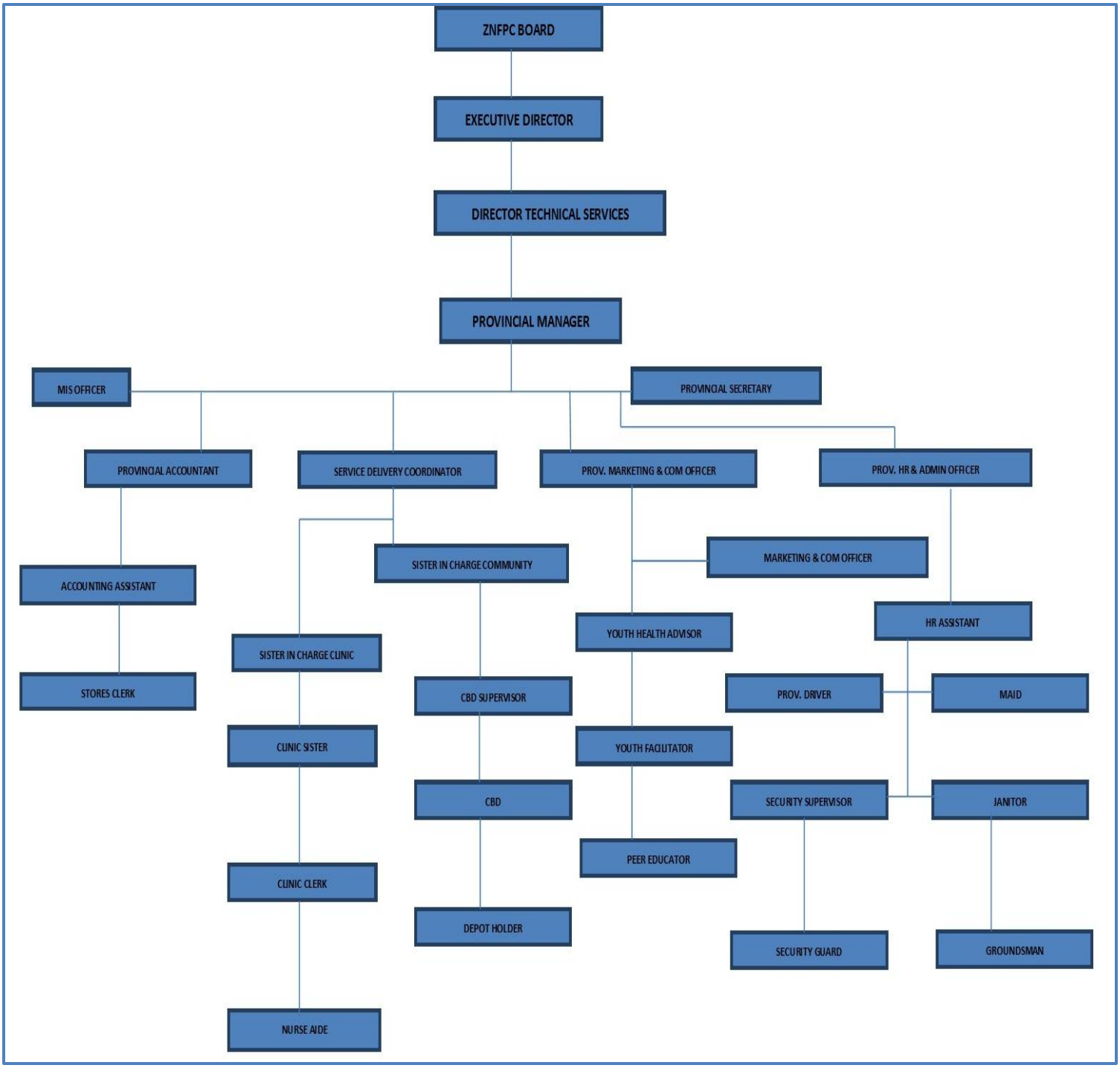


**Fig 1.1 Zimbabwe National Family Planning Council Organisational Structure**

### 1.2.3 Vision

Ellen (2014) describes an organisation's vision as an aspirational foresight of what the organisation would want to accomplish. It is a company's road map showing what a company wants to become usually pegged on a mid-term or long term future basis. ZNFPC's vision is to offer "Quality Family Planning services for all by 2020".

### 1.2.4 Mission Statement

Ellen (2014) states that an organisation's mission statement describes its core drive which summarises its aims and values. It is a form of a written declaration which shows the chief purpose for the existence of the organisation. The Zimbabwe National Family Planning Council is devoted "To provide rights based integrated quality FP services through innovation and coordination".

## 1.3 Problem Statement

A problem is a matter or scenario which is regarded as unfavorable which needs to be dealt with (). From the problems comes the proposal of the new system which brings solutions or the desired state. ZNFPC currently has a paper based manual client management system. For this system to thrive, the organisation is using several of its staff in different offices to handle different files and records as well as tasks with regards to service provision. Such personnel used includes office bearers like the service delivery coordinator, sister in charge community, sister in charge clinic, clinic nurses, clinic receptionist and community based distributors amongst others. The manual paper based handling of the organisation's client management system has been working in its way, however several challenges and shortcomings are inclined to this methodology. These challenges include

- Difficulties in maintaining or updating paper based records
- Slow processing speeds with regards to capturing and retrieving of client information.
- Inefficient client tracking capacity. Service providers had to peruse through files to check on who is due when then contacting the person afterwards.
- Common human errors which has proved to be costly to the clients as well as the organisation.

- Difficulties in analysing data recorded on paper files
- Data inconsistencies where clients supply different information on different visits
- Data redundancies where heaps and heaps of files with old useless information are always kept ad taking up space.
- Missed client check-up dates.
- Problems in maintain privacy with regards to client information

In view of these challenges, ZNFPC wishes to adopt and implement a computerised web based Client Management System to inform concerned stakeholders and clients on important service delivery information.

## 1.4 Aim

The prime aim of this project is to design and develop a computerised and web based Client Management System for Zimbabwe National Family Planning Council, which will utilise relational database applications, internet services and mobile phone technologies to manage the organisation's clients.

## 1.5 Objectives

Whitten etal (2003) explains an objective as a desired outcome that a project seeks to achieve when successful. With a clear understanding of the current system's major challenges the researcher desires to objectively address these so that the new system will be able:

i) To create a computer based central database for the organisation that will orderly and chronologically houses all necessary client records.

ii) To send updates and reminders to clients through mobile phone texts and / or emails

iii) To allow easy Client Records Update whenever changes happen

iv) To offer effective and enhanced security to the clients' information held by the organisation.

v) To effect automated periodic backups

vi) To produce comprehensive and ad hoc reports

### 1.6 Instruments

In the field of software design and / or engineering, according to Rosenblatt (2012), instruments and methods describes innumerable platforms and tools that can be used for the design and development of a software. The proposition mainly determines the required level of staff expertise and knowledge in designing the system. The following is a list of software development tools that were used in the development of the new system:

- **PHP** – the PHP hypertext processor is a programming language used in the creation of websites which include dynamic content that interacts with databases and offers high security and speed in execution (Rosenblatt, 2012). Hypertext Processor developed websites are compatible with several commonly used web browsers and they can run or execute on a number of operating systems.

- **MySQL database –** according to Rosenblatt (2012) MySQL database is an open source as well as free database management system. The choice for this database management system was reached at since it is compatible with PHP hypertext processor and supports all the requirements of the new system. Its security strength is one other aspect that makes it robust and suitable for incorporation in the new system.

- **Adobe Dreamweaver CS 6 –** it is a web development tool which enables design and development of interactive websites which are easy to use and are very much user friendly (Clifton, 2014).

- **XAMPP –** this is a free, open source cross-platform web server package. Its advantage is that it encourages php error handling and reporting (Clifton, 2014).

### 1.7 Justification

The Zimbabwe National Family Planning Council Client Management System will provide an accurate and efficient way of maintaining client records as well as tracking them. The system will enhance proper client tracking and service continuity. Given the ever escalating mobile technologies, client updates on mobile platforms can be highly utilised for this cause. This will definitely bring about client convenience and satisfaction on the organisation's services. Online relaying of information is the in-thing in this current era of technological advancements and hence health services provision in the country cannot be left out.

### 1.8 Conclusion

Having identified the limitations of Zimbabwe National Family Planning Council's Client Management system, there were proposed resolutions aimed at solving these challenges. In addition, some of the project proposal's objectives will be coming in as newer dimensions and additions besides directly addressing the current system's challenges. Following the software development project steps, the planning phase supersedes the introductory phase. The planning phase will put much thrust on the feasibility of the proposed system with respect to different contributory factors.

# CHAPTER TWO: PLANNING PHASE

## 2.1 Introduction

The purpose of a project planning stage is to systematically analyse the project with regards to its work breakdown, the costs attached, resources required and the scheduling aspect (Ahamed, 2010). This phase takes cognizance of the practicality or feasibility of the project taking into account all the instrumental factors that determines the success or failure of the project. When properly done, the end of the planning phase should leave all team members well aware and clear on the tasks, sub tasks and expected deliverables of the project, the time frames under which tasks are to be performed and completed as well as the roles and responsibilities expected of each and every team member. Planning also analyses and evaluates the business value of the pending project. In general, the planning phase defined what was the work to be done and how it was going to be done. The project plan was also used as a tool or framework to review and control the process of developing the intended software.

## 2.2 Business Value

Brown (2014) states that business value can be explained in three facets which are the customers' desire, the producers' creativity and the system's sustainability. A business value analysis aims at interrogating the business venture or the new system proposal to establish its proficiencies and validity. Business value describes the overall net benefit that will accrue to the owner from a given project after having funded its development. For any project to be funded it has to be justified first to see if it is worth undertaking in terms of its perceived return on investment (ROI). According to the investigation done, the implementation of the ZNFPC Client Management System will see quantitative and qualitative benefits accruing. Such benefits include:

- **Customer confidence** – with timely and chronological updates being posted to clients, the later will gain much confidence in the services of the organization. This in itself will create more clients for the organization as the satisfied ones will act as ambassadors to other potential ones.

- **Economical** – the system will promote saving both for the organization and its clients. The making of expensive conventional phone calls to clients will be replaced by cheap mass SMSs by the organization to its clients. On the other hand clients do not need to pay for transport fares to physically visit the service delivery points just form information but simply receive it on their emails or mobile phones.

- **Enhanced decision making** – the system is a strong MIS tool that will help decision makers in the organization systematically analyse trends in the services provision. This will help quick interpretation and decision making by management.

- **Overcome geographical and time barriers** – once the system is distributed / linked among different service delivery points (SDPs) of the organisation, it implies that any client who is already captured in the system can have his / her details accessed from any SDP. This means services can continue from an informed point from any place any time.

### 2.3 Feasibility Study

Otto (2010) defines feasibility study as the process of analyzing and evaluating a given project with the intention to reduce or eliminate the impact of risks. Feasibility study is an analysis meant to determine whether or not to embark on a proposed project as propounded by Tripathy (2013). The main tracking indicators that are used to gauge the feasibility of the proposed system are the:

- Economic feasibility
- Technical feasibility
- Social feasibility and
- Operational feasibility

All these feasibility aspects were closely analysed for the Client Management project and explained as follows:

#### 2.3.1 Technical Feasibility

According to Rodger (2005), technical feasibility evaluates the availability and accessibility of the technical experts knowledgeable and skilled enough to deliver on the given tasks of the project. This aspect takes cognizance of the availability and accessibility of the required technology that is

required by the new system. It checks whether the technology exists at all or whether there are experts to develop it. Besides the availability, access and development aspects of the new technology, the technical feasibility also analyses to ascertain whether the organisation has or will be able to find technically qualified personnel to operate the system during its serving life span. A requirements list of the ZNFPC Client Management System was compiled to help guide the technical requirements in order to propel the project forward. The following explains the technical feasibility aspects analysed.

#### 2.3.1.1 Technical Expertise

The technical expertise part looks into the availability, ability and accessibility of the human resources that would catalyse the development and the ultimate use and maintenance of the new system. The researcher who is the sole developer of the project has adequate technical expertise as acquired during the preceding semesters of the course. The developer has undertaken modules such as different programming languages, software engineering, software project management, economics, marketing and decision support systems amongst others. These makes the developer a technically empowered expert to undertake this project. In addition he Zimbabwe National Family Planning Council has a team of experts comprising of an Information Technology (IT) manager, Systems Administrator, Networks Administrator, Data Management Officers as well as Management Information Systems Officers. This team can be of much assistance when it comes to implementation of the system as well as maintaining it.

Some other personnel like the clinic receptionist / clerk, the nurses, the service delivery coordinator, the managers and the likes who will interact with the system would need just to be oriented on their specific platforms on the system. The trainings can be done with the guidance of the technical experts afore mentioned.

#### 2.3.1.2 Hardware and Software Infrastructure Specifications

An investigation was conducted to ascertain the available hardware and software infrastructure within the organization. This was to ascertain whether the existing infrastructure was sufficient

enough to support the new system or whether new acquisitions would be required. The following tables shows the hardware and software requirements and their availability in the organisation.

**Table 2.1: Hardware Requirements**

| Hardware Item | Quantity Recommended | Available |
|---|---|---|
| Database Server (HP T620 HP Thin Pro)<br>**Server specifications**<br>• Hard Disk Drive (2TB recommended)<br>• Processor (3.4GHz recommended)<br>• Memory – RAM (8GB recommended)<br>• Network card (10/100 ethernet)<br>• DVD r/w Drive (52x Read, 24x Write) | 1 | Not available |
| Service provider computers (HP Z240 Tower Workstation)<br>**Workstations specifications**<br>• Hard Disk Drive (500GB recommended)<br>• Network cards (10/100 ethernet)<br>• Memory – RAM (2048MB)<br>• Processor (2GHz) | 3 | Not available |
| Ethernet network switch | 1 | Available |
| Networking cables (Fast Ethernet 10BaseT) | 120metres | Available |
| Tape drive | 1 | Not available |
| Printers (HP Laser Jet MFP M436dn) | 1 | Not available |

**Table 2.2: Software Requirements**

| Software Item | Quantity Recommended | Available |
|---|---|---|
| Software packages (XAMPP Server, ) | 1 | Not available |
| Antivirus (ESET Endpoint Security) | 1 | Available |
| Macromedia Dreamweaver | 1 | Not available |
| Microsoft Office 2016 | 1 | Available |

### 2.3.2 Operational Feasibility

This is a study that is aimed at establishing whether the new proposed system would suit the working environment of the organisation in an appropriate and acceptable manner (Mogan, 2006). According to Otto (2010), operational feasibility tries to ascertain the ability of the system to satisfy the users' requirements as stipulated in the original requirements specification document. The question to address here is whether the project's objectives will be met and successfully implemented. This will very much depend on the abilities of the experts available to custom make the system to suit and work in the organisation's environment. The study also tries to check for the possible readiness to start using and reactions of the system's users and key stakeholders towards the new system. This analysis will indicate whether rolling out of the new system will not face resistance.

An in-depth analysis was undertaken to ascertain the level of the new system's operational viability with regards to the users and stakeholders' readiness and acceptance. With the projected setup and perceived functionality of the proposed system it was well determined that the system would be successfully operational in the organisation. With the anticipated performance of the system, it was gathered with no doubt that the system will perfectly suit the working environment of the organisation without any hindrances.

### 2.3.3 Economic Feasibility

Economic feasibility is an analysis that is done to gather facts describing whether a given project endeavor may bring about positive returns with respect to the investment given. A project is said to be economically feasible when the ultimate total value it creates outweighs the costs incurred (Williams and Erdogmus, 2002). In other terms economic feasibility is a form of a cost-benefit analysis which seeks to evaluate which side outweighs the other. When embarking on any project, developers ought to carefully predict all the probable expenses they would incur in developing, implementing and maintaining the system. The anticipated yields from the system needs also to be carefully estimated. This will allow a comparative analysis to be done between the two. For the ZNFPC Client Management System, a cost-benefit analysis (CBA) was carefully done to value the seeds versus the fruits of the system. The economic feasibility, besides to see whether proceeds were more than costs, was also done to see whether the organisation had the capacity to fund the project. Therefore the economic feasibility was used to determine the organisation's eligibility to meet the costs and the proceeds were also used as justification to fund the project.

#### 2.3.3.1 Cost Benefit Analysis (CBA)

Cost Benefit Analysis (CBA) is a systematic financial metric used to determine and analyse the probable costs that will be incurred during a project development life cycle and the benefits that will accrue from its implementation (Davis, 2005). It is an approach aimed at establishing or estimating the strength and the weaknesses of any given project that may need to be undertaken. This is actually a process of quantifying costs and benefits attached to a certain project or decision by considering and evaluating available options or alternatives of the project over a specified period. Castro (2002) explains that following a cost benefit analysis a decision has to be made normally which picks on an alternative that shows lucrative benefits that significantly supersedes the costs. For a meaningful comparative analysis of the costs and benefits to be reached at, there is need to evaluate and bring to a common denomination all the costs and benefits. Comparing items from a different perspective would not make much sense as biased decisions can be drawn.

**a) Costs**

Randall (1996) describes a cost as an amount or value or expense that has to be given up or that is attributable to the acquisition of a given product or item. With regards to software projects, costs encompass all the expenses attributable to the development / acquisition, operating as well as maintenance of the system.

**i) Development Costs**

According to Lederer and Prasad (2007), software development costs are all those expenses that are incurred during the whole process of coming up with a new software. Every single expense should be carefully estimated from start to end of the project to give an accurate or near accurate expected expense. Estimates that are far below or above the real costs may have a negative impact as this may see the progress stalled along the way because of under budgeting or project failing to kick start in the first place because of an affordable budget estimate that may scare off funders. These estimated costs are also regularly revised during the process of project development to allow for changes in the economic environment to be factored in. The following table illustrates the projected developmental costs for the ZNFPC Client Management System.

**Table 2.3: Development Costs**

| **Item Description** | **Quantity** | **Cost (US$)** |
|---|---|---|
| HP T620 Thin Pro (Server) | 1 | 1200 |
| HP Z240 Tower Workstation | 3 | 2400 |
| Tape Drives | 2 | 200 |
| Printer | 1 | 800 |
| Software | 2 | 600 |
| **Total Development Costs** | | **5200** |

### ii) Operational Costs

All the costs that are incurred during the active life time of a system are referred to as operational costs. Randall (1996) groups operational costs into two main categories which are fixed operational costs as well as variable operational costs. They are the costs that are met on a day to day basis during the running life time of a system. Fixed costs do not change over time unlike variable costs that changes with the volume of usage or work output from the system. The following table shows the projected operational costs of the ZNFPC Client Management System.

**Table 2.4: Operational Costs**

| **Item description** | **Operational cost estimates (USD) for the years** | | |
|---|---|---|---|
| | **2018** | **2019** | **2020** |
| System maintenance | 2000 | 2200 | 2300 |
| Stationery and consumables | 400 | 400 | 400 |
| User training | 1000 | 500 | 200 |
| **Total operational costs** | **3400** | **3100** | **2900** |

## b) Benefits of the new system

A benefit is defined as an advantage or profit or positive disparity that is gained from something. Benefits are normally the ones used by programme owners to decide whether or not to pursue a certain project alternative. The more lucrative the benefits of a given project appears to be, the more likely the owners would consider pursuing the alternative. These benefits can be grouped into two that is tangible benefits or intangible benefits.

### i) Tangible benefits

Tangible benefits are those good things or positive things that are physical or real in nature that accrues following the implementation of a given project alternative (Wren, 2003). The table below shows the tangible benefits that will accrue from implementing the Zimbabwe National Family Planning Council's Client Management System.

**Table 2.5: Tangible Benefits**

| **Tangible Benefit** | **Value (USD)** | | |
|---|---|---|---|
| | **2018** | **2019** | **2020** |
| Improved revenue collection due to wide coverage of service | 2000 | 2200 | 2500 |
| Operational and stationary cost reduction | 1000 | 1300 | 1500 |
| Labour cost reduction | 5000 | 5500 | 5500 |
| **Total** | **8000** | **9000** | **9500** |

**ii) Intangible benefits**

According to Wren (2003) intangible benefits are those positives that are not easy to measure, perceive or see but still retain some merit. . Some intangible benefits can be valued but some are difficult or even impossible to attach a value but evidence of their existence can be seen. The ZNFPC Client Management System will have intangible benefits which include the following:

- Improved employee morale
- Improved client satisfaction and increased clientele base
- Information dissemination
- Improved competitive advantage
- Improved / strong organizational image

Projections of intangible benefits of the ZNFPC Client Management System for the years 2018, 2019 and 2020 were given as US$2500, US$2600 and US$2600 respectively.

**Table 2.6: Cost Benefit Analysis**

| Costs and Benefits | Period (Year) | | |
|---|---|---|---|
| | **2018** | **2019** | **2020** |
| **Costs:** | | | |
| - Development costs | 5200 | | |
| - Maintenance costs | | 3500 | 4000 |
| - Operational costs | 3400 | 3100 | 2900 |
| **Total Costs** | **(8600)** | **(6600)** | **(6900)** |
| | | | |
| **Benefits:** | | | |
| - Tangible | 8000 | 9000 | 9500 |
| - Intangible (estimated values) | 2500 | 2600 | 2600 |
| **Total Benefits** | **10500** | **11600** | **12100** |
| | | | |
| **Net Benefit / Loss** | **1900** | **5000** | **5200** |

The cost benefit analysis table shows that the net benefits continue to increase with time implying that the system will favorably pay off in the long run. Conclusively, this CBA supports the development and implementation of the ZNFPC Client Management System.

### 2.3.3.2 Capital Investments Analysis

Collier (2003) defines capital investment as the act of seeding resources or funds onto a particular project with the ultimate goal of harvesting returns in due course. The analysis of capital investment comes into play to ascertain whether it is worthwhile to push capital to a given cause based on the attractiveness of the yields. There are basically three modes used to analyse capital investment and these are the Return on Investment (ROI), Net Present Value (NPV) and the payback period. All these capital investment analysis methodologies were employed to evaluate the general profitability that would accrue from the implementation of the proposed ZNFPC Client Management System.

### a) Return on Investment

Return on Investment (ROI), as explained by Wilkinson (2014), is a performance measure that looks into the profits accumulated over a given time period expressed as a percentage of the total investment injected into the project. It is an accounting approach that is used to calculate the profits generated from a given investment. The formula for calculating ROI is given as follows:

$$\textbf{ROI} = \frac{\textbf{(Investment Revenue – Investment Costs)}}{\textbf{Investment Costs}} \textbf{ x 100\%}$$

Now, for the ZNFPC Client Management System, the return on investment for the year 2018 would be:

$$\textbf{ROI} = \frac{\textbf{(10500 – 8600)}}{\textbf{8600}} \textbf{ x 100\%}$$

$$= \textbf{22.1\%}$$

Given the calculated value of ROI above, the interpretation would be that the project is worth undertaking for it promises favorable returns.

### b) Net Present Value

The net present value (NPV) is a criterion used to measure the value of any investment today and give a projection of its value in the future based on some economic factors surrounding (Lucey, 1996). Expected future earnings are scaled down by a predefined discount factor as a way of trying to reach out to a nearly accurate return value after some time lapses. For the ZNFP Client Management System, the NPV was calculated for the foreseeable three year period spanning January 2018 to December 2020 with a discount rate of 10% per anum being used. The following table shows the yearly present value calculations and the final net present value.

**Table 2.7: Net Present Value**

| Year | Cash Flow (USD) | Discount Factor (10%) | Present Value (USD) |
|---|---|---|---|
| 0 | (8600) | 1 | (8600) |
| 1 | 4600 | 0.909 | 4181.4 |
| 2 | 5900 | 0.826 | 4873.4 |
| 3 | 6600 | 0.684 | 4514.4 |
| **Net Present Value (NPV)** | | | **4969.2** |

The calculation of the net present value in the table above shows a positive NPV which presents the project alternative worthy considering for further interrogation and probably implementation as it would be a viable project. The discount factor of 10% was reached out at after considerations of current economic climate.

### c) Payback period

Hughes (2005) explains payback period as the time lapse from which the initial capital injection is made and the time the project breaks even. The payback criterion looks at the option which takes the shortest possible time to break even. The following table shows the cash flows and payback period for the ZNFPC Client Management System.

**Table 2.8: Payback Period**

| Period (Year) | Cash Inflow or (Outflow) | Balance |
|---|---|---|
| 0 | (8600) | (8600) |
| 1 | 4600 | (4000) |
| 2 | 5900 | 1900 |

The table above shows that the probable payback period of the Client Management System project is about one year and eight months. This is a favorably shorter period to wait before enjoying positive returns from the project endeavor.

Therefore, considering all the capital investment analysis methods given above, the conclusion favors the implementation of the ZNFPC Client Management System. All methods used to analyse the capital investment indicated that the project is worth undertaking.

### 2.3.4 Social Feasibility

Social feasibility analyses the pool of stakeholders to the project and tries to establish how each stakeholder group is affected by the project (Bidgoli, 2011). This analysis looks at both the positives and negatives of the project on stakeholders. Stakeholders all those individuals, groups, organisations or institutions who are either directly or indirectly affected by a project during or at any part of its life cycle. The perception of stakeholders determines the usefulness or success of any software project. For a system or project to be said to be socially feasible, stakeholders should be in a position to testify its ease of use and perceived usefulness in terms of problem solving.

With regards to the ZNFPC Client Management System it is perceived to be highly socially feasible because of its ability to offer undisputed convenience with regards to time, accuracy, accessibility and general efficiency. With the aforementioned advantages attached to the system, it also implement privacy and security of individuals' confidential health information making it even more favored by stakeholders. Nevertheless, on the other side, the implementation of this system may affect other employees' jobs as it brings in a paradigm shift from manual to computer based system which require less human effort.

## 2.4 Risk Analysis

As explained by Williams (2004), a risk is a potential threat that may harm or bring detrimental effects to something. Now, the analysis of risk is that process done in order to figure out or establish likely dangers that may result in negative things during the project's life cycle. The analysis of risk tries to take note of all probable disappointments likely to be met with the system and thus try to device mitigatory factors or actions to totally avoid or reduce the impact of the threats. With regards to the Client Management System of ZNFPC, an analysis was done which brought out the following as probable negative eventualities or risks:

### 2.4.1 Risks Prone to the System

- **Management support** – for any form of project to be pursued in any organisation it has to gain the confidence of the organizational leaders. The ZNFPC leadership support of the Client Management System has to remain resolute throughout the life span of the project. Any form of jitter by the leaders or managers along the way may saw some form of support being withdrawn and this will derail the progress of the project. In this case the project team should ascertain the level of support from key leaders before starting work on the project. Commitment by managers can be expressed in writing for future reference.

- **Funding** – with the economic feasibility having been done the expectation would be that the project will be funded to the end given the approved financial adequacy. However, the economic climate may change unexpectedly and this may totally sway the initial budget out of proportion. Or rather resources may be channeled to some other areas which management feel are better ranked than the project in question. Given such a scenario the project team needs to cultivate or instill much confidence of their project in the leadership such that it goes up the ladder of preferences.

- **Stakeholders** – no matter how well lucrative or how well explained any given project be at any cost to the stakeholders, it is inevitable that there will always remain a fragment that harbors negative perceptions about it. This kind of group needs to be dealt with very carefully as their negative idea may perpetuate and perpetrate into the general stakeholder populace. Once a sizeable number of stakeholders believes there is something sloppy about the project then it derails all plans. To counter such drawbacks there is always need to strongly market the idea amongst the stakeholders. This was done to ensure stakeholder buy-in and support for the Client Management System. Any probable resistance from a small fraction of the total stakeholder populace may not hinder the project's progress.

## 2.5 Stakeholder Analysis

Stakeholder refers to an individual, group, organisation or institution which has direct or indirect interests or which can be directly or indirectly affected by a given project (Lewis, 2000). Different stakeholders have different interests upon a given project and are as well differently affected. This means that even their involvement in the project is not the same. Brugha and Varvasovszky (2000) states that stakeholder analysis is an exercise used to gather knowledge about all relevant factors such as their behaviors, intentions, interests and interrelations. The analysis extends to check on possible resources stakeholders have or might bring into the project. For the ZNFPC Client Management System the identified key stakeholders included the following:

- **Directorate** – these are strategic managers with the obligation to propel the organisation forward. It is the wish of ZNFPC Directorate members to have a system that will accomplish all the goals and objectives of the project.

- **Tactical and operational managers** – following its organogram, ZNFPC has operational level manager as well as tactical (middle) level managers. These managers possesses a stake in the organisation's systems.

- **Employees** – from the pool of ZNFPC employees are the users of the new system who will interact with it on a regular basis as they will be going about doing their duties. This group is mainly worried about two things that is the system's ease to use as well as its purported usefulness. Employees ought to be happy with the project for it to be a success.

- **Clients** – everything that the organisation does is for the client. Thus whatever is decided, it is done with the client in mind. Clients' wishes have to be taken on board at all costs. They are also part of the system's end users whose wishes of the system ought to be fulfilled

## 2.6 Work Plan

Marelize (2010) defines a work plan as an ordered set of steps laid down indicating how individuals or group pursuing any given project will move from start to end in order to realise their goals and objectives. A proper work plan illustrates what is to be done, when it is to be done, how it is to be done and who is supposed to do it. For the ZNFPC Client Management System the task schedule was drawn up as illustrated in the following table.

**Table 2.9: Task Schedule**

| TASK | START DATE | END DATE | DURATION |
|---|---|---|---|
| Documentation | 15/01/2018 | 20/04/2018 | Continuous |
| Project Proposal | 15/01/2018 | 19/01/2018 | 1 week |
| Planning Phase | 29/01/2018 | 09/02/2018 | 2 weeks |
| Analysis Phase | 12/02/2018 | 23/02/2018 | 2 weeks |
| Design Phase | 26/02/2018 | 16/03/2018 | 3 weeks |
| Coding and Testing | 19/03/2018 | 13/04/2018 | 4 weeks |
| Implementation | 09/04/2018 | 20/04/2018 | 2 weeks |
| Evaluation and Maintenance | 15/01/2018 | 20/04/2018 | Continuous |

A gantt chart is a horizontal bar chart which pictorially indicates the tasks and activities of any given project in their order showing time slots for each part. The following is a gantt chart for the ZNFPC Client Management System.

**Table 2.10: Gantt Chart**

| | Duration (in weeks) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Activity** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** |
| Documentation | | | | | | | | | | | | | | | | | | | | |
| Preliminary Investigation | | | | | | | | | | | | | | | | | | | | |
| Planning phase | | | | | | | | | | | | | | | | | | | | |
| System Analysis | | | | | | | | | | | | | | | | | | | | |
| System Design | | | | | | | | | | | | | | | | | | | | |
| Coding | | | | | | | | | | | | | | | | | | | | |
| Testing | | | | | | | | | | | | | | | | | | | | |
| Implementation | | | | | | | | | | | | | | | | | | | | |

## 2.7 Conclusion

The planning phase was more inclined towards ascertaining whether it was viable to proceed with the development of the ZNFP Client Management System. An in-depth feasibility analysis was conducted touching on different critical perspectives which included the economic viability, technical, operational and even social compatibility of the proposed software. The feasibility analysis carried out showed that the project is economically viable with the organisation able to fund it. Experts were found to be available in the organisation to undertake the project tasks. The chapter also encompassed the identification of key stakeholders of the project and how they would be affected by the implementation of the project idea at stake. Risks were also analysed and everything was put in place to mitigate or eliminate their impact or consequences. Having planned accordingly, the next stage now involves a close analysis of the current system to enhance an informed building up of the new system.

# CHAPTER THREE: ANALYSIS PHASE

## 3.1 Introduction

Following the general systems development life cycle steps, the analysis phase follows after the planning phase. A successful planning phase was conducted which indicated that a new web based Client Management System for the Zimbabwe National Family Planning Council can be developed. Now, the analysis phase takes a more detailed examination of the current system in place looking at things such as the users, processes, relationships between major system entities and data storage amongst other things. To clearly understand the current system and somehow stakeholder expectations, a number of fact finding methodologies are taken on board. Diagrammatic representations of the current system will be used to get a clear understanding of the processes. This phase also entails weighing of alternative courses of action at hand to achieve the set goals and objectives.

## 3.2 Information Gathering Methodologies

Information gathering or data gathering is the process of collecting information for a particular cause (Manick, 2012). To get a clear understanding of the current system, the developer used different data gathering techniques. The following are data gathering methodologies or fact finding techniques that were employed in the analysis of how the Zimbabwe National Family Planning Council manages its clients' records:

### 3.2.1 Observations

Observations are one of the fact finding techniques that works by way of on-sight analysis of events to see how they unfold, the behaviors and artifacts that exists in the social setting chosen for a particular study. It is a scenario whereby data gatherers physically carries out on-site visitation to analyse or check directly to see how things are done at a chosen sight for a particular system. There is also what is called covert participation observation technique which entails an observer participating in a given process whilst closely observing and taking note of every detail needed but with other team members not aware of this observation mission (Hallewell etal, 2012).

The researcher carried out a series of observations within the organisation to gather information about the current system. The observation exercises were done during the first half of the month of February 2018 at the ZNFPC Midlands's FP Static clinic. Four sessions of observations were carried out in two different ways. The first way was where the observer simply sat in the enquiries or clinic reception room and observed how clients were served. The second style was where the observer participated as a staff member but with his fact finding mission not known to the other staff members (covert participation). The covert participation observation technique was employed to get an unbiased understanding of the system at hand. These observations were done at different days of the week and different times of the day. This was to try and find out any service differences with regards to client influx, time of the day and also different service providers. The observation process tried to get information on how the clinic clerk and the nurses interacted with the clients and how the clients also related to the clinic staff. Verbal and non-verbal communications between these parties was observed. The observer also closely checked on the client recording process. A series of staggered physical observations were done as a way to validate the gathered facts since a single visit would not avail much detail or understanding at ones. (*See Appendix D for sample observation score sheet*)

#### 3.2.1.1 Observation Advantages

During the process of observation, the observer gathered the following as advantages of using observations as a fact finding method:

- The observer's direct interaction with the ZNFPC's real practical work environment provided a deeper understanding of the whole process by the observer
- It was simple to make the intended system observation. No special skills that were required for the observer to carry out his mission but just a reasonable minimal level of appreciation of the subject area being investigated.
- The observer gathered information as he could see physically. This provided a high degree of accuracy and correctness on the facts gathered as the observer could see evidence of the theme under investigation directly. The covert participation criteria that was also employed provided more accurate evidence as well

- The observer had no hustle to seek for the observed persons' consent, the observer simply observed and took note of whatever areas he needed.

#### 3.2.1.2 Observation Disadvantages

Inasmuch as observation is a good information gathering criteria in its way, there still remains the negative part about it. Observation as an information gathering technique presented the following disadvantages as envisaged by the observer:

- The process was time consuming as the observer had to shelf other activities and focused on this activity.
- Some ZNFPC clinic staff who realised they were being observed portrayed a more admirable service provider – client interaction atmosphere giving a false impression than the normal.

### 3.2.2 Interviews

An interview is a formal consultation or meeting in which a respondent (interviewee) is asked questions where the responses given provides data or information that is subjective to the cause or research (Sward, 2010). The interviews are a traditional information gathering process which was used by the researcher to establish facts, opinions, feelings, perceptions and other things about the current system at ZNFPC. With clear objectives of what information wanted to be gathered, the researcher prepared a list of questions specific to different respondents. The respondents interviewed for this project included representatives from the key stakeholder groups. These included the clients, service delivery staff, operational and tactical managers.

The researcher had to seek for each and every interviewee's consent first before conducting the interviews. Questions were asked only to those respondents who gave their consent. Structured interview questions were administered to the respondents and these questions tried to address aspects inclined towards the current system. The questions were designed to solicit for as much information as possible about the current system. The interview sessions were conducted in the boardroom and this was a free and conducive atmosphere to allow free responses and suggestions by the respondents. Management workers opted to be interviewed from the comfort of their offices.

Interviewing of different respondents was meant to get a very transparent and all-inclusive view of the current system.

In terms of interview sessions timing, the times differed depending on the availability and freeness of the respondents. Client respondents were interviewed at any time of the day for as long as they had visited the clinic and consented to the interviewer request. For the service delivery staff members, interviews were scheduled during the individuals' tea breaks or lunch times. This was meant to allow smooth flow of service provision at the clinic. Management workers' interview sessions were penciled down after making prior arrangements with them as their schedules are always packed.

The idea to include respondents from different sections and different levels was a well calculated move by the interviewer. During the interview process, the interviewer was striving to build a good rapport with all interviewees as they are also critical stakeholders of the system. Having interacted and gotten a pool of ideas from across board, the researcher is assured of a positive buy-in from the stakeholders when it comes to implementation of the new system. With this move the new system will face little or no resistance at all when it is eventually rolled out. (*See Appendix B for sample interview questions*)

The researcher found out that interviews, as a fact finding technique, had their own merits and demerits highlighted as follows:

#### 3.2.2.1 Interview Advantages

During the interview sessions, the researcher figured out the following as advantages attached to using the interviews as a fact finding technique:

- There was accurate data gathering in areas such as gender and race amongst others, which the interviewer could see for himself. These are such areas that the respondent cannot misrepresent
- The interviewer was able to capture verbal and non-verbal ques. These described the respondents' attitude towards the questions or topic under discussion. The interviewer

could see where respondents were happy and where they were not happy with the system by merely looking at their physical reactions after a question had been paused.

- The interviewer had the ability to keep the focus of discussion. Respondents were at times straying away from facts but the interviewer could bring them back to focus.
- Respondents could show emotions and certain behaviors that were captured and described a lot about the subject matter under investigation.
- More information was siphoned from the respondents through probing.
- Respondents were very free to answer since the discussions were held in a closet and there was no direct influence of the respondent from others as interviews.

#### 3.2.2.2 Interview Disadvantages

The interview shortcomings were noted as follows:

- The interviews proved to be time consuming. This demanded both the interviewer and the interviewee's time. Since ZNFPC is a service provider organisation, its staff members are always receiving and rendering services to clients. Thus they could afford very minimal time slots to respond to the interview questions. Some questions could be rushed through because of the time constraint aspect.
- The interviewer could certainly notice some form of falsification of information by some respondents as one question asked to several respondents could bring conflicting responses. It was envisaged that some interviewees were deliberately giving false information because of different motives which included to impress or undress the interviewer

### 3.2.3 Questionnaires

According to Andy (2009), a questionnaire is a self-administered script containing a set of standard questions or queries pertaining to a particular study area that can be given to several persons for responses. A questionnaire can contain open ended or closed ended questions depending on the type of information required from respondents. This exercise mainly utilized open ended questions which was meant to net as much information as possible. Questionnaires were designed mainly for ZNFPC staff members and some for the organisation's clients. Since these data gathering tools

were self-administered, respondents were given up to a week to fill in and return the scripts. Questionnaires were mainly targeted to workers who could not afford interview time because of their schedules but rather were comfortable responding to questionnaires at their own pace. Two different questionnaires were designed, one for staff members and another for clients. (*See Appendix C for sample questionnaires*)

Just like other information gathering methods, the questionnaire had its own good and weak sides as pointed out below:

#### 3.2.3.1 Questionnaire Advantages

- The method kept user anonymity and privacy. This promoted the input of much information which could not be freely given using other methods
- A large pool of respondents were reached out with questionnaires. This translated to a lot of information being gathered.
- It proved to be a flexible way of data gathering as it did not interfere very much with neither the information gatherer nor the respondents' schedule. Respondents filled these in at their own pace and comfort.
- Designing of the questionnaire did not require much technical or expert skills but rather to know the subject area in question

#### 3.2.3.2 Questionnaire Disadvantages

- There was misinterpretation of some questions as shown by wayward responses given by some other respondents. Respondents could simply answer according to how they interpreted the questions and no one could be there to elaborate the questions for them
- Dishonesty and misrepresentations of facts was noted as there was no obligation to follow up and verify authenticity of information provided from the respondents.

### 3.3 Analysis of the Existing System

The fact finding exercise done by the researcher through the previously explained data gathering methodologies was to find out much detail about the current system in use. All this fact finding mission was aimed at finding out how the current system works. Things like the input, the

processes and the outputs of the system among other things were being scrutinized. Having carried out a series of observations, interviews and gathered data by way of questionnaires, facts about the current system were put together.

The whole process starts by a client visiting the Zimbabwe National Family Planning Council's static clinic. A client walks in to the enquiries first where he or she interacts with the clinic clerk first. General information is given to everyone by the clerk but further medical investigations on the client can be done by a nurse and this calls for a consultation fee to be paid. Personal details of the client wishing to receive a service are taken down at the clerk's desk. These details include full names, date of birth, national identification number, address, contact details (phone numbers, email address) and any other particulars necessary. Medical investigations are done in the consultation room by the nurses. For any Family Planning service of the client's choice to be rendered some form of medical history maybe required of the client. Such history include whether the client has previously used any FP method, whether she encountered any side effects, whether the client is on other medication of some sort that may contra-indicate with any FP method. Certain tests like Blood Pressure check, weight taking amongst other things are also done at the clinic to get a full medical state of the client before administering any method.

A client who then gets a service will have his or her service details written in the record book as well as on a client card. The client card shows all service details and of more importance it also shows client review dates as well as resupply and reinsertions dates. The review, resupply or reinsertions dates differ from one FP method to another. It was noted that the clerk takes much time perusing through the record books to pick information about a revisit client who does not bring a client card. Several revisit clients do not bring their cards when they revisit the clinic they simply narrate certain required information by word of mouth to the clinic receptionist or the nurses. The word of mouth can be very misleading. This creates more labour to the clerk as well as the nurses as they would rework on some tasks in order to prescribe the right method to the client. This presents pressure to the clinic staff and longish waiting periods for other clients in a queue. This at times prompts the service providers to cut corners just as a way to beat time in servicing clients. This in itself was observed to be an inefficient way of managing clients. Clients

could give false medical information by word of mouth and this may translate to biased prescriptions being made. With biased prescriptions clients are at risk of facing numerous side effects.

Because of the client card problem, the clinic's records ends up having a lot of redundant data. One client could be recorded on several occasions creating unnecessary repetitive work for the clerk. There was also discovered the aspect of data inconsistences where one client could be recorded with different particulars on different dates. The fact finding mission also discovered that the client card issue was also somehow chasing away clients as the clinic would request clients to go and buy their own booklets for use as client cards. The clinic at times freely provides these cards to clients but these are regularly out of stock implying that clients are asked to source for their own.

When a client has opted for a full consultation, a payment to that effect has to be made before the consultation itself has been done. The same applies to any other FP service, payment has to be done before the service itself is given. Thus the clerk would liaise with the nurses as to who has paid, how much, and for what? Receipts are also used as payment confirmation notes.
It was also learnt that numerous phone calls were being made to contact clients. This is an expensive way of passing on messages and updates to numerous clients in the clinic's records. Some interview responses showed that the clinic staff at times ignore the client follow up element. Clients would be left to adhere to their visiting dates without the service provider reminding or following up on them.

With regards to client follow-ups, the clerk would sift through the record book of services checking which clients are due for review, resupply or reinsertions and when. Clients would be phoned to be reminded of their next visit date. With many clients in the books, this process was discovered to be very laborious and time consuming such that the clerk would simply skip phoning some clients. The element of phoning has also been milking the council in terms of phone bills. Given these challenges around client phoning, the organisation has been prioritizing follow-ups on critical clients such as PAP-smear clients.

At the end of every month, the clinic nurses would compile summary service statistics. They would go through the bulky records fishing out different services and summing them up. Their compilation would show each and every service's clientele numbers for that particular month. Summary statistical reports are forwarded to management for capturing and further analysis. From the management analysis comes analytical reports showing programme performance trends. The statistical analysis reports helps in making programmatic decisions. Whatever programmatic decisions are made would try to make an impact on clients, thus the organisation's interaction and communication with its clients is inevitable.

Thus, in general, the fact finding mission established clients' dissatisfaction about use of small booklets or cards which they should carry each time they visit the static clinic for services. The major complaint was that these booklets or cards could easily be misplaced. Clients in possession of these records were also easily missing check-up dates. Service providers at the static clinic also showed dissatisfaction with the current manual way of managing clients. This current methods was so expensive, laborious, and erroneous and time consuming. Whenever a repeat client walks in especially without his or her own hand book or card, the service provide would try to retrieve the client's information from the files based on verbal information about last service dates by the client. It was pointed out that very few clients without their hand book or card would provide accurate information. In terms of client follow-ups, opening of files and records to check which clients were due for check-ups and should be contacted provided high chances of errors of omission. Some clients due to be contacted were erroneously omitted or deliberately omitted because of too much pressure on the staff members.

In terms of statistical compilation and analysis, it was pointed out that the manual approach presented greater challenges. This method is a very slow time-consuming process which is susceptible to errors too. The process would require a dedicated cadre at some point to do the consolidation of service statistics at the end of each reporting period. A faster and accurate way of statistical compilation and analysis was a desired thing both to the service providers and management respondents.

The current manual system of has the following structure of inputs, processes and outputs:

**Inputs**

- Client details
- Client medical information
- Service providers (nurses) details
- Managers' details

**Processes**

- Check client details and medical information
- Client service rendering
- Check client checkup dates and send updates

**Outputs**

- Clients service reports
- Updates or notices to clients

### 3.4 Process / Data Analysis

Process analysis involves assessing data available and try to establish how it is handled within an entity. Every segment of the data is inspected for one to be able to illustrate it (Joanne, 2006). The current system's process analysis is diagrammatically shown by what is called an activity diagram. This activity diagram basically shows the activities (processes) done by the system. The process analysis actually breaks down the whole system into activities that are done at different points of the whole system process. Figure 3.1 is an activity diagram for the current system of managing clients by ZNFPC.

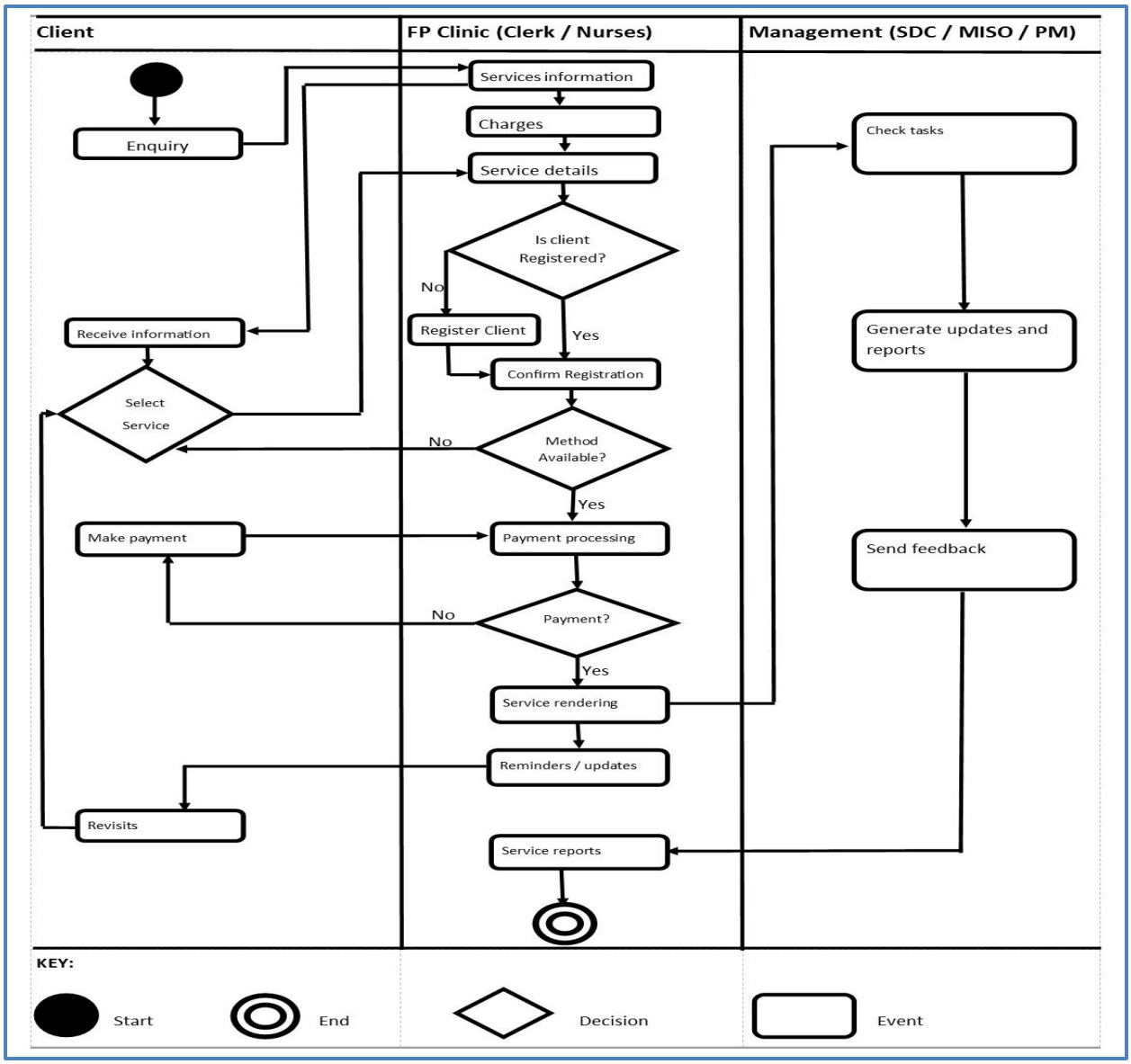


**Figure 3.1 Process Diagram of the current System**

As described in the previous section of the current system's analysis, the process flow diagram is simply pictorially highlighting the client management process at ZNFPC. It highlights the activities by the system's stakeholders and how these activities relate to each other.

### 3.5 Data Analysis

Data analysis is a process of taking a closer look or interrogating gathered data to get a clear understanding of it (Rouse, 2011). The process analysis involves inspecting, cleansing,

transforming and modelling data with the ultimate goal to discover patterns. Data analysis points at extracting useful information from a given set of data to draw out conclusions which are used in making decisions.

### 3.5.1 Context Diagram

A context diagram is a pictorial representation of the entire system covering all the underlying aspects or details of the system. It shows things such as inputs, outputs and how data actually flows from one point to the other within the system (Roger, 2005). A context diagram, also known as a level zero data flow diagram does not give much detail but rather depicts the system as one whole unit with major inputs and outputs shown. Figure 3.2 shows the level 0 DFD of the current system.

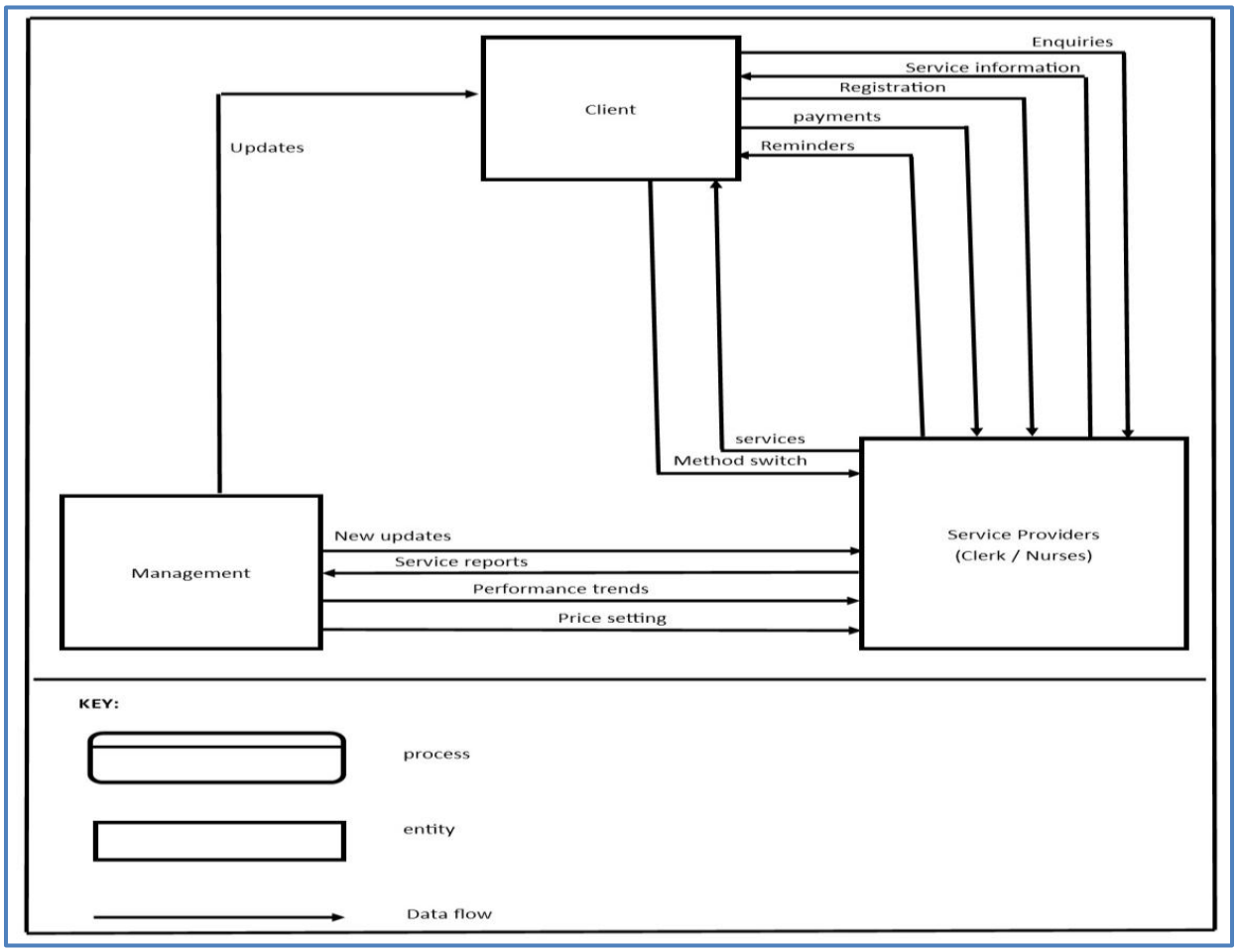


**Figure 3.2 Context diagram of the current system**

### 3.5.2 Data Flow Diagram (level 1)

According to Manning (2014), a data flow diagram (DFD), also referred to as a level 1 DFD, is a pictorial representation of a system which shows the general flow of data or information within the system. It models the system's entities, the relationships that exist, the flow of data and its storage. The level 1 DFD is more detailed than the preceding level 0 DFD. Every single process of the system is shown with its inflows and outflows. Figure 3.3 shows the level 1 DFD of the ZNFPC's current client management system.

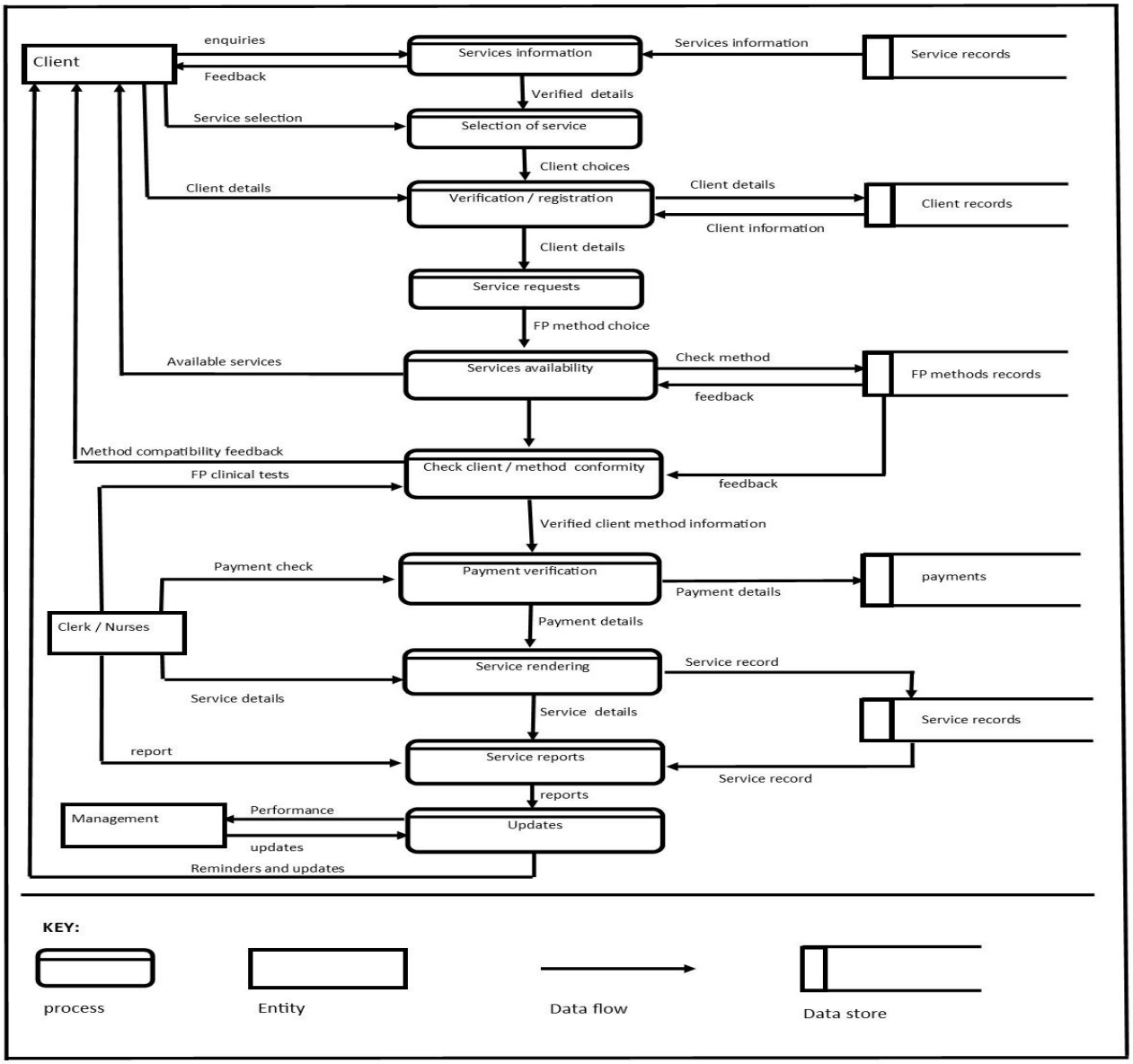


**Figure 3.3 Data flow diagram for the current system**

### 3.6 Weaknesses of the Current System

The current system which is being used to manage clients of the Zimbabwe National Family Planning Council has the following limitations:

- Common human errors – these include omissions in capturing client data, omissions in client follow-ups
- Very slow processing speeds – with the manual way in existence, capturing and retrieving of client information consumes much time
- Costly and difficult to update records – when new information needs to be added to existing records, retrieving and manipulating hand written files is quite cumbersome. This can be costly as well as handwritten records cannot be erased or overwritten but rather a totally new file needs to be written and replaces the old obsolete one.
- Very difficult to consolidate and analyse data recorded on paper files. This makes it difficult to monitor
- Data inconsistences – where clients supply different information on different visits and this cannot be easily picked with the current system.
- Missing of check-up dates by clients as a result of the weak communication system
- Information security lagging – with paper based records it is somehow very difficult to maintain security and privacy

### 3.7 Evaluation of Alternatives

The evaluation of alternatives is a process in which an analysis of a set of options is done in order to select or choose which option to pursue. The evaluation is done based on the gathered information. A feasibility study had earlier on been conducted which indicated that a new system is possible for the organisation. This section now evaluates, amongst available alternatives, the best option to pursue towards implementation of the new system. There were three alternatives which were tabled for consideration. These are improvement of the current system, in-house development of a new system or total outsourcing of a system from outside the organisation.

Adequate information was gathered for each of the alternatives afore mentioned. This was meant to enhance a fair comparative basis of the alternatives. Each alternative's feasibility is also checked with regards to indicators like technical, economical, operational and others applicable. These alternatives are explained below:

### 3.7.1 Outsourcing

Outsourcing is the process of acquiring an already packaged system or engaging outside developers to custom develop a package for a client (Wijers and Verhoef, 2012). The third part outside developers could be individuals or a company. This option can be taken by an organisation in need of a software by engaging the developer from outside to come up with a system that would satisfy its needs. Or it can simply buy from off the shelf an already packaged system that addresses its needs. In modern day technological era, there are so many potential software developers all over. However, outsourcing has its own merits and demerits explained below:

#### 3.7.1.1 Advantages of outsourcing

- Expert developers are readily available in the market

#### 3.7.1.2 Disadvantages of outsourcing

- Security concerns – since the system acquired from is well understood by the developers, there is temptation that they may take advantage to sift through the client organisation's records and get information illegally for their own use.
- Expensive – this could be very expensive for the organisation as it needs a huge ones off or initial payment to procure. Subsequent costs may continue accruing as maintenance and licensing maybe paid for to the developers.
- External developers may fail to develop a system with the much needed touch as they may lack the in-depth understanding of the organisation
- An already packed off the shelf software may fail to meet the real demands of the organisation.

### 3.7.2 Improvement of the Current System

Improvement of the current system is a matter of making positive changes or adjustments to the current system with the objective to enhance its impact or usefulness. The improvements are made to counter any limitations or deficiencies of the current system that could have been noted. This alternative have the following advantages and disadvantages:

#### 3.7.2.1 Advantages of Improvement

- Fairly cheap to make few adjustments on an existing system
- Users may not face any challenges to cope with the amended system as it remains basically the same with a few additions

#### 3.7.2.2 Disadvantages of Improvement

- Making changes directly on an existing system may not provide adequate functionality to address the operational demands
- Enhancement of a manual system with a few manual changes again may not bring the much needed satisfaction
- The current system has so many limitations such that trying to panel beat it to deliver the much anticipated functions would not be feasible

### 3.7.3 In-house Development

In-house development explains a process whereby an organisations utilizes its own resources to support the development of a new system. The resources which an organisation would use in the internal development of a system may include finances, time and human resources. Zimbabwe National Family Planning Council has the capacity to internally develop the Client Management System.

#### 3.7.3.1 Advantages of In-house Development

- Significant labour cost saving. Making use of expert employees who are already on the organisation’s salary structure is far much cheaper than hiring external experts for a given project

- Meeting of set objectives by internal developers is very certain as they have an undiluted hands on touch with the users' expectations
- Easy and cheaper to maintain. Since the developers stays with the organisation it means any need arises in the system is imminently attended to and addressed without any extra cost apart from normal salary structure.
- Operational efficiency will be highly enhanced

#### 3.7.3.2 Disadvantages of In-house development

- The organisation has a dilemma to keep the expert team intact as it may incur expenses in trying to hire new experts in case of attrition

### 3.7.4 Comparison of alternatives

Having taken a closer look at each of the available alternative actions, a comparative analysis was drawn up. A close interrogation of the tabled alternatives was done, and it was considered worthwhile to pursue the in-house development alternative. In terms of projected costs, the improvement alternative seemed to be cheaper but it was defeated since it will only bring a few additions to the same old system.

## 3.8 Requirements Analysis

According to Davis and Davis (2010), requirements analysis refers to the process of finding or determining the necessary inputs and conditions necessary to meet the demands of the project. These requirements named out should be practically actionable, measurable and testable amongst other attributes. The requirements of a project can either be functional requirements or non-functional requirements.

### 3.8.1 Functional Requirements

Functional requirements shows what have to be done by way of stipulating individual tasks, actions or activities that must be accomplished (Sofia, 2010). This determines how the actual or exact inputs to the system, the processes and the data storage facilities should work. Functional

requirements has to explain how data should be manipulated within the system. To ascertain that functional requirements are met, there should be some check points to measure whether the system is operating in the way expected. The following are laid out actionable and measurable functional requirements of the Zimbabwe National Family Planning's Client Management System:

- The system should be able to report errors on omissions by reporting an attempt to save a record with incomplete entries
- The online security should be emphasized since this is a web based platform
- A unified database structure which houses all information in one database but at the same time implementing well-crafted relations of different tables.

#### 3.8.1.1 Use Case

A use case is a technique which is used to analyse a system with the aim to identify, clarify and organize all the system's requirements. Now, a use case diagram is a pictorial or graphic portrayal of the interactions that exists amongst the individual elements of a system. In a use case diagram, users are referred to as actors whilst the system's processes are called use cases. The following figure is a use case diagram for the current system:

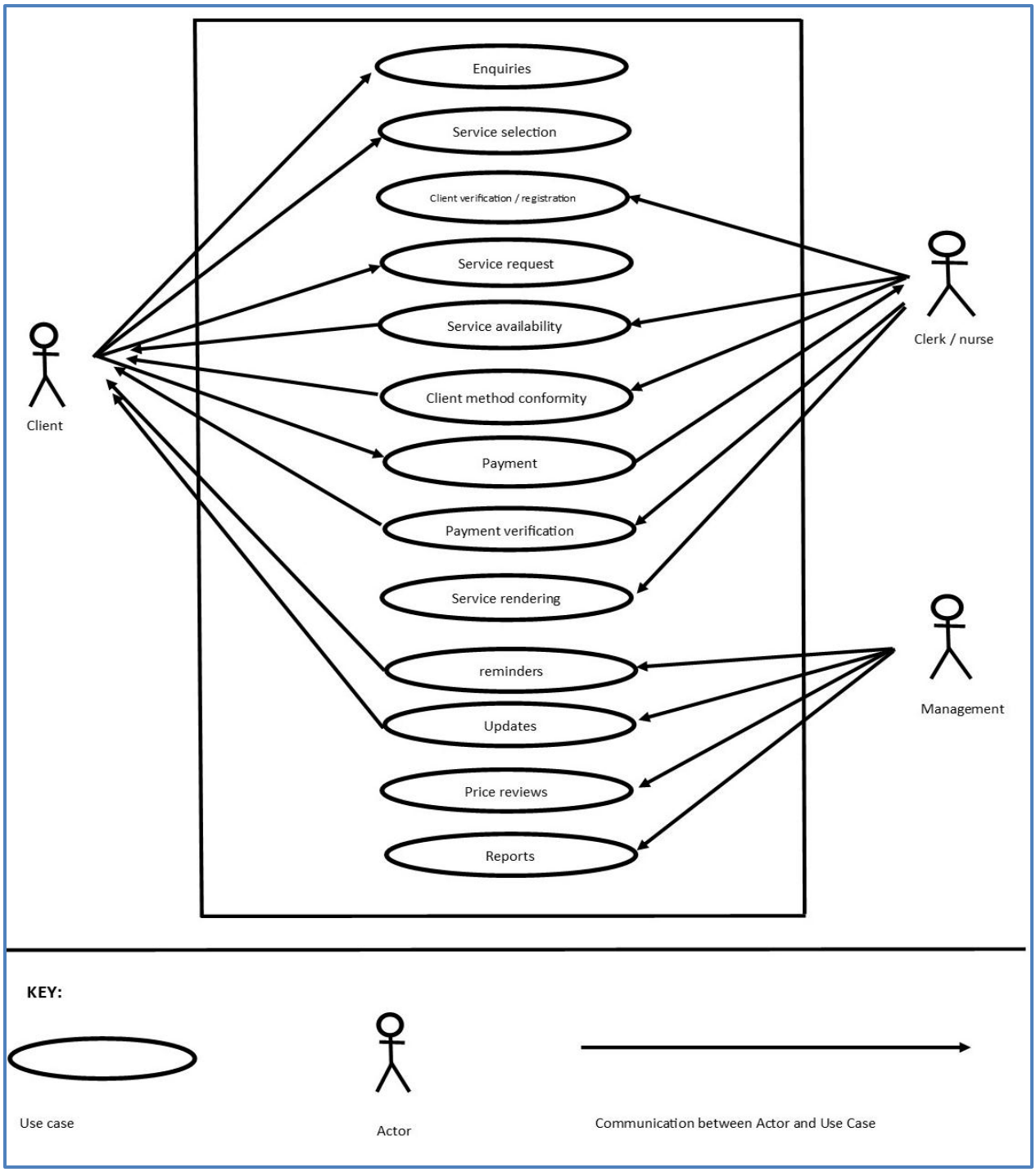


**Figure 3.4 Use Case Diagram of the current system**

### 3.8.2 Non-functional Requirements

Chung etal (2009) states that non-functional requirements are those aspects that presents a systematic and pragmatic approach to the development of software. In this way the software products should possess qualities such as accuracy, up to standard performance, sound security amongst other things. Non-functional requirements actually bring satisfaction of the system to the users. The Client Management System's identified non-functional requirements include the following:

- User authentication – the system should be well crafted to effectively screen users. Only genuine authentic users should be allow access into the system by way of some measures such as pin codes, or passwords
- Database views – the system should allow different views of the database in some formats that portrays different facets of the information contained therein
- Data encryption to increase security of information in the database was a critical aspect pointed out by most respondents

## 3.9 Conclusion

This chapter saw an in-depth analysis of the current system to gather more detail that will help in the subsequent phases of the project. To get a clearer understanding of the current system and probably the anticipations of a new system from stakeholders, different fact finding techniques were used. By way of gathering information using different ways it meant that the researcher got useful information from different sources and views. How information used to be passed on and manipulated in the current system was very much interrogated to come up with a clearer understanding of the whole process. With this understanding, the project is set to move to the next phase where the new system will be designed. This will articulate on the architectural design, physical design, database design and the interfaces design of the new system.

# CHAPTER FOUR: DESIGN PHASE

## 4.1 Introduction

The preceding chapter focused much on the analysis of the current system being used to manage clients at the Zimbabwe National Family Planning council. It showed all the activities and the flow of data in the current system setup. Subsequently, the design phase now focuses on the proposed system. It is at this stage where it is shown how the new system will actually work. The design will aim to address all the system's objectives as stipulated in the requirements specification.

## 4.2 System Design

System design explains a scenario of engineering a good software product by way of following software design concepts. Waldo (2006) states that system design is a coherent plan for the system that is arrived at by the team of developers working on the project. It stipulates the data, all the associated data types, and the data flow patterns from input, processes, storage and outputs. The system design element in software development emphasises on the requirements and the anticipated functionalities of the software package to be developed. The design should address all the set goals of the system.

### 4.2.1 Context Diagram

A context diagram, also known as a level zero data flow diagram, is an aggregate representation of the whole system's entities and the activities thereof. It is an abstract representation which shows data, and how that data is passed on amongst the different entities of the system. A context diagram (level zero DFD) was designed for the proposed Client Management System for ZNFPC. This enhanced the designing of the system since the context diagram clearly provided the boundaries of the system. The following is the context diagram for the proposed ZNFPC Client Management System.

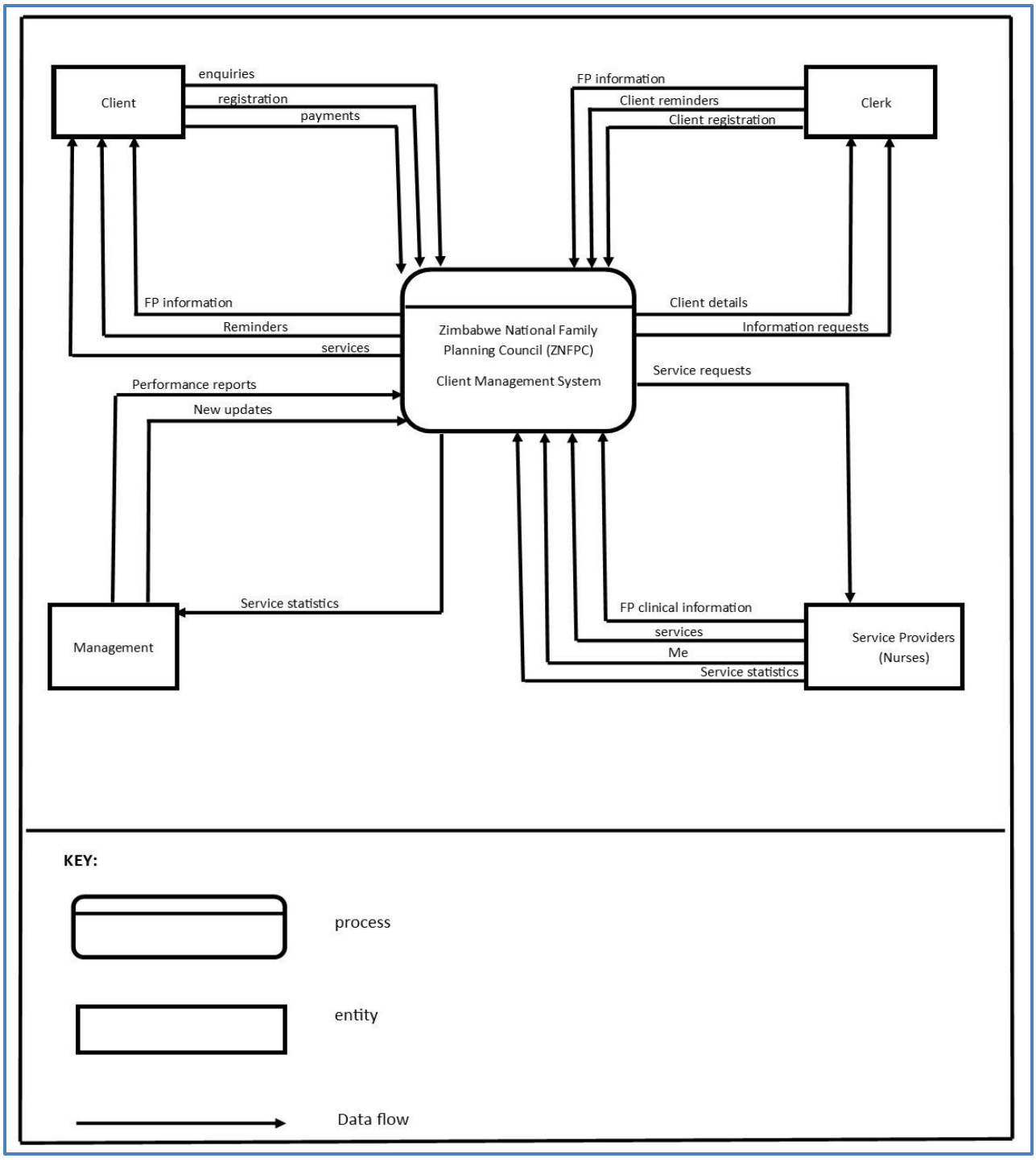


**Figure 4.1 Context diagram**

### 4.2.2 Data Flow Diagram

Bertino (2011) states that a data flow diagram (DFD) is a graphical presentation which shows all the components of a system. These components include entities, data flows, processes and the data stores. This is also referred to as a level one DFD and it breaks up some summarized elements from the lower level zero DFD. It gives a clearer picture of how the system would actually operate. The level one DFD components provides a basis for the building of the system's architectural design as well as its physical design. The following figure is the DFD for the Client Management System of ZNFPC.

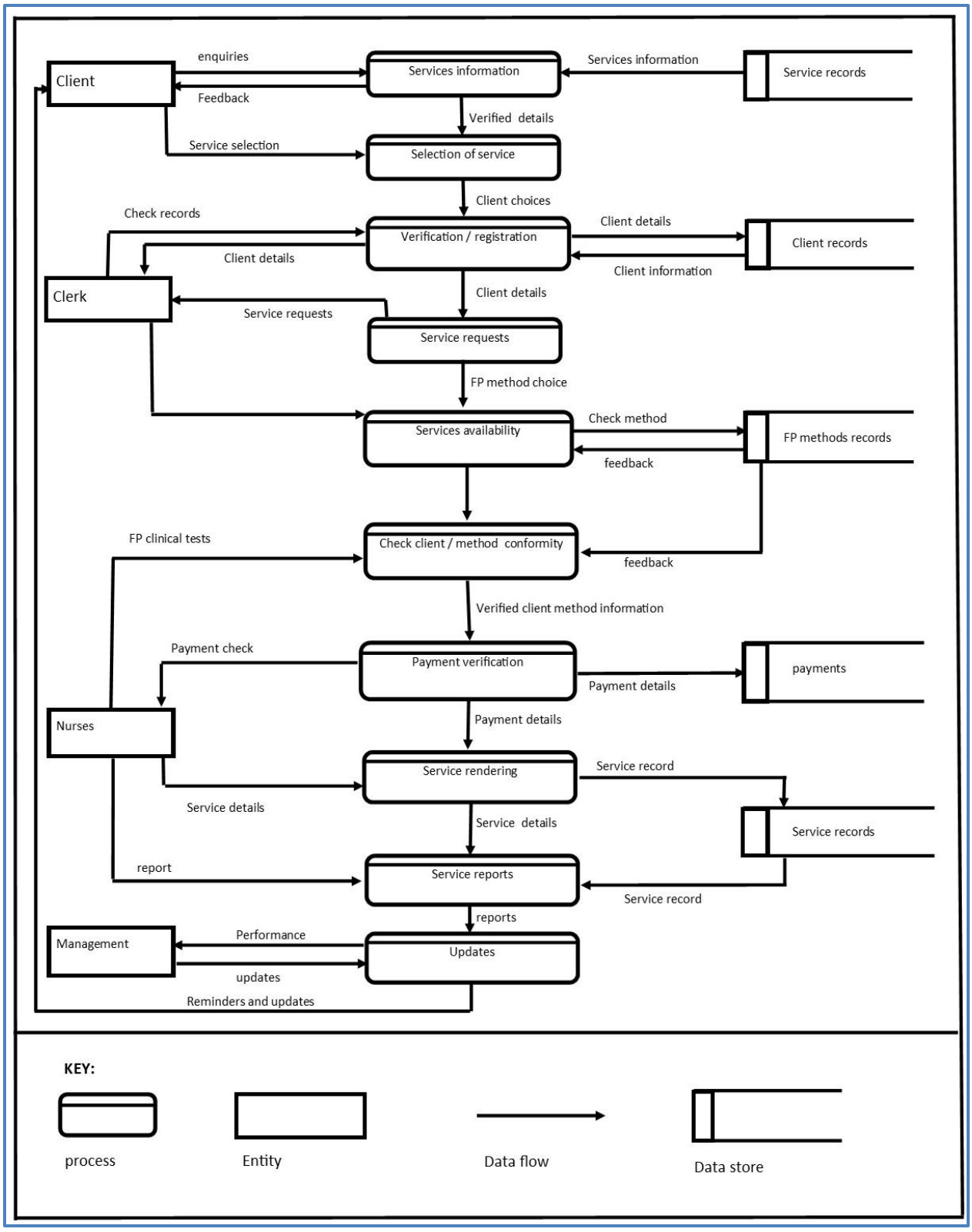


**Figure 4.2 Data Flow Diagram**

### 4.3 Architectural Design

According to Anderson (2010), architectural design is a process which involves system structuring, control modeling and modular decomposition. This process ought to be done in the early stages of the system development life cycle. Architectural design gives technical details which defines the system to be developed. These details explains components of the system such as the hardware, software, networking equipment and the database applications. The components that makes up the Zimbabwe National Family Planning Council Client Management System encompasses the following:

- **Database server** – a secure digital data storage facility meant for the keeping of the entire system's data.
- **Client computers** – these are electronic devices which are used by the system's end users to interact with the system's database.
- **Ethernet Networking cables** – medium for data transference in a network

The following diagram shows the architectural design of the ZNFPC Client Management System.

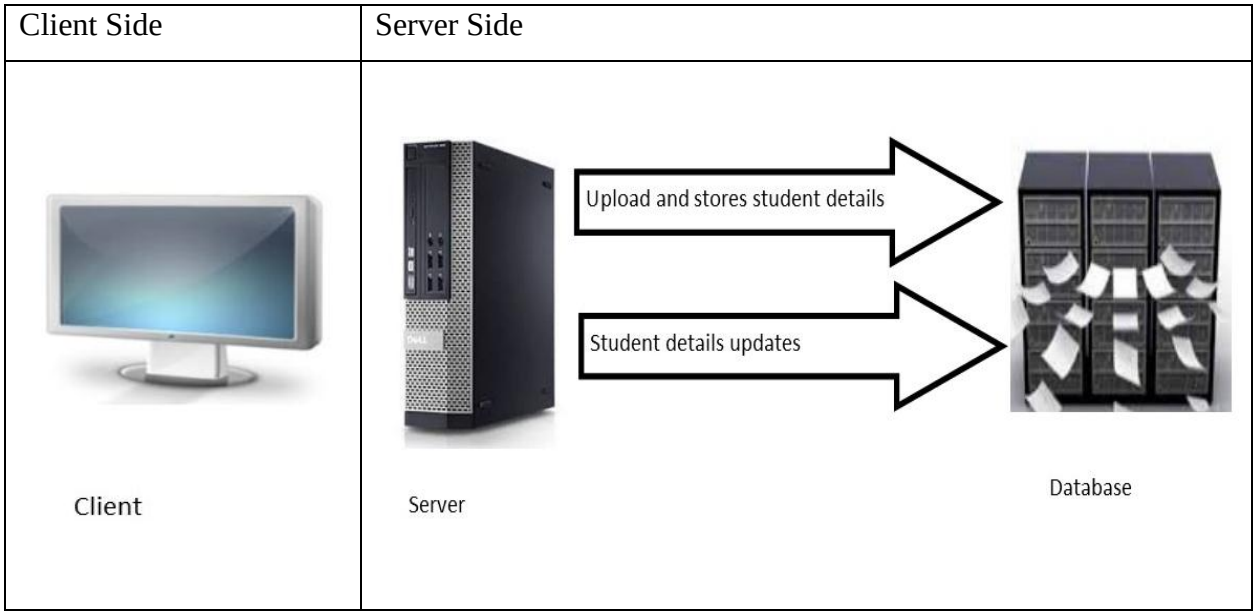


**Figure 4.3 Architectural design**

This architecture was designed with an adaptability aspect to allow for future changes.

### 4.4 Physical Design

Schach (2009) states that the physical design of a system gives a clear explanation of how the concerned hardware components and software components interact to give a working system. It describes the physical nature of the hardware components which should be compatible with the software components of the system. The following diagram shows a physical design of the ZNFPC Client Management System.

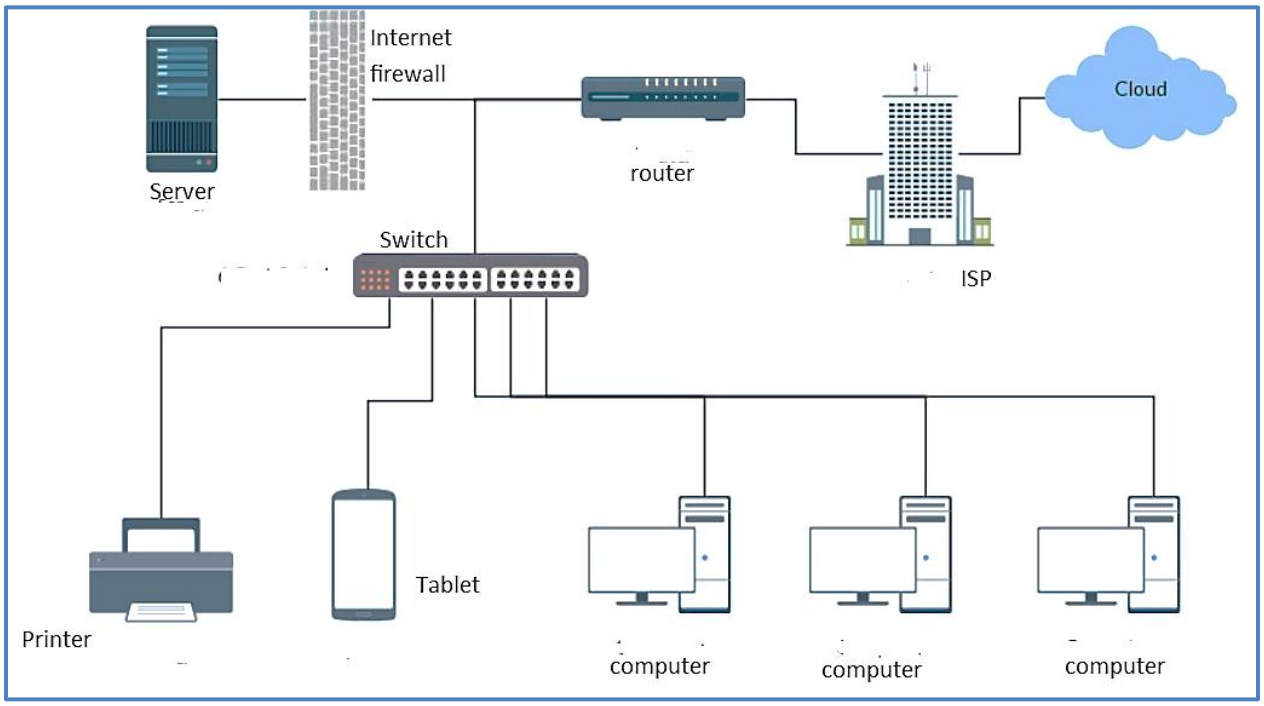


**Figure 4.4 Physical design**

### 4.5 Database Design

Database design is the art of structuring and / or constructing a database (Powell, 2013). Database design involves determining all the elements of the databases and also giving a description of how these work. User expectations should be met at this stage. For the ZNFPC Client Management System, a computerized database was designed. The following section describes the elements of the database's physical design.

### 4.5.1 Physical Database Design

Wesley (2005) explains that the physical database design shows how the database will be implemented with regards to physical storage of the data and how external users interact with it. With the physical database design, users can view the database as a single system owing to the concurrency control mechanisms to be put in place. The physical database design aspect takes into cognizance the common database elements such as the external, conceptual and internal layers.

- **External**

  This determines how the users views the database. The view of database contents is guided at this stage by the differences in the defined user privileges. With the ZNFPC Client Management System, users have the ability to change the way in which they view the database contents according to their preferences but not altering the contents themselves.

- **Conceptual**

  The conceptual level in the physical database design shows the detailed database's logical structure. The conceptual level is concerned with what data is to be stored in the database tables and their physical storage in the database itself. A data definition language (DDL) was used to determine these at the database creation level.

- **Internal**

  It's the bottom layer underneath all levels of the database. The structure of how exactly the data will be stored in the database is shown on this layer.

The diagram below shows the ZNFPC Client Management System's database architecture.

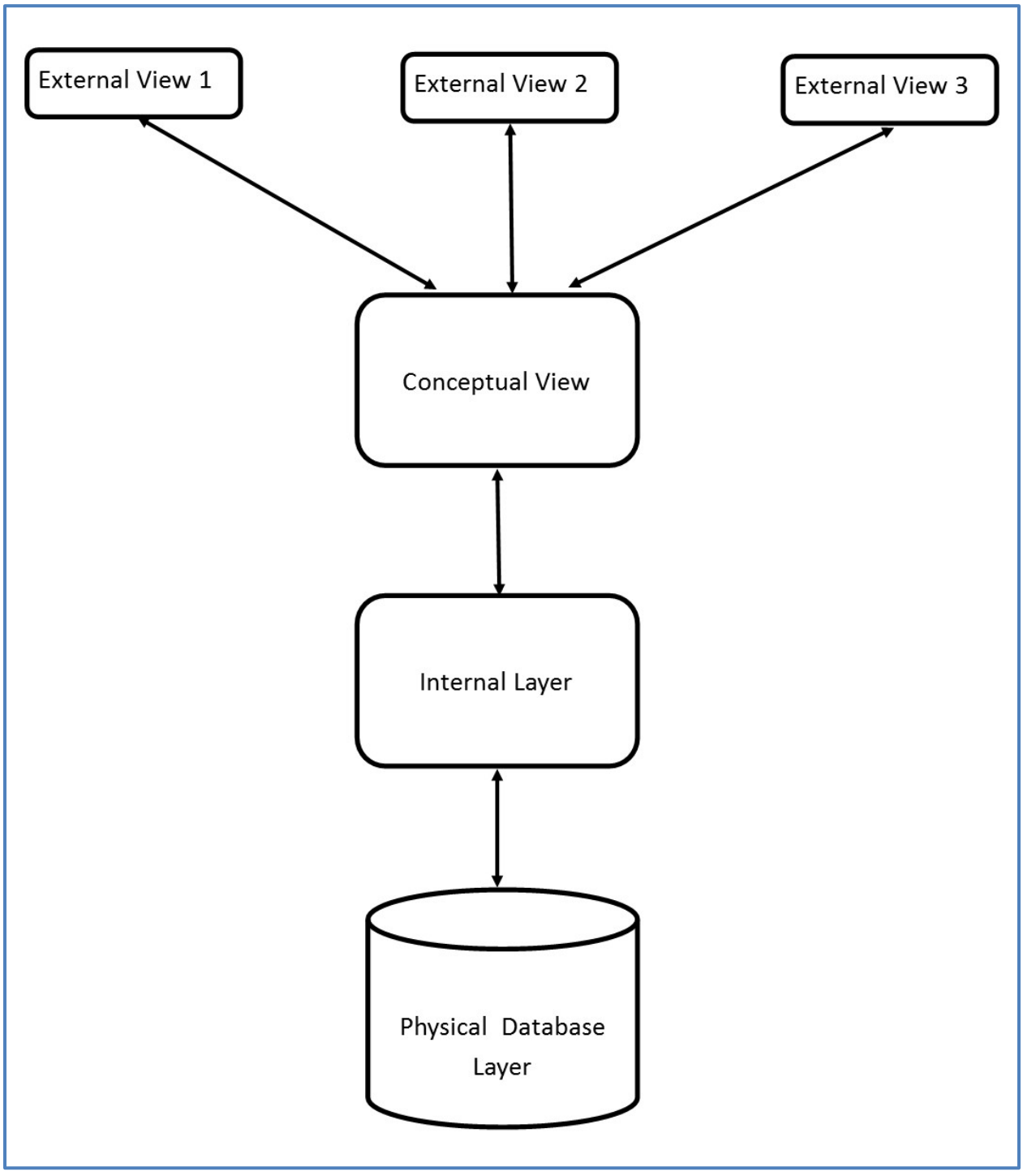


**Figure 4.5 ANSI-SPARC Database Architecture**

### 4.5.2 Database Tables

**Table 4.1 Clients Table**

| Field | Data type | Structure description |
|---|---|---|
| Surname | varchar(20) | Client's surname |
| FirstName | varchar(20) | Client's first name |
| MiddleName | varchar(20) | Client's middle name (optional) |
| NationalID | varchar(15) | Primary Key (PK), Client's national identity number |
| DOB | varchar(10) | Client's date of birth |
| Sex | varchar(6) | Client's gender |
| HIVStatus | varchar (20) | Client's HIV status |
| PhysicalAddress | varchar(200) | Client's residential physical address |
| MobileNumber | varchar(14) | Client's contact mobile number |
| E-mail | varchar(64) | Client's email address |

**Table 4.2 Staff Members / Users Table**

| Field | Data type | Structure description |
|---|---|---|
| E-mail | varchar(64) | User's email address |
| Surname | varchar(20) | User's surname |
| FirstName | varchar(20) | User's first name |
| Department | varchar(50) | User's department |
| AccessLevel | varchar(20) | User's database access level |
| Password | varchar(32) | User's login password |

**Table 4.3 FP Methods Table**

| Field | Data type | Structure description |
|---|---|---|
| MethodID | int(3) | FP Method unique code |
| MethodName | varchar(20) | Name of the FP method |
| Duration | varchar(20) | Life span of the FP method |
| Type | varchar(20) | FP method's category |
| MethodPrice | float | The FP method chargeable fee |
| CreateBy | varchar(64) | Name of the user who creates a new FP method |
| Date | date | The date when a method is created |

**Table 4.4 FP Services Table**

| Field | Data type | Structure description |
|---|---|---|
| ServiceID | int(11) | Primary Key (PK), Service's unique identity |
| NationalID | varchar | Foreign Key (FK), Client's national identity number |
| Weight | float | Client's mass |
| Sugar | varchar(20) | Level of sugar in client's blood |
| BP | varchar | Client's blood pressure level |
| MethodName | varchar | Family Planning method |
| Parity | int(11) | Client's number of children |
| Currentmedication | varchar(100) | Client's current FP method |
| Nextdate | varchar(10) | Next check up date |
| Datetime | varchar(20) | Date and time of service |

**Table 4.5 Payments**

| Field | Data type | Structure description |
|---|---|---|
| ServiceID | int(11) | Unique service number |
| NationalID | varchar(20) | Client's ID number |
| Amount | double | FP service fee |
| PaymentMethod | varchar(20) | Method of service payment |
| DateTime | varchar(20) | Date and time of payment |

**Table 4.5 Backups**

| Field | Data type | Structure description |
|---|---|---|
| BackupID | int(11) | Uique identification of backups |
| DateTime | varchar(20) | Date and time of database backup |
| DoneBy | varchar(20) | User who makes the backup |
| Filename | varchar(20) | Name of the saved file |

### 4.5.3 Enhanced-Entity Relationship Diagram

Conger (2014) states that an Enhanced Entity Relationship Diagram is a pictorial representation of an extended entity relationship (ER) diagram which shows relationships of entities of an information system. It is a powerful tool which is used to model an information system. It clearly shows the system entities, their attributes, relationships between entities and also specifying the cardinalities that exists on relationships. An enhanced entity relationship diagram for the ZNFPC Client Management System was crafted as shown below:

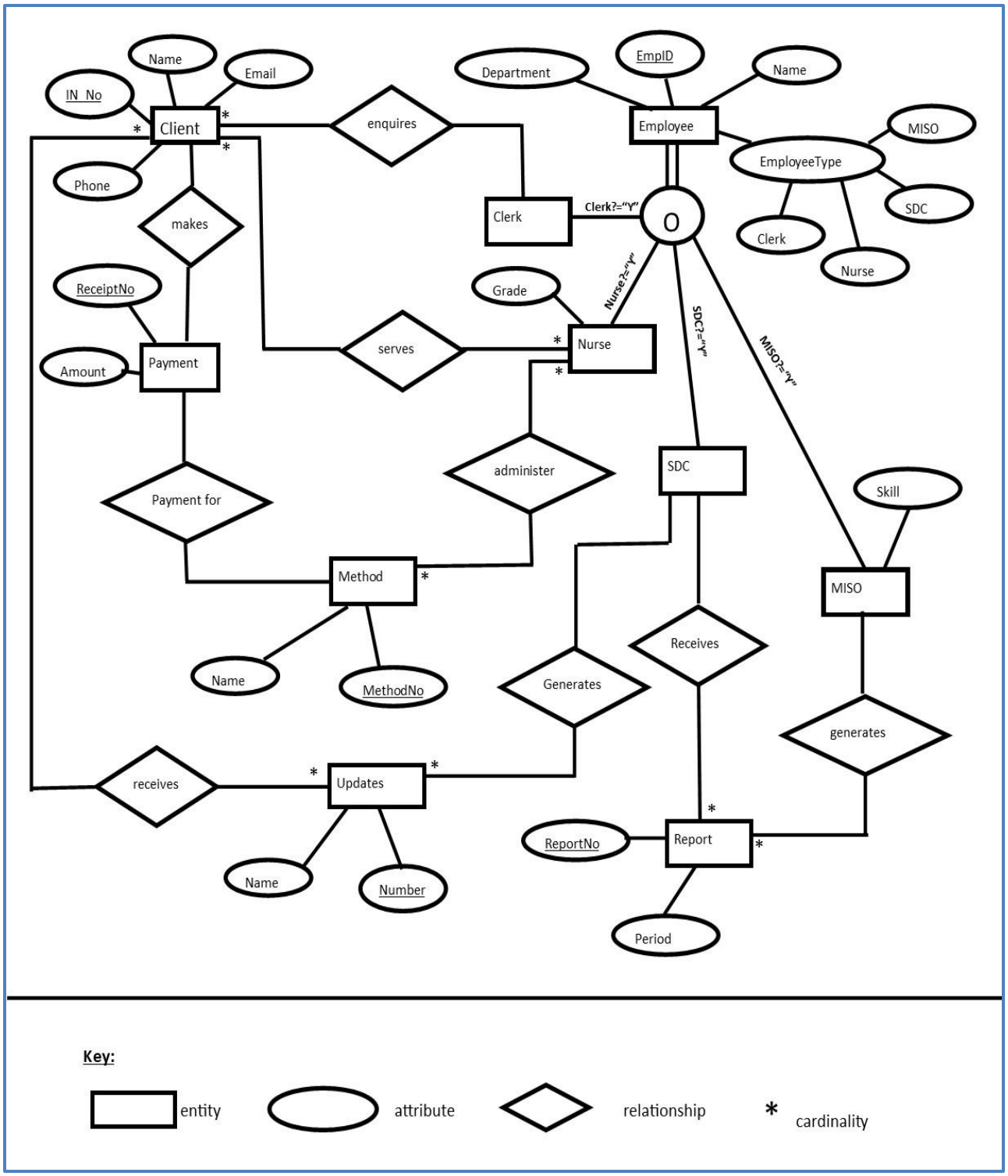


**Figure 4.6 Enhanced Entity Relationship Diagram**

### 4.6 Program Design

According to Ulrich (2000) program design is the art of structuring components of a system in such a way that the predefined goals and objectives will be realised. It is an activity of moving from a specification of some required program to a detailed description of the program itself. The program requirements specifications are the ones taken in as input to the design of a program. The system is broken down into modules so that each individual module is clearly defined during the process. The following sections are used to show the ZNFPC Client Management System program design:

#### 4.6.1 Class Diagram

A class diagram is a diagrammatic presentation which shows how entities of a system interrelate with each other (Conger, 2014). The class diagram shows the entities, their attributes, the cardinalities, completeness constraints, participation and specialization. The following is a class diagram for the ZNFPC Client Management System.

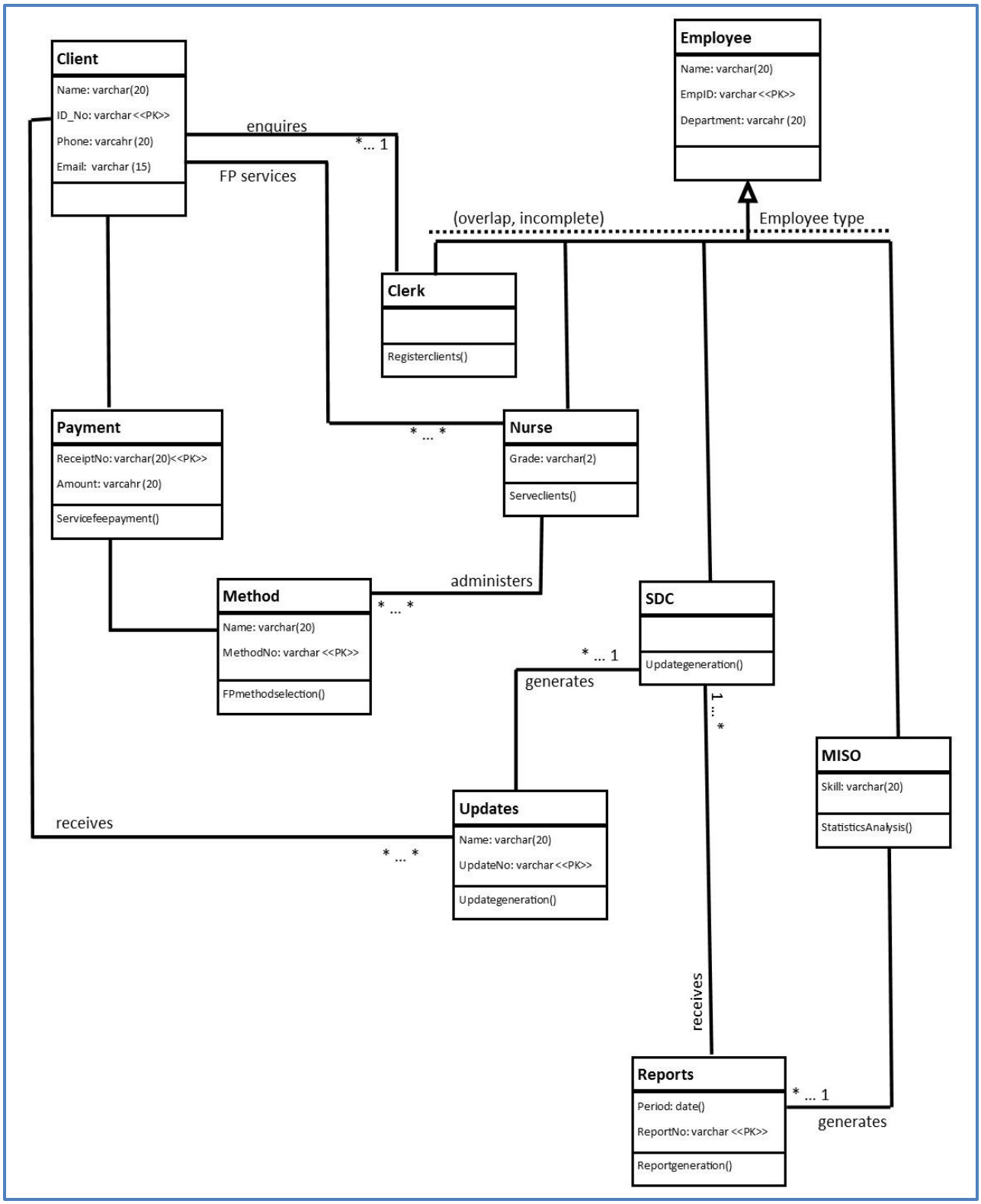


**Figure 4.7 Class Diagram**

### 4.6.2 Package Diagram

Conger (2014) explains a package diagram as a pictorial representation of different modules of a system that makes up a program structure and it also shows the interactions amongst them. The ZNFPC Client Management System is made up of classes which are grouped into packages to enhance simplicity. The following is a package diagram for the Client Management System of ZNFPC.

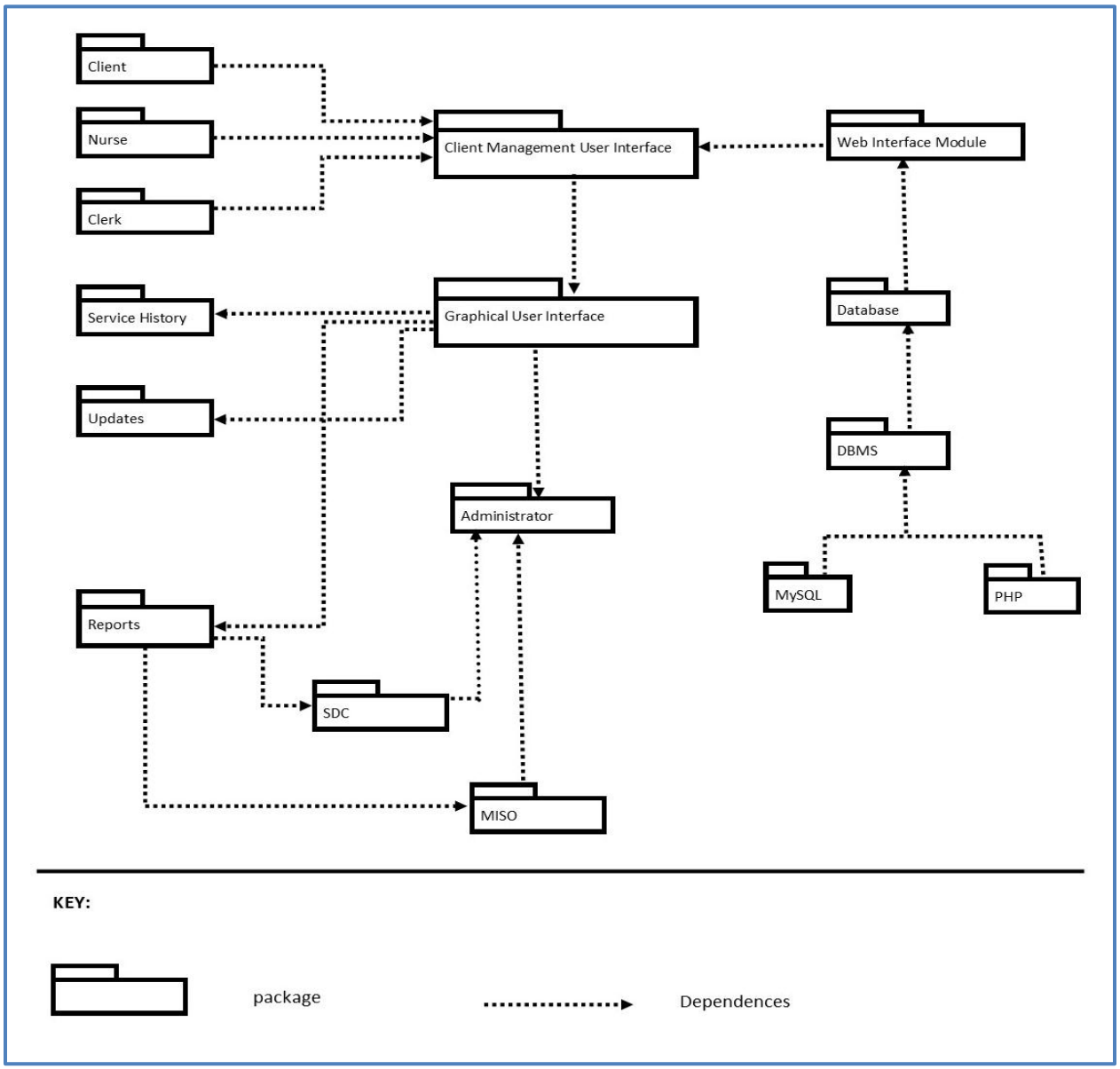


**Figure 4.8 Package Diagram**

### 4.6.3 Sequence Diagram

A sequence diagram is an analysis tool that shows the logical ordering of data as it goes through different processing stages in an information system (Conger, 2014). The following shows the sequence diagram of the ZNFPC Client Management system.

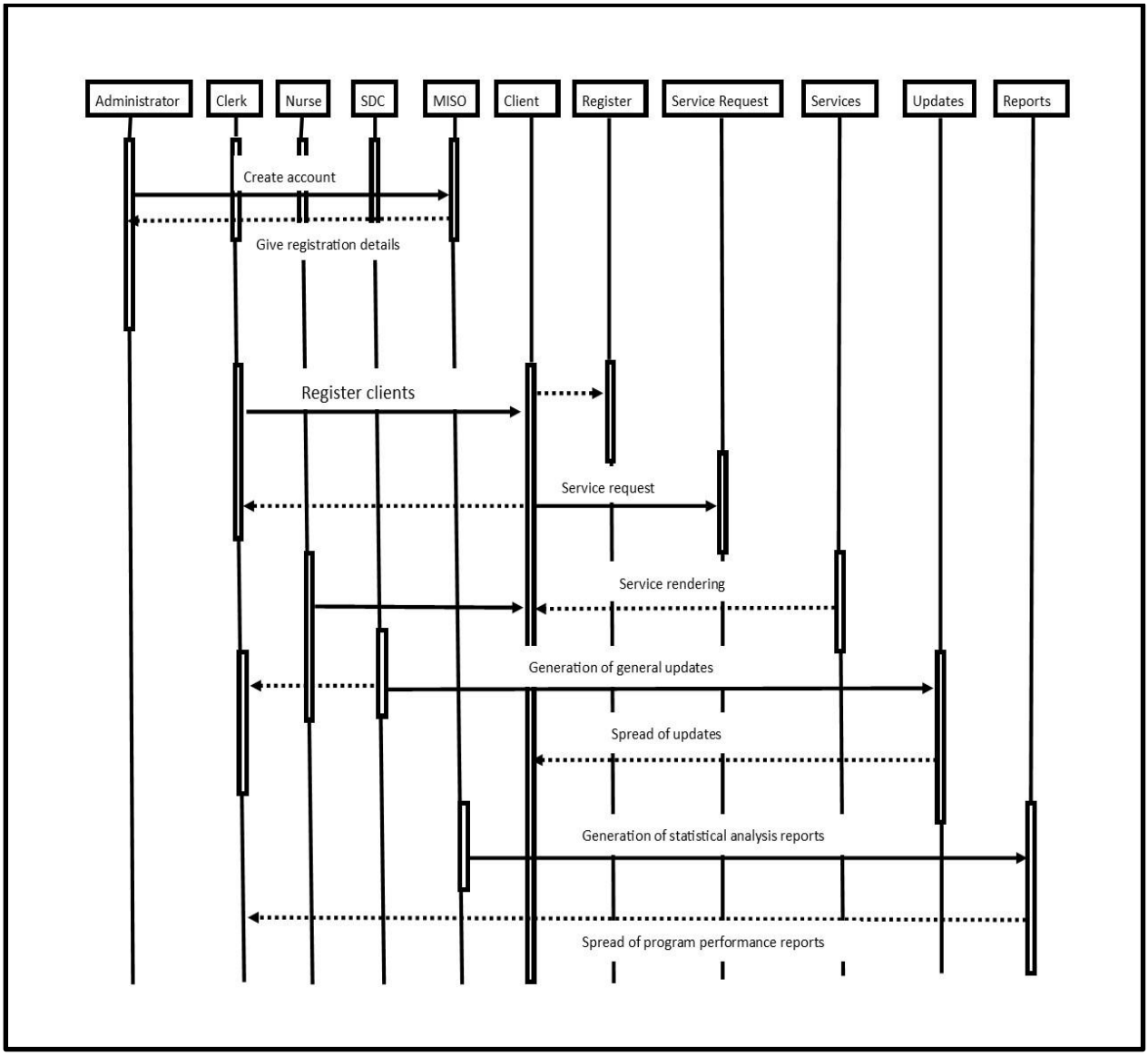


**Figure 4.9 Sequence Diagram**

### 4.7 Interface Design

Sommerville (2004) states that an interface is a platform on which a computer system user interacts with the system. The interaction between the user and the system may not require much technical expertise from the user. The ZNFPC Client Management System will be using a Graphical User Interface (GUI). The GUI is a very friendly platform which makes use of icons, which are picture like in nature, and these aid to very quick and easy interpretation and understandability of their meanings by the user. The main reason for designing the system's interfaces is to craft attractive and user friendly platforms which is favorable to the users. The following sections highlights a few samples of input and output designs of the system.

#### 4.7.1 Input Design

The Graphical User Interface will make use of simple text and pictures so that users will find it very easy and much user friendly:

**a) Login Form**

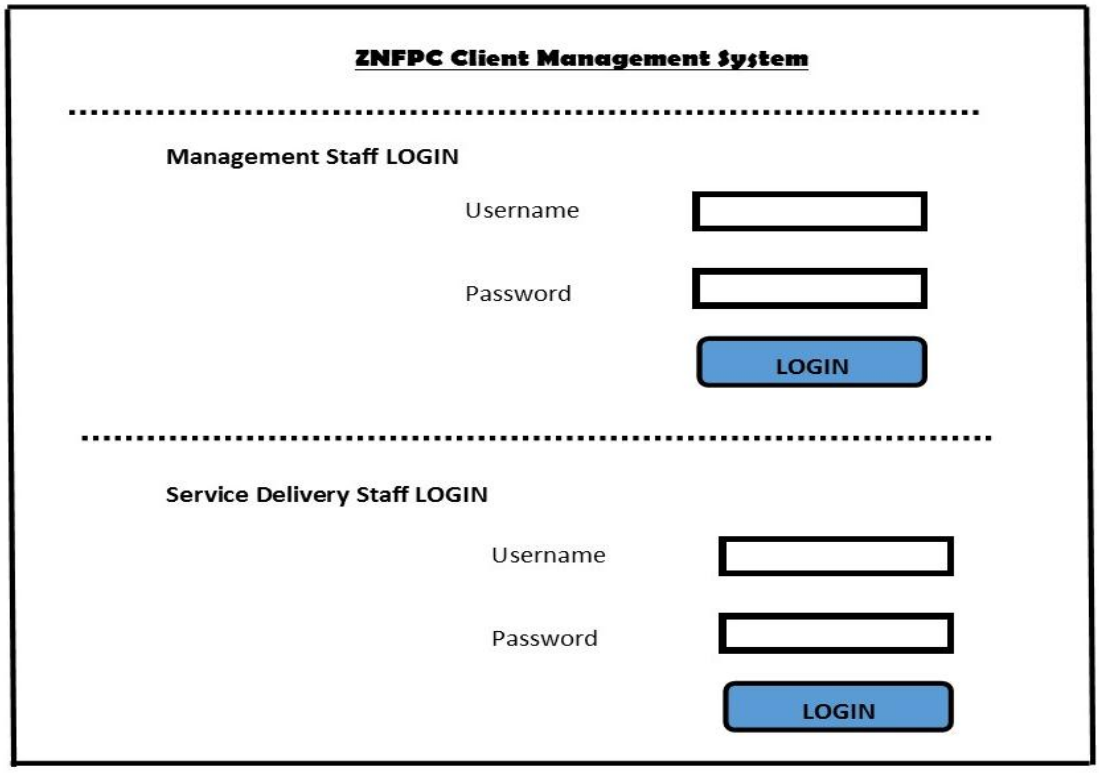


**Figure 4.10 Login Form**

**b) Client Registration Form**

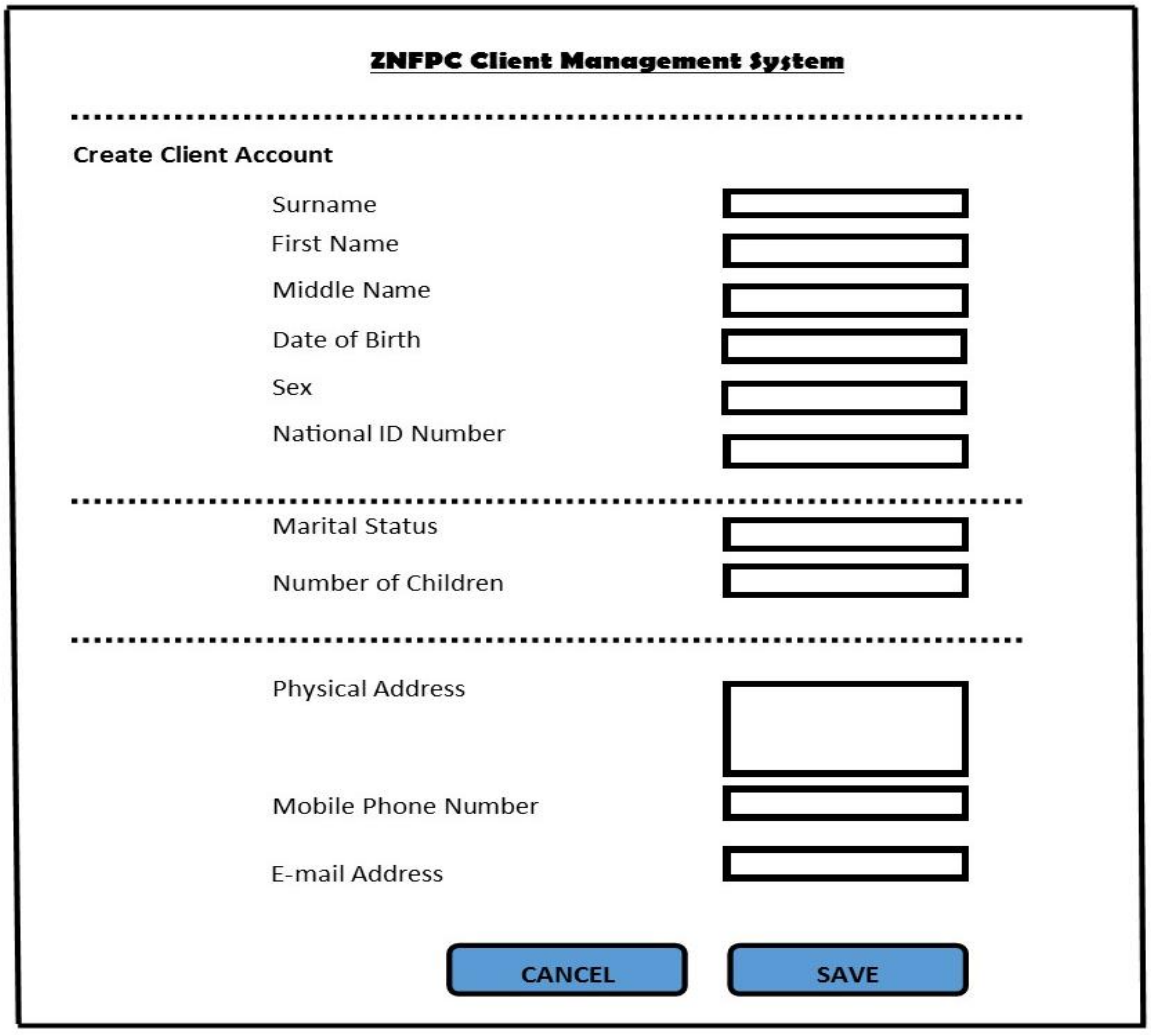


**Figure 4.11 Client Registration Form**

**c) Service Record Form**

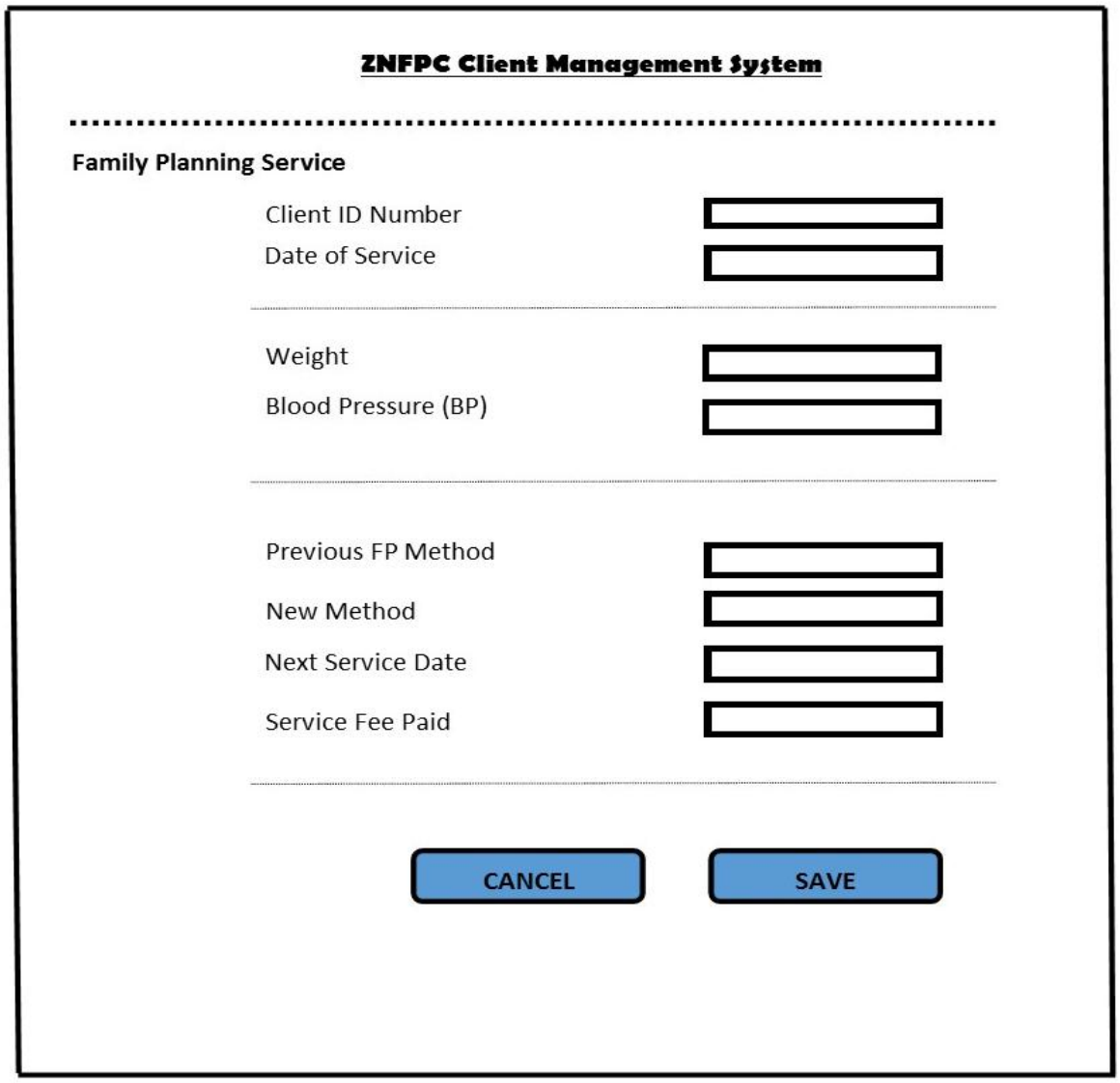


**Figure 4.12 Service Input Form**

### 4.7.2 Output Design

The output design interfaces shows the samples of the ZNFPC Client Management System's output forms.

**a) Registered Clients Records**

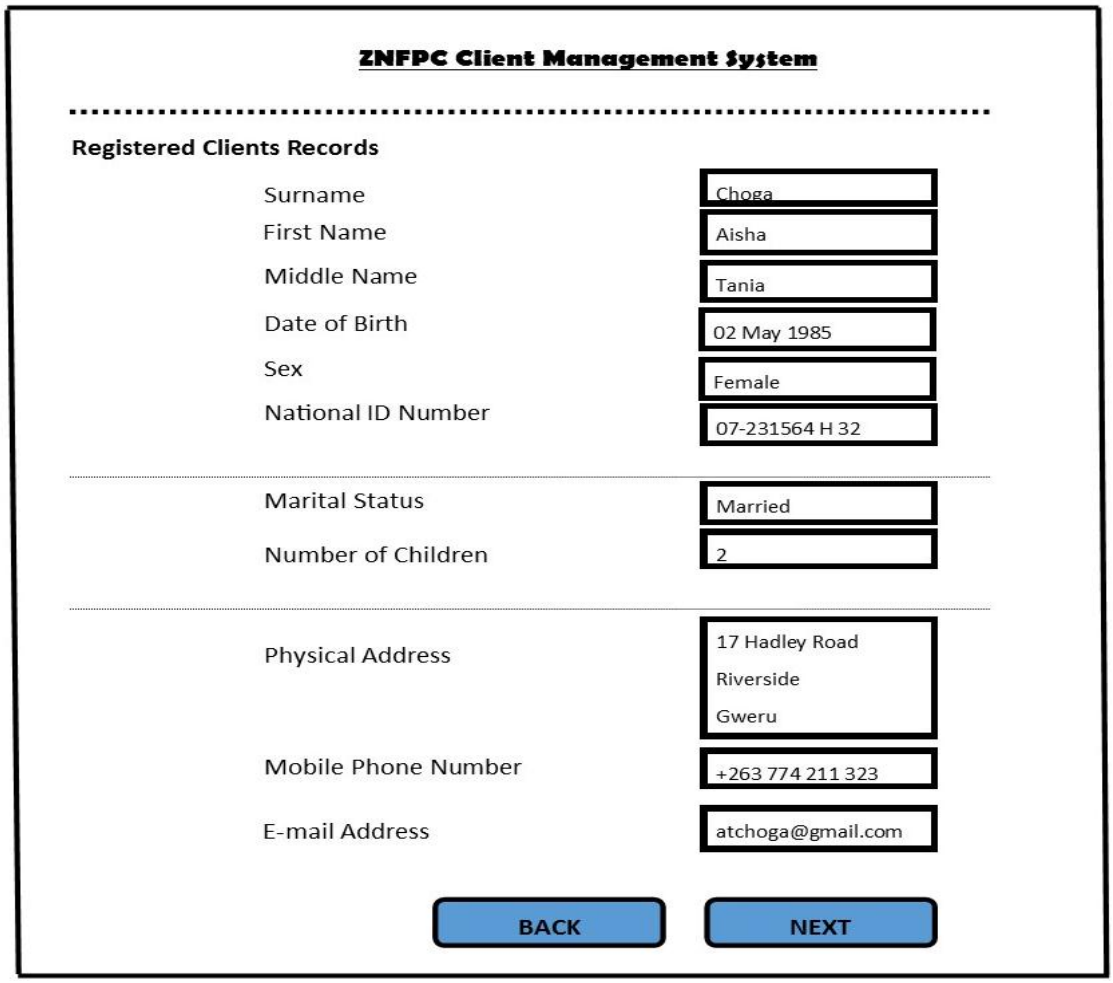


**Figure 4.13 Registered Clients**

**b) Rendered Services Records**

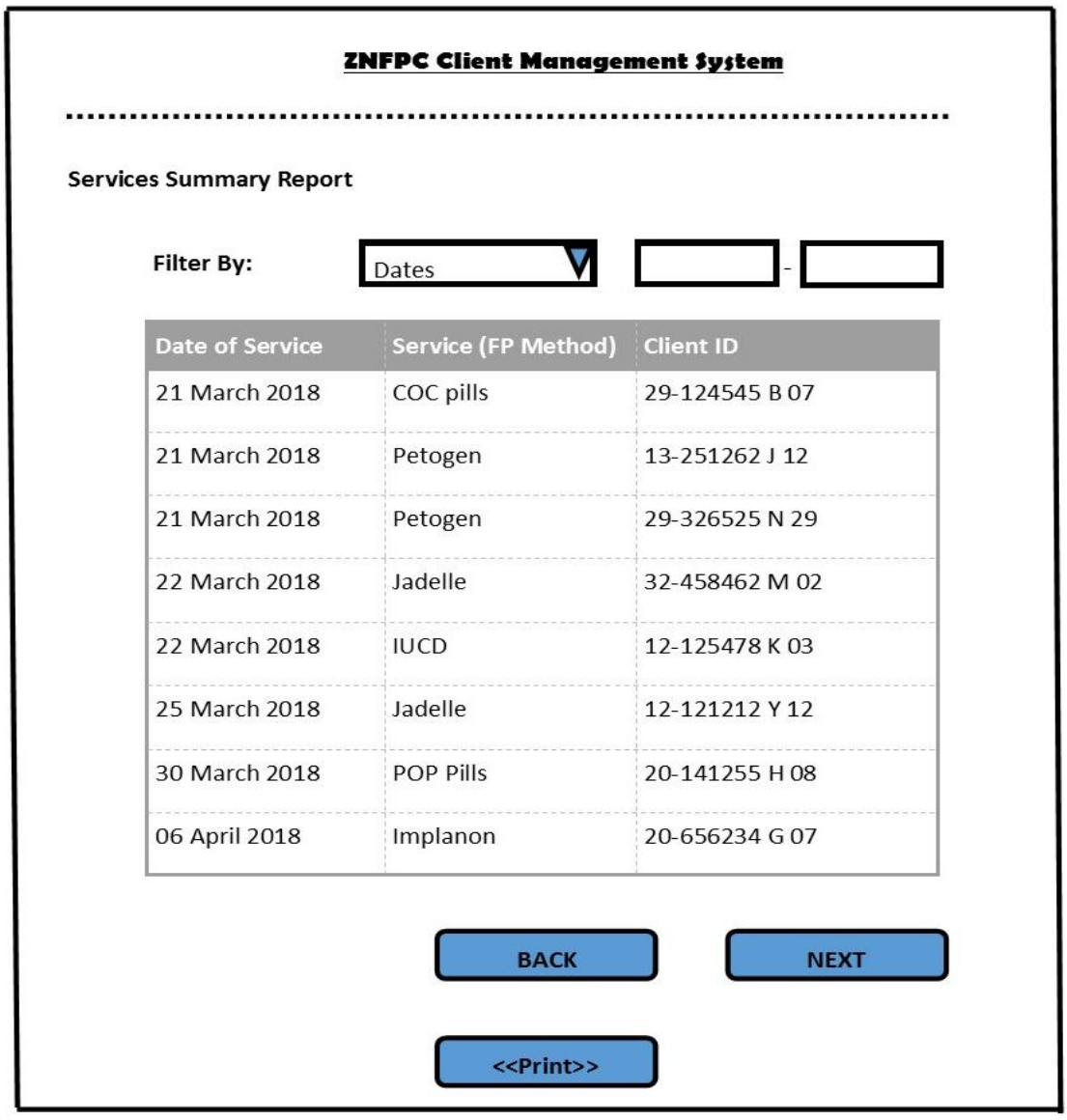


**Figure 4.14 Service Summary Form**

### 4.8 Pseudo Code

Stephen (2002) states that a pseudo code is a simple description of a somehow complex computer programming algorithm or structure in an easy and understandable language such as English. A pseudo code describe computer program does not include real programming language syntax since it is not an executable code but rather a descriptive statement of what the program should do. With a pseudo code, it does not need one to be an expert to understand the flow of the computer program.

**Login pseudo code**

```
Enter login details
        IF details match database THEN
                Proceed to System Home Page
        ELSE
                Display login in error message
END
```

**Client registration pseudo code**

```
Confirm system database connection
        IF database connection is available THEN
                Client provide all required registration details
        ELSE
                Display database connection error message
                        IF Client registration details are correct THEN
                                Check for any matching existing records
                        ELSE
                                Show record saved message
        END
```

**Service rendering process pseudo code**

```
Enter service provider details
IF service provider details are correct THEN
Enter client medical information
Enter Client FP Method choice

    IF client FP Method choice conforms with medical information THEN
        Render FP Method service to client
    ELSE
        Client choose a different FP Method
ELSE
    Display service provider details error message

END
```

### 4.9 Security Design

Security design refers to the act of putting measures in place that will ensure minimization of system risks such as theft, fraud, misuse and other factors by way of enforcing detective and deterrent measures (Timango, 2009). Software security is the process of maintaining confidentiality, integrity and availability of a computer system and its data. Integrity means that only authorised users should be allowed access to the system and perform manipulation of data in the database. Confidentiality is the aspect of preventing unauthorized access to information in the system's database. System accessibility defines availability of the system. The aspects of integrity, confidentiality and accessibility were taken on board when the ZNFPC Client Management System was designed. The following sections explains the security design approaches for the ZNFPC Client Management System.

### 4.9.1 Physical Security

Physical security, according to Timango (2009), is the use of physical controls to enforce protection of a given thing. With regards to computer systems, physical control entails protection of hardware, software, network equipment and data against physical actions and events that have the potential to damage or cause loses to an organisation. The probable physical threats include things such as fire, theft, burglary, vandalism and natural disasters amongst others. As a means to enforce physical security for the ZNFPC Client Management System the following were designed to be in place:

- Security durawall at the premises
- Screen doors and locks, burglar bars
- Heat sensors, smoke detectors
- Security guards

### 4.9.2 Network Security

Network security entails implementing physical and software preventive measures to protect the network infrastructure and data from unauthorized access, misuse and damage amongst other things. Such actions maybe perpetrated by hackers, password crackers and any other illegal intruders. The ZNFPC Client Management System has been designed in such a manner that enforces effective network security. The security is aimed at minimizing or eliminating any form of risks that may befall the system's network. User authentication is one means that was designed for the system to ensure security.

### 4.9.3 Operational Security

Operational security is a form of control that regulates the actions of different users of the system. To put this aspect to effect, the ZNFPC Client Management System has in place different users whose privileges on the system are also different. Not every user is allowed access to every section of the system. Based on each user's rights, access level privileges are controlled.

## 4.10 Conclusion

The ZNFPC Client Management System design phase was completed successfully with a conceptualized view of the system having been crafted. The design phase saw the drawing up of the system's architectural design, the physical design and the database design for the ZNFPC Client Management System. Following the systems development life cycle the subsequent phase is now the implementation stage where everything that has been planned and designed is now practically implemented. The implementation phase will involve coding of the system and its implementation in the organisation.

# CHAPTER FIVE: IMPLEMENTATION PHASE

## 5.1 Introduction

With the design phase of the ZNFPC Client Management System having been successfully completed, following the software development life cycle, the subsequent stage is the implementation phase. Cashman (2010) explains that the implementation stage of a software project entails checking and verifying the system's compatibility and workability within the organisation's environment in relation to the set objectives. Quite a series of activities will be carried out in the implementation stage and these include, amongst others, development of the actual system (program coding), thorough testing of the system, its installation and maintenance. The element of testing is meant to identify and cull any form of bugs in the code that may cause malfunctioning of the system.

## 5.2 Coding

Coding is defined as the process of converting a system design on paper onto a workable software package by making use of any applicable programming language (Medard and Sprintson, 2012). It is a process of software development by way of writing code that is writing of programs that gives instructions interpretable and understandable by a computer which in turn should give reasonable or acceptable outputs. The ZNFPC Client Management System design which was crafted in the preceding phase will now be implemented and converted to actual functioning by way of coding. The system will be developed on modules that contains the source codes understandable by a computer compiler. The instructions (codes) are compiled and executed to give outputs, through designed output interfaces, understandable by the end users. PHP Hypertext Processor (php) programming language, MySQL database and Apache web server tools were used to develop the Client Management System for ZNFPC.

## 5.3 Testing

Testing, in software engineering, is the process of checking to ascertain whether a system is conforming to the user expectations or whether it meets the objectives as given in the requirements specifications (Craig and Jaskiel, 2012). The process of testing is meant to detect errors and other bugs that could be hidden in the program codes. It should be ascertained through the testing process

whether or not the system is giving out the desired output given the right inputs in the right operating environment. Any form of defects that might not have been singled out during the coding process itself in the different modules of the code will definitely be detected by the thorough testing process. This thorough test guarantees a high quality software product. The ZNFPC Client Management System was exposed to a series of different testing criteria in an effort to try and eliminate any bugs within the code. All identified errors were corrected accordingly. Three different types of testing were used namely the black box testing, the white box testing and the grey box testing. These are explained as follows:

### 5.3.1 Black Box Testing

Glenford (2004) states that black box testing is the process of assessing a system's functionality without predefined set of inputs and subsequently without known anticipated outputs or results. The black box testing technique was used for the ZNFPC Client Management System where the programmer was interested in assessing the system's functionality. This method was not concerned with how the modules were internal built or coded but only looked at the outputs to determine functionality. The black box testing did not even temper with the system's code but rather only to see how it responds to certain instructions. The name "black box" explains the fact that the source code of the module or program being tested is hidden from the tester. This means the tester cannot see what is inside but rather sees only how the system responds to given instructions.

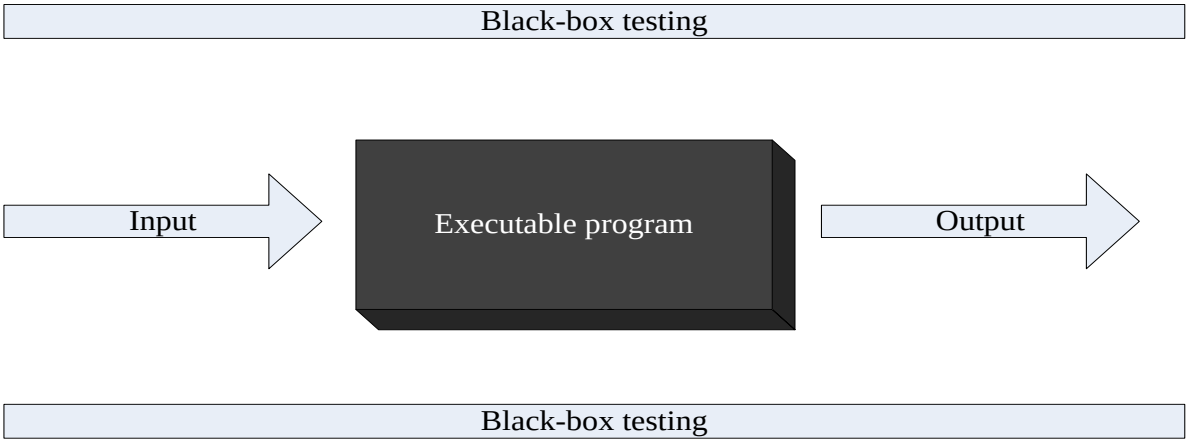


**Figure 5.1 Black box testing [Source: Glenford (2004)]**

### 5.3.2 White Box Testing

White box testing is a method of software testing which test the internal functionalities of a software application by making use of predefined inputs with anticipated outputs (Glenford, 2004). It is also referred to as clear box testing or glass box testing or transparent testing or structural testing. The names suggest that the testing sees through the system, nothing is hidden from the testing process. The white box testing method involves interrogating the system's functionality and correcting and areas which do not meet the expectations as stipulated in the requirements specification. The white box testing methodology was employed on the testing done on the ZNFPC Client Management System. The following diagram resembles the white box testing formulae.

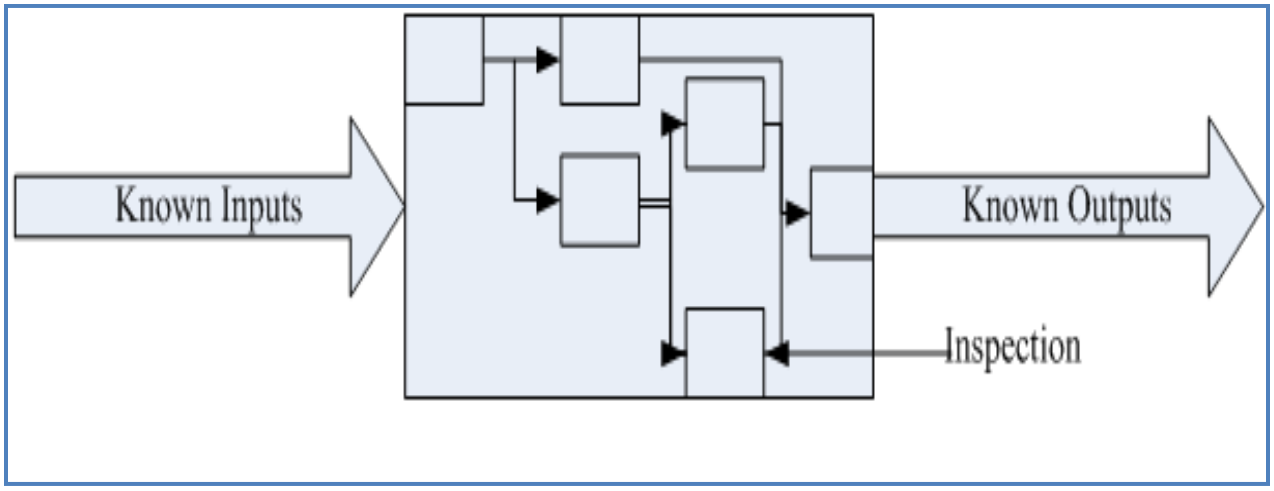


**Fig 5.2 White box testing [Source: Glenford (2004)]**

With white box testing, the internal structure, design and implementation of the items tested were known to the tester. This meant that whatever differences that were noted between the actual and the anticipated meant that there were some areas that needed to be corrected. Programming knowledge was required to perform the white box testing as this involved the need to look at the code itself and check its functionality. Unit testing and integration testing was done.

### 5.3.3 Grey Box Testing

Grey box testing, in software engineering, involves use of effective combination of the black box testing and the white box testing methodologies. Random tests are done to ascertain the program's functionality as well as the internal structure of the system. This is a software debugging strategy in which the tester has somehow limited knowledge about the internal structure of a program.

### 5.3.4 Testing Levels

Testing is of software ought to be done at different level in order to come up with an acceptable and error free software package. The ZNFPC Client Management System was exposed different levels of testing as follows:

- Unit testing
- Module testing
- System testing (sub-system)
- Acceptance testing

The following diagram shows the testing levels done on the ZNFPC Client Management System:

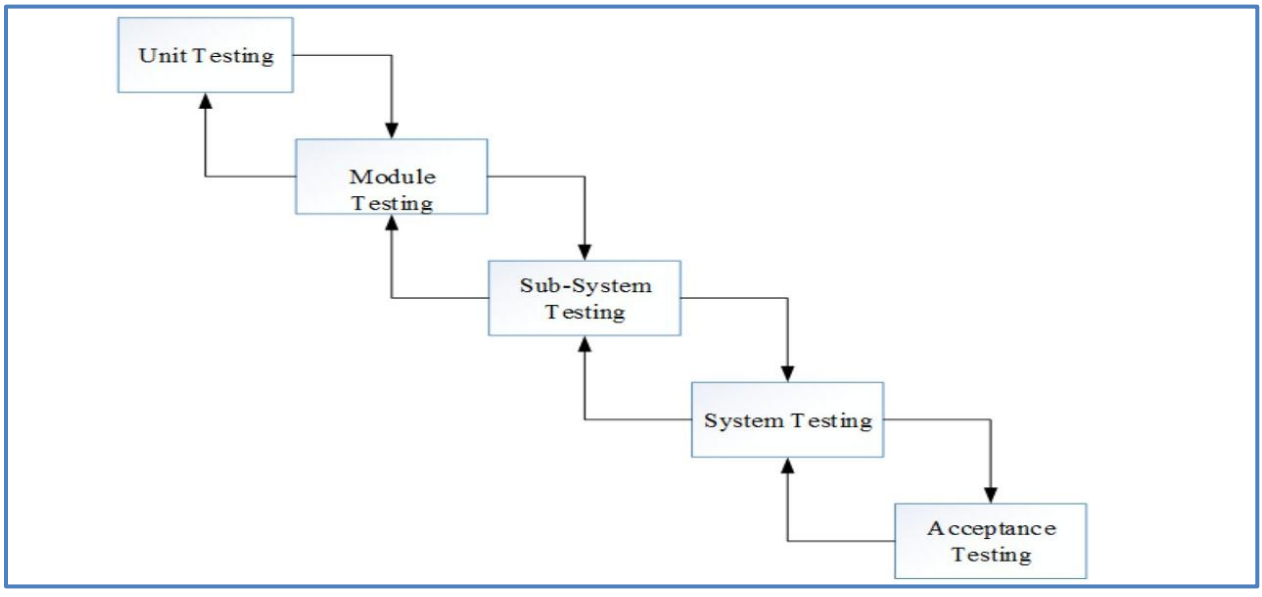


**Fig 5.3 Testing levels**

### a) Unit testing

Mall (2014) states that a computer program's smallest developmental component in a system that can be tested on its own is called a unit. The ZNFPC Client Management System was broken down in to several testable units which were thoroughly tested as separate entities. An example of a unit testing that was done on the system was that of login pages where user authentication on login attempts was checked. This was to ascertain whether the system screens users according to defined login credentials. The generation of individual clients' reminders with regards to their particular FP methods was also tested as a unit. Some mix up in terms of different FP methods duration was noted and corrected accordingly. Next checkup dates are supposed to be generated to individual clients with respect to their FP method's life span.

### b) Module testing

According Saleh (2009) a module is a collection of different components of a system that can be run collectively to achieve a particular objective of a system. A group of units or components of a software system makes up what is called a module. Modules are tested to identify and eliminate bugs that could develop as a result of merging individual units. When units are combined, they may react differently and this may deter the original anticipated performance. Modules of the ZNFPC Client Management System were tested with all bugs being fished out and addressed.

#### i) Verification and Validation Module Tests

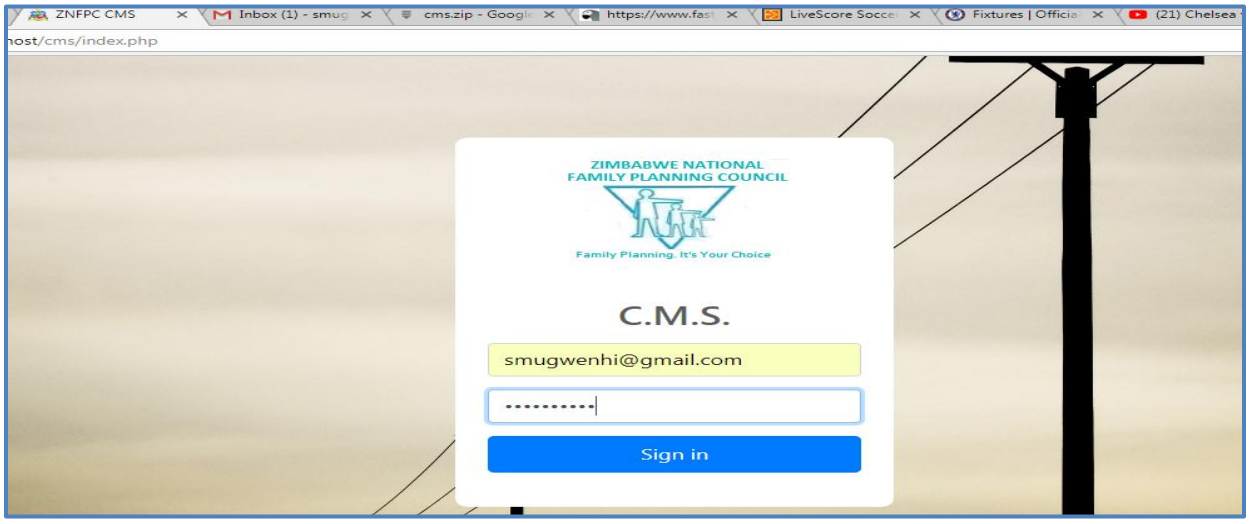


**Fig 5.4 Username and password validation**

Figure 5.4 above shows the main page login screen. This is used to authenticate users. Only authorised users are allowed access when they login with valid login credentials.

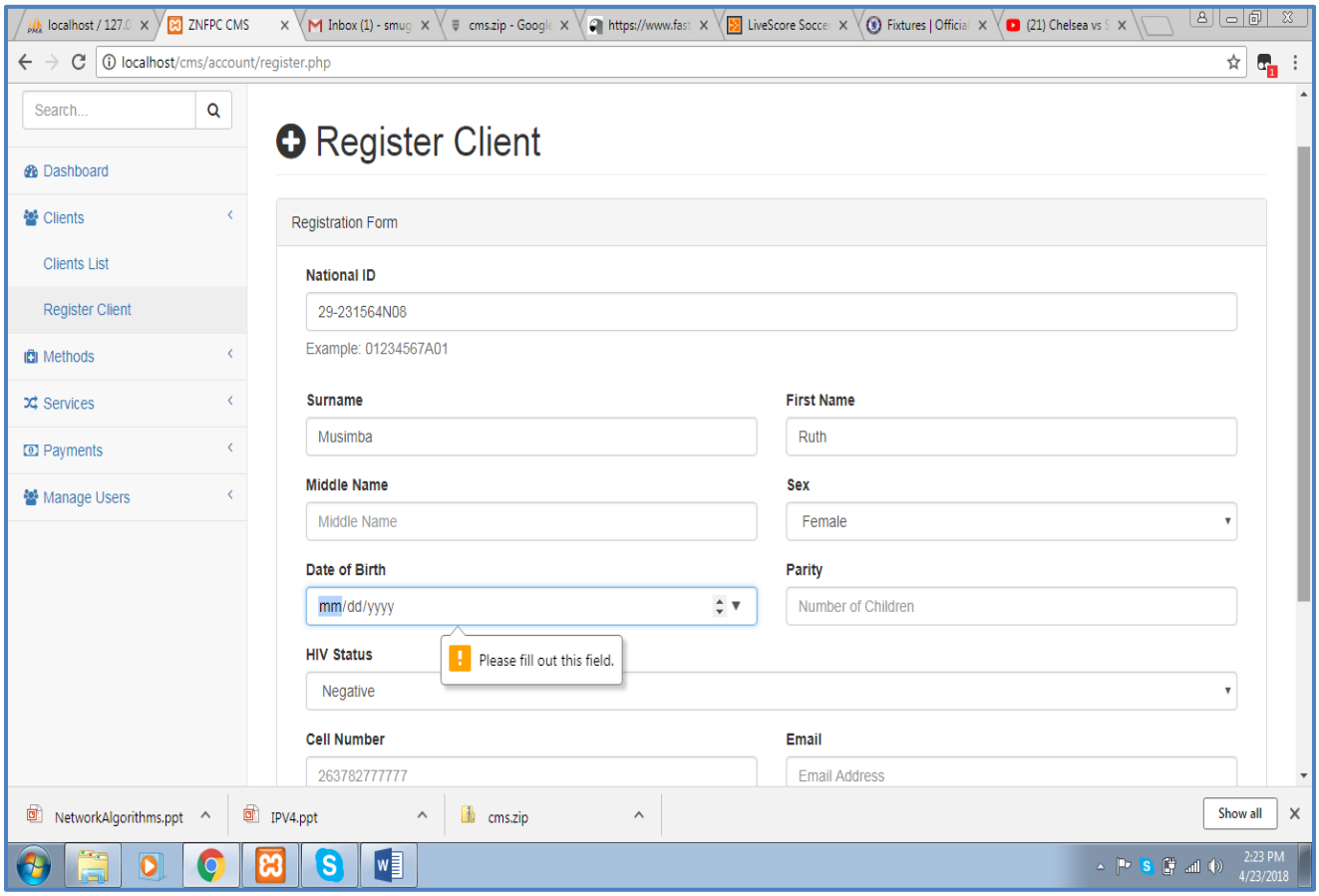


**Fig 5.5 Client Registration Validation**

The diagram above shows a client registration form which was used to validate that client registration module. All fields were working as designed. The above example shows an attempt to save a client record with missing date of birth and the system alerts the user of the omission. A record is only saved when all important fields are filled in.

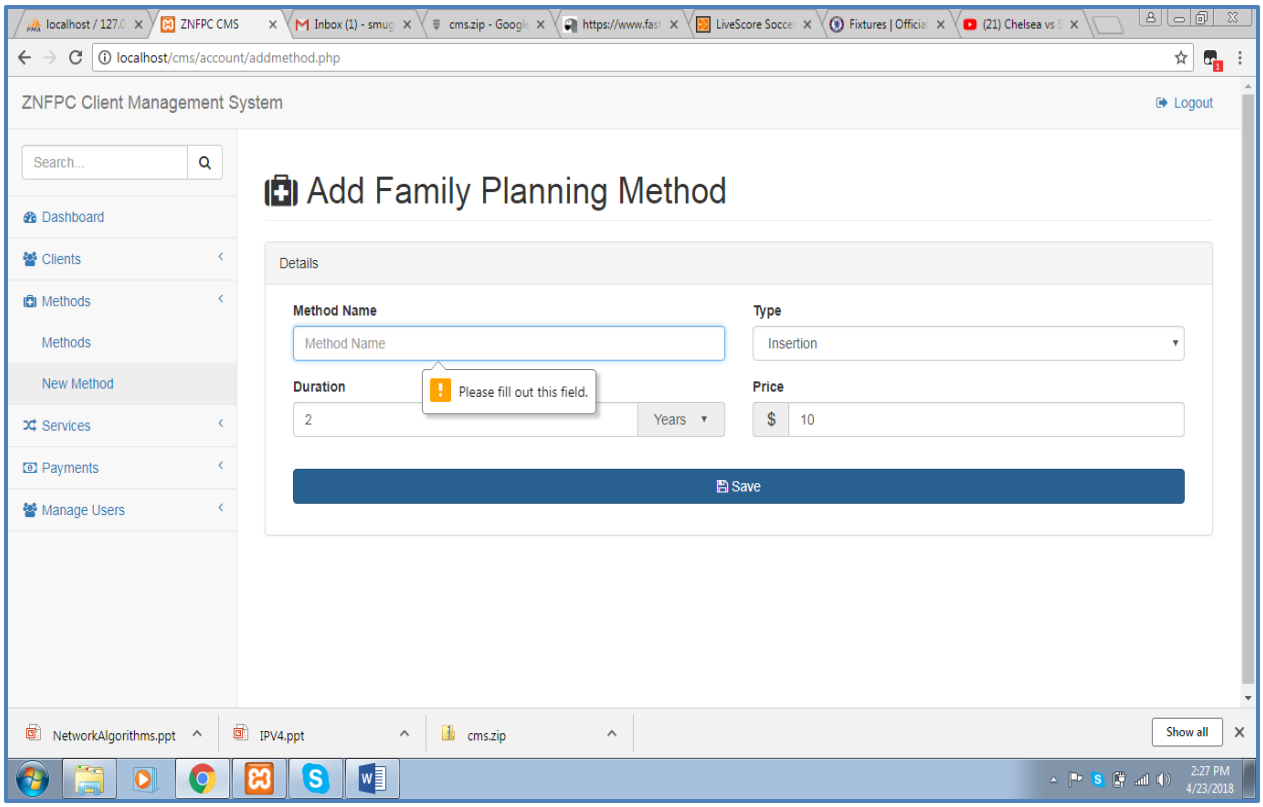


**Fig 5.6 FP Method Registration Validation**

The above form was also used to test the validity of the creation of a new FP method module. Figure 5.6 shows that a method cannot be created without being given a name.

### c) System testing

Saleh (2009) states that a system is a group or collection of individual processes that work coherently to achieve some common specific goals. When individual program modules are integrated or combined, they make up a wholesome system or software. A full system, which is a software package needs to be tested in totality to check if it works as a single unit with all its components smoothly relating without any difficulties. The system testing aspect was well applied to the ZNFPC Client Management System with all areas interrogated to see how the whole package responds. One major area that was really scrutinized was that of database connection and its updates. Since the Client Management System is a web based application, the apache web server element was tested again. All these areas were found to be working smoothly.

### d) Acceptance testing

Before the system is given for final installation, it has to be presented for further testing to the users, both internal and external, for their comment. The users can express satisfaction or dissatisfaction with the system. Users of the ZNFPC Client Management System were given a run of the system. The sampled out users for testing had a look and feel of the system and they indicated the system addressed their concerns as gathered in the requirements specification.

## 5.4 Installation

Savenkov (2008) states that installation is the process of configuring all the components of a newly built or acquired system for it to run on some specified hardware. It is also explained as the placement of the newly developed and tested software package in any given organisation for its first use. The installation of the Zimbabwe National Family Planning Council Client Management System was configured following the steps explained below.

### 5.4.1 Steps involved in setting up the site

- Installation of XAMPP – this has Apache, which is a required web server software, and MySQL database management software. These are required to be in a running state for the system in question to be able to run as well. Figure 5.8 shows the XAMMP control panel exhibiting the stated applications.

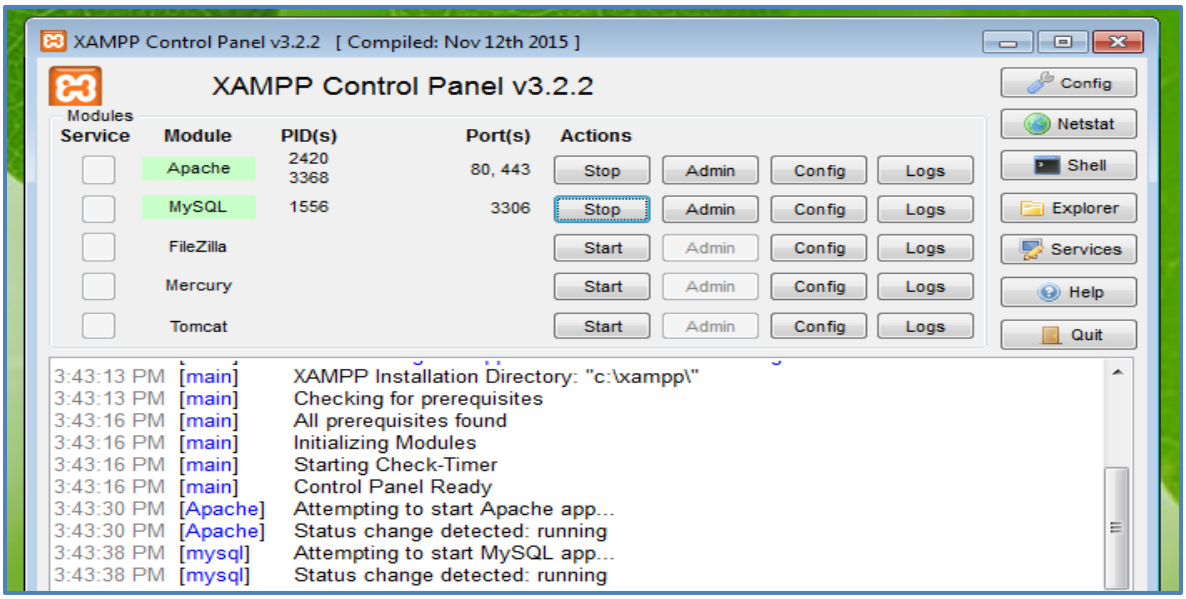


**Fig 5.7 XAMPP Control Panel**

- Files for the new system were stored in Drive C of the System server machine inside the **htdocs** root folder
- Creation of a ZNFPC site – this was done using macromedia Dreamweaver software package
- The ZNFPC Client Management System database was imported onto the server machine. This was done through the uniform resource locator (url) http://localhost/phpmyadmin/
- Using any web browser, the site is located on http://localhost/cms/. The system will display a home page from where users can make use of the system applications.
- An overall system test was also done soon after the all the installation configurations were done just to as
- certain functionality

#### 5.4.1.2 Performance and Objective Evaluation

For any software system to be considered complete and accurate, it has to meet the users and / or stakeholder functional and non-functional requirements. Tests were done to ascertain whether the system was conforming to the pre-specified objectives. The following test results were gathered from the tests done:

**Objective One:**

- To create a computer based central database for the organisation that will orderly and chronologically houses all necessary client records

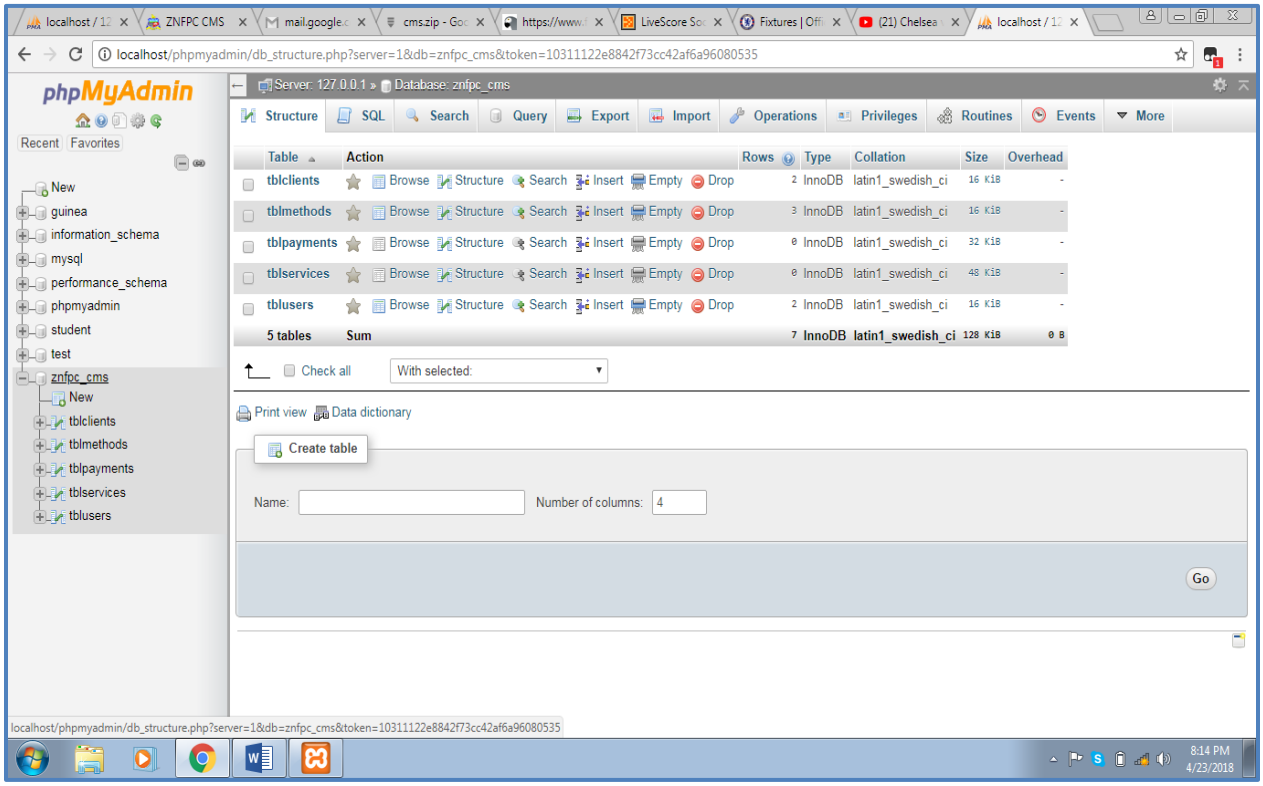


**Fig 5.8 Central Repository of Client Records**

Figure 5.8 above shows the designed Zimbabwe National Family Planning Council Client Management System database with the name **znfpc_cms**. Relational tables of the database are also shown on the diagram. Each table bears necessary attributes as per design. The database houses every information of the organisation which relates to the Client Management aspect in question.

**Objective Two:**

- To send updates and reminders to clients through mobile texts and / or emails

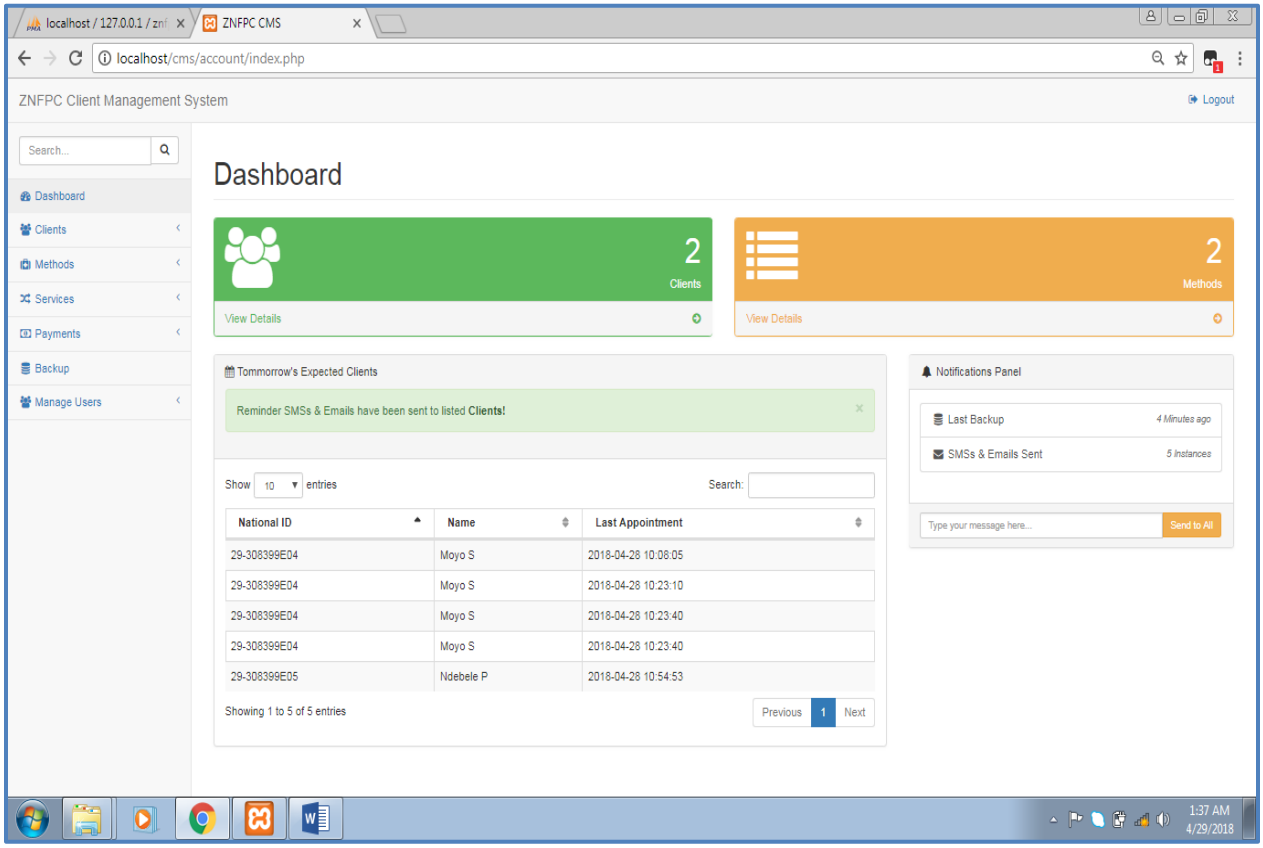


**Fig 5.9 Reminder sending to Clients**

Figure 5.9 above indicates the confirmation of reminder sending to clients who are due for the next visit the following day. Reminders are automatically sent to clients at different designated intervals based on the method duration and other specifications. The same window also provides for a section where general updates can be created and sent to every client.

**Objective Three:**

- To allow easy Client  Records Update

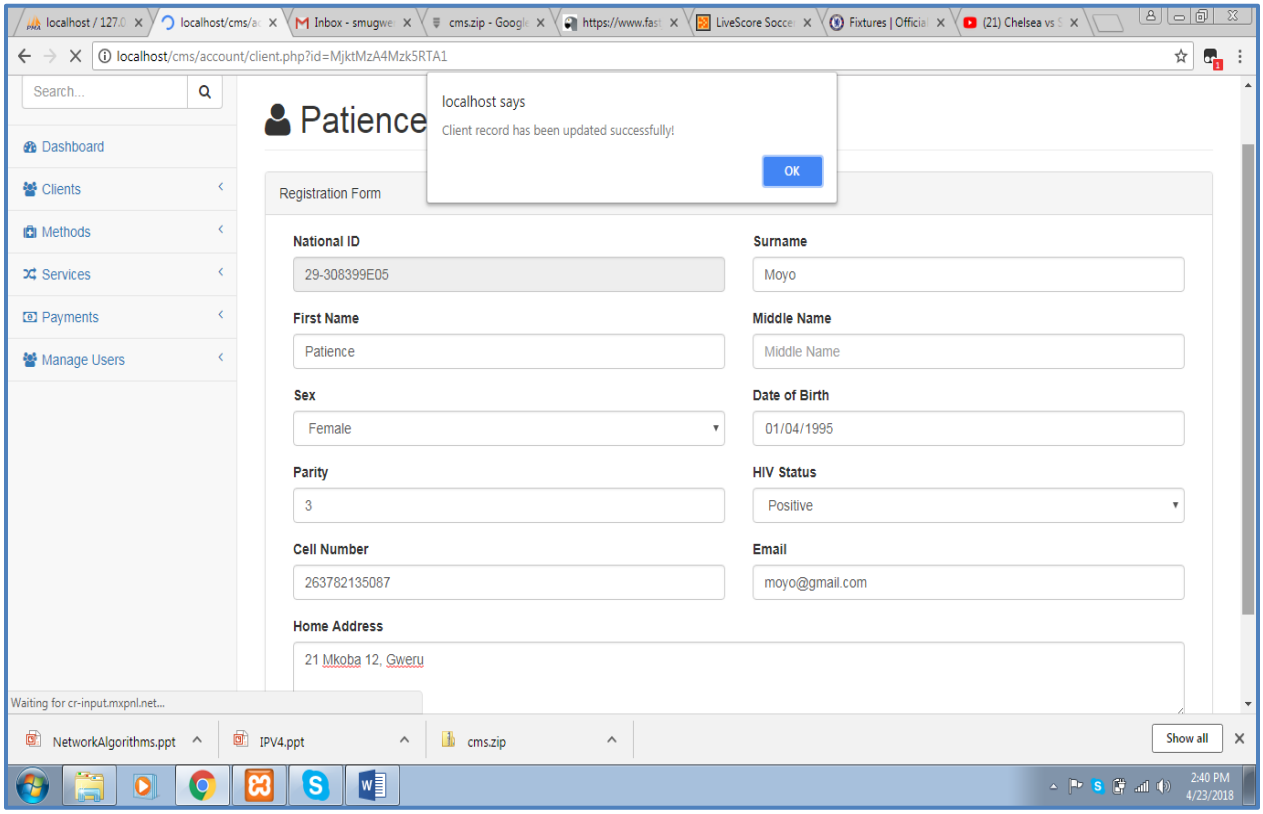


**Fig 5.10 Client Record Update**

Some clients details changes over time and hence there is the need to regularly update clients' records accordingly. Fig 5.10 above shows an already existing client record that has been updated with new information and saved to the database.

**Object Four:**

- To offer effective and enhanced security to the clients' information held by the organisation

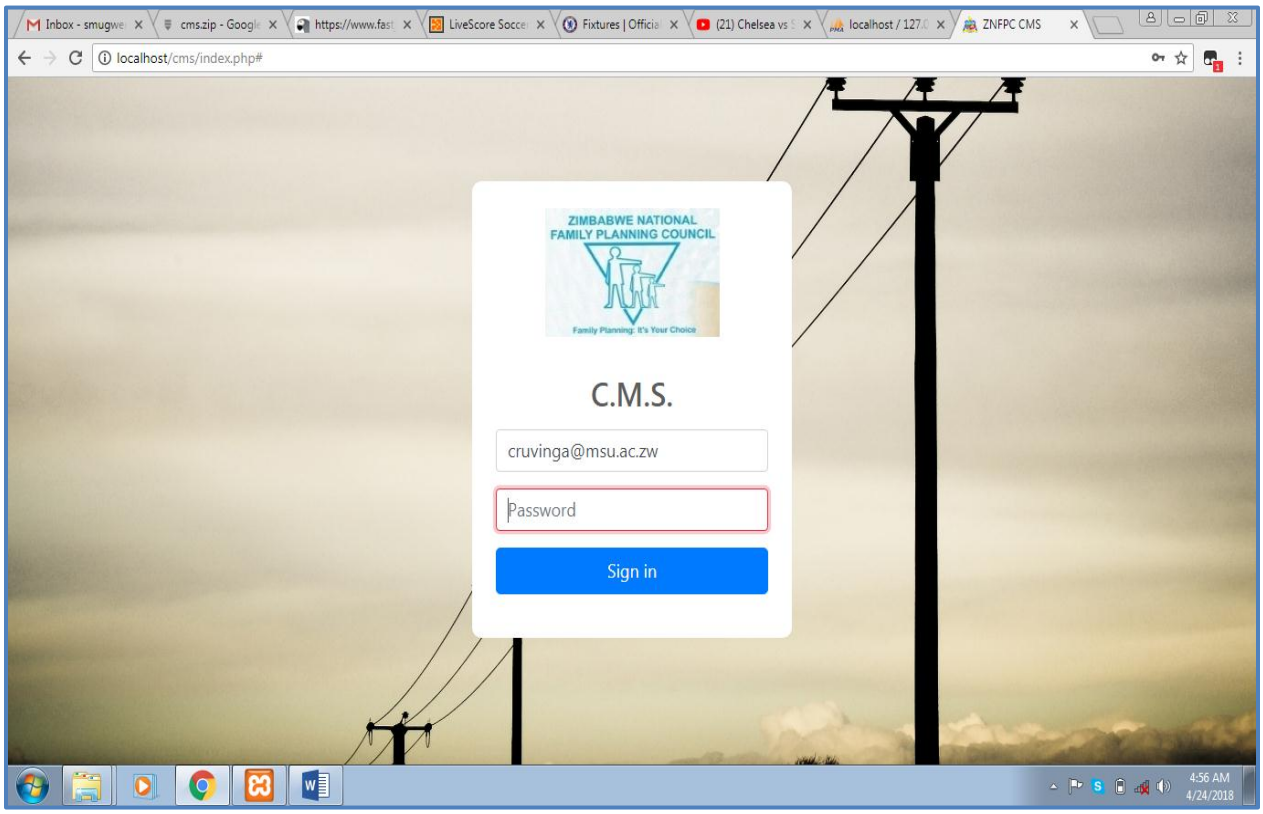


**Fig 5.11 User Authentication on Login**

One of the critical objectives of the system is to keep client information safe and confidential. The system will implement several security measures to achieve this objective and one of them is system user authentication. Only authorised users whose login details matches the database are allowed access. The bold "password textbox border" (also red in color) in Fig 5.11 implies that the password entered does not match the database.

**Objective Five:**

- to effect prompted or automated periodic backups

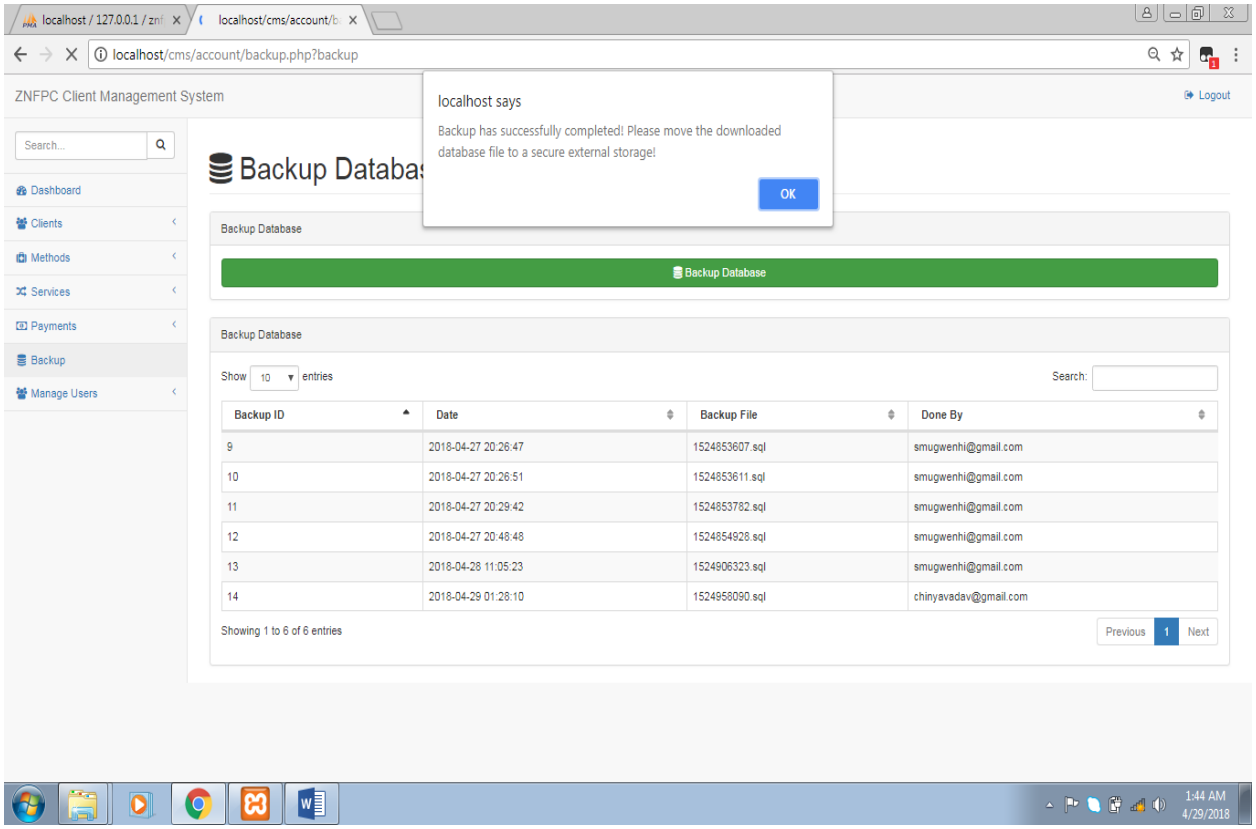


**Fig 5.12 All records back-up confirmation**

The above diagram shows the confirmation of the overall backing up of all records in the database. The backup process is in two ways that is there are periodic automatic updates and the user can actually prompt for such an action as indicated in Figure 5.12.

**Objective Six:**

- to produce comprehensive and ad hoc reports

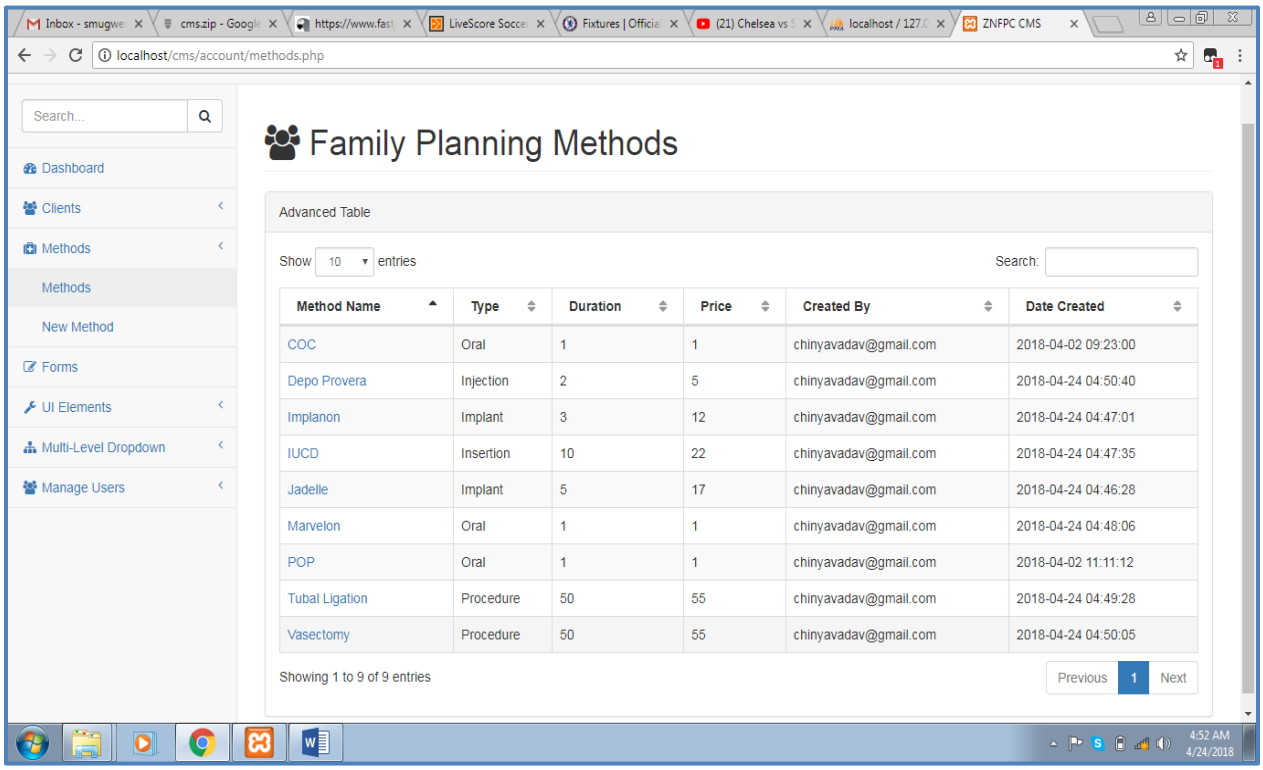


**Fig 5.13 FP Methods List Report**

One of the objective of the system is to produce summarized, structured and informative reports. Figure 5.13 above shows existing Family Planning methods in the database. Other reports includes Clients lists, services lists, payments analysis amongst other things.

### 5.4.2 User Training

According to George (2010) user training involves information dissemination to users on how to use the system and it is a very important part of the system's implementation. The user training aspect is considered a very critical part as it determines whether the system will be correctly utilized to maximise on its usefulness. User training for the ZNFPC Client Management System was conducted for the a variety of users which encompassed the IT personnel in the organisation, the static clinic receptionist, nurses, sister in charge clinic, the service delivery coordinator, the management information systems personnel and others as deemed fit. The trainings conducted

enabled users to make maximum use of the system in their day to day operations. The system developer concentrated much on this aspect of user training as it was envisaged that with a high degree of user appreciation of the system, the project's objectives will be smoothly and easily realised. Proper use of the system also meant easy maintainability of the system as there would be little or no disruptions as a result of misuse.

### 5.4.3 System Change-over Strategies

According to Shelly and Rosenblatt (2012), system changeover is the process of transitioning or shifting from one system to another system. The transition is usually from an old system to a newly developed or acquired system. Having developed a web based ZNFPC's Client Management System and conducted fruitful user training sessions for the key user stakeholders, system changeover strategies were considered from where one was chosen to use for the transition from the old system. The following subsections explains system changeover strategies which were available for adoption by the ZNFPC management.

#### 5.4.3.1 Direct changeover strategy

Shelly and Rosenblatt (2012) expresses the direct system changeover strategy as an instant system conversion methodology which entails total or complete dropping of the old system on a particular predefined time and imminently switching on to the new system. The managers simply has to carefully decide on when the system switch has to be effected when they opt for this strategy. The direct changeover strategy is suitable on certain scenarios and circumstances based on its merits and demerits.

**Advantages**

- Takes the shortest possible time of switching from one system to another
- Minimal costs related to the conversion process are incurred
- Operational costs are also limited as there are minimal or no linkages at all of the new system with the old system

**Disadvantages**

- Very high chances of missing out on critical information from the old system
- Limited initial utility of the new system since users will have limited time to familiarize with the system. Familiarization time is very much limited because of the instant shift

The following figure diagrammatically highlights the direct changeover strategy:-

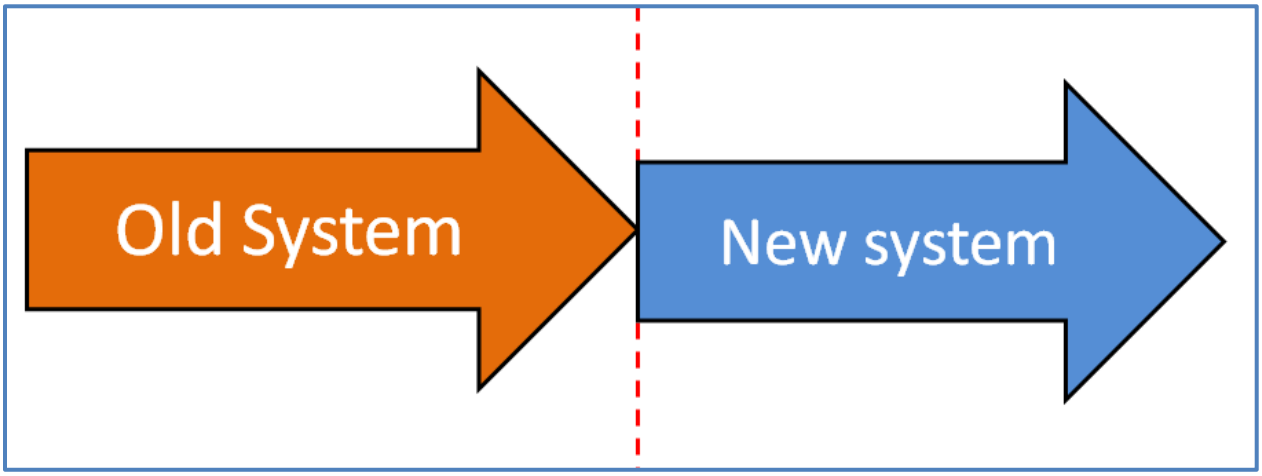


**Fig 5.14 Direct changeover strategy** [Source: Doyle (2009)]

### 5.4.3.2 Pilot changeover strategy

With the pilot changeover strategy, the new system is used on a small selected portion of the organisation. That experimental selected portion where the new system is initially used is referred to as a pilot site. In an organisational set up, the pilot site could be a department, a branch or a unit.

**Advantages**

- Very easy to make periodic evaluations of the new system's performance before cascading it down to other sections or the rest of the organisations.
- New system failure impact will be limited to a small pilot section of the organisation

**Disadvantages**

- May take very long to implement the new system in the whole organisation
- Chances are high that a successful system at pilot site may fail at organisational level because of differences in volumes of data to be handled

The following figure diagrammatically highlights the pilot changeover strategy:-

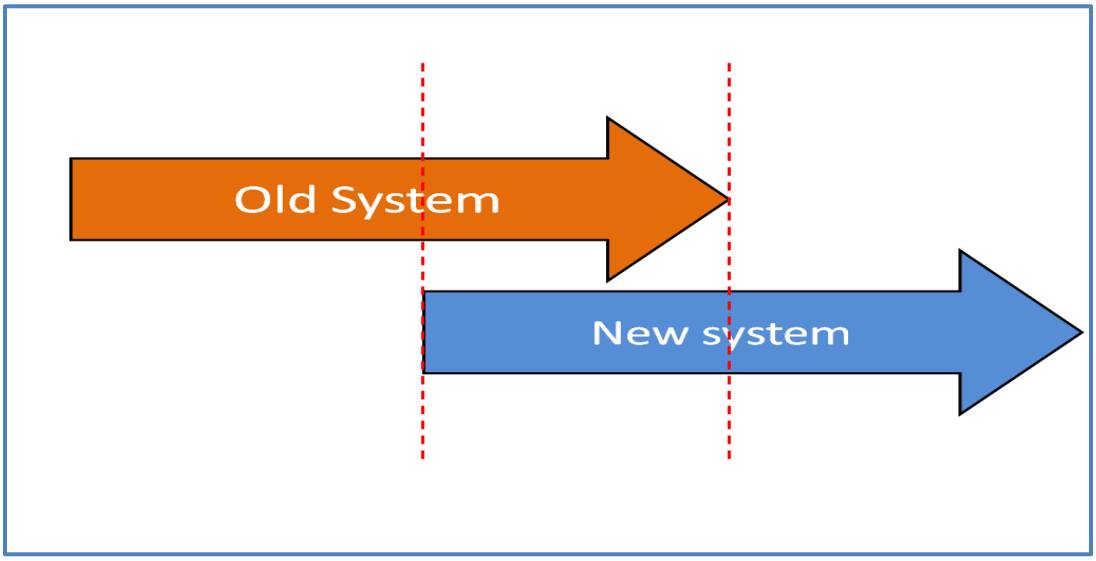


**Fig 5.15 Pilot changeover strategy** [Source: Doyle (2009)]

### 5.4.3.3 Phased changeover strategy

The phased changeover strategy replaces the old system in certain predefined stages or phases. With this strategy, a new system is rolled out to one functional area or department at a given time until all functional areas or departments are fully covered.

**Advantages**

- Error identification and elimination is thorough at every stage
- Reduces risks aligned with complete conversion of the whole system at once

**Disadvantages**

- Takes much time to get to the point where the system is fully operational in the entire organisation
- The time taken may promote hatching of resistive tendencies from different stakeholders

The following figure diagrammatically highlights the phased changeover strategy:-

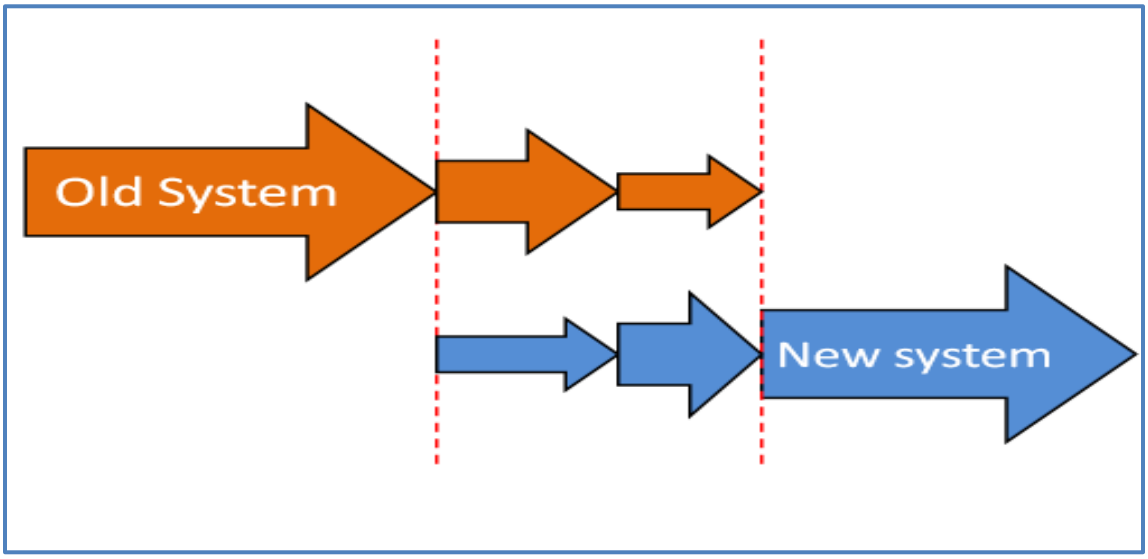


**Fig 5.16 Phased changeover strategy** [Source: Doyle (2009)]

### 5.4.3.4 Parallel changeover strategy

Horwath (2010) expresses parallel changeover strategy as the concurrent running of the old and the new system over a specified time frame. The time given is usually meant to get the new system stabilise before a complete shift of all operations to it. The old system is eventually discarded after the new system has gained the required momentum.

**Advantages**

- Risks of data losses is greatly minimized. The old system acts as a backup in case of the new system's failure

- Performance comparisons between the old and the new system can be done during the dual systems' running

**Disadvantages**

- Very costly running two system at ones
- Duplication of effort

The following figure diagrammatically highlights the parallel changeover strategy:-

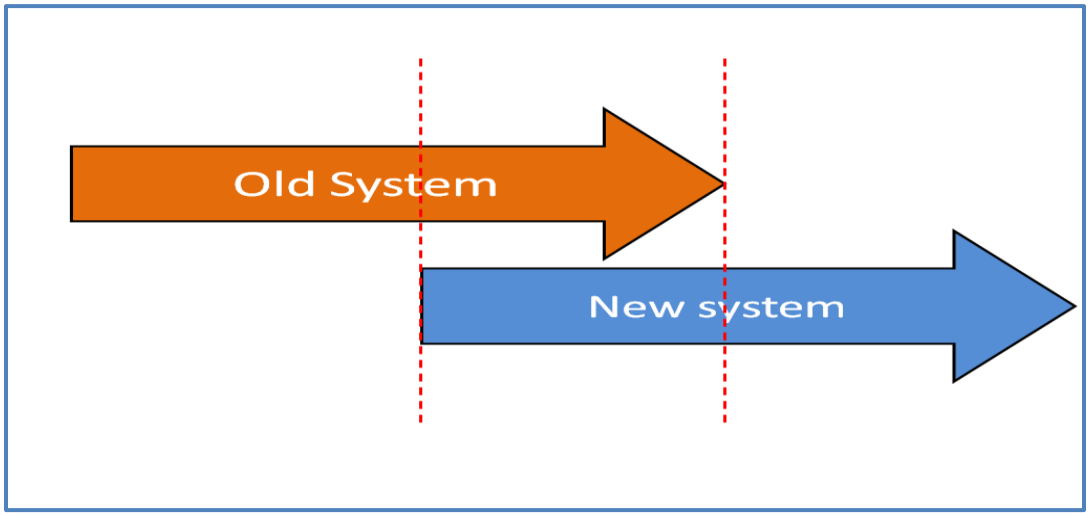


**Fig 5.17 Parallel changeover strategy** [Source: Doyle (2009)]

**Recommended changeover strategy**

The ZNFPC management were furnished with detailed information about the afore-mentioned possible changeover strategies. With this understanding it was recommended to use the phased system changeover approach where different functionalities would be implemented one by one. The phases can be broken down as client registration, FP methods payments and the updates functional areas.

### 5.5 Maintenance

System maintenance is an ongoing process of system upkeep to make sure the system is free from faults and functions effectively and efficiently (George, 2010). This element simply aims at keeping the system running and living up to its expectations. Necessary changes and adjustments are also done during maintenance to keep the system abreast wit time and any new developments in its line of operation. The ZNFPC Client Management System will be maintained following the aspects of corrective, adaptive, perfective and preventive maintenance aspects.

#### 5.5.1 Corrective Maintenance

According to Thakur (2017), corrective maintenance deals with the repair of faults or defects found in the day-to-day running of a software system. This is basically a maintenance process in which an effort is made to identify and isolate or rectify any faults found in the system. It can also be described as a reactive modification of a software product which is normally done or performed after the system has already been delivered so as to correct discovered errors or problems. Some errors may have not been identified during system development and testing and these ultimately require to be corrected the moment they are identified. Corrective maintenance also entails simply reinstating the system back to its original state before a running error occurred. The corrective maintenance aspect will be practiced throughout the life span of the Zimbabwe National Family Planning Council Client Management System. This will keep the system up to the expectations of the users.

#### 5.5.2 Adaptive Maintenance

In this modern era where there is rampant dynamism in the area of technology, thus, it is inevitable that any given software product should be flexible enough to adapt to the changing needs of the stakeholders for it to stay relevant. Adaptive maintenance is normally done for the system to conform to the prevailing environment. Adaptive maintenance refers to those changes made to a software product that are aimed at making the system conform to the new emerging demands or changing needs, and in this case changing needs and requirements of the Client Management System for ZNFPC. For instance the organisation may introduce a new FP method which the Client Management System should be well able to accommodate. Because of such kinds of changes

which may occur in the health (FP) fraternity, it is of very much importance that the system be able to adapt smoothly to such changes.

### 5.5.3 Perfective Maintenance

Perfective maintenance, according to Sommerville (2012), is a process of ensuring smooth linkages of all the modules or functional areas of a software product in its task deliverance. It upholds a high degree of coherence of the system's modules. Moreover it is concerned with implementing new or changed user requirements by making functional enhancements to increase the system's performance even in circumstances where the changes may not have been suggested by faults. System improvements and other functionalities can be appended to the system in an effort to make it more appealing to users.

### 5.5.4 Preventive Maintenance

Quezada (2017) states that preventive maintenance is that process aimed at detecting probable system hiccups and actually deterring them from happening before hand. The software code should be implement functionalities such as error handling and exception handling. Preventive maintenance avoids malfunctioning of the system which may be caused by such factors as obsolescence. This type of maintenance is done to counter or avoid unforeseen negative occurrences ahead of time.

## 5.6 Recommendations

With the ZNFPC Client Management System having been successfully developed and implemented, there are future oriented suggestions or recommendations for the system. All objectives of this project were addressed accordingly, the future oriented developments were suggested to include:

- Online enquiries of FP services by clients
- Service fees payments through online facilities

## 5.7 Conclusion

The ZNFPC Client Management System software development project was successful owing to the attainment of objectives that were set during the early stages of the project. Furthermore to the development success factor, the software product was successfully implemented. Proper testing (verification and validation) of the system was done to make sure that it produces data outputs with a high degree of integrity which can be depended on. All the necessary software requirements of the system were installed to support the system's configuration and implementation. The maintenance of the system will be done as prescribed in the maintenance section. All the elements of the system were accordingly written down in the ZNFPC Client Management System's documentation for continuous reference.

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www.uasc.edu/learning_material/systems and design/2003.html (Accessed: 10/03/2018).

http://www.seminarprojects.com/search.php (Accessed: 10/03/2018).

# APPENDICES

## APPENDIX A: USER MANUAL

The user manual is a descriptive document designed to help users of the system with the necessary knowledge and techniques on how to operate the system. This user manual will highlight all key step on how to operate the ZNFPC Client Management system with the intension to help the users to navigate smoothly through the system. It has been prepared to complement on user trainings and to provide help whenever users are interacting with the system. It also helps in the maintenance of the system because the end users will refer to the user manual if there is any problem that may arise during the use of the system. The user manual informs users on what to do in cases where the system reacts in an unusual manner.

### Login

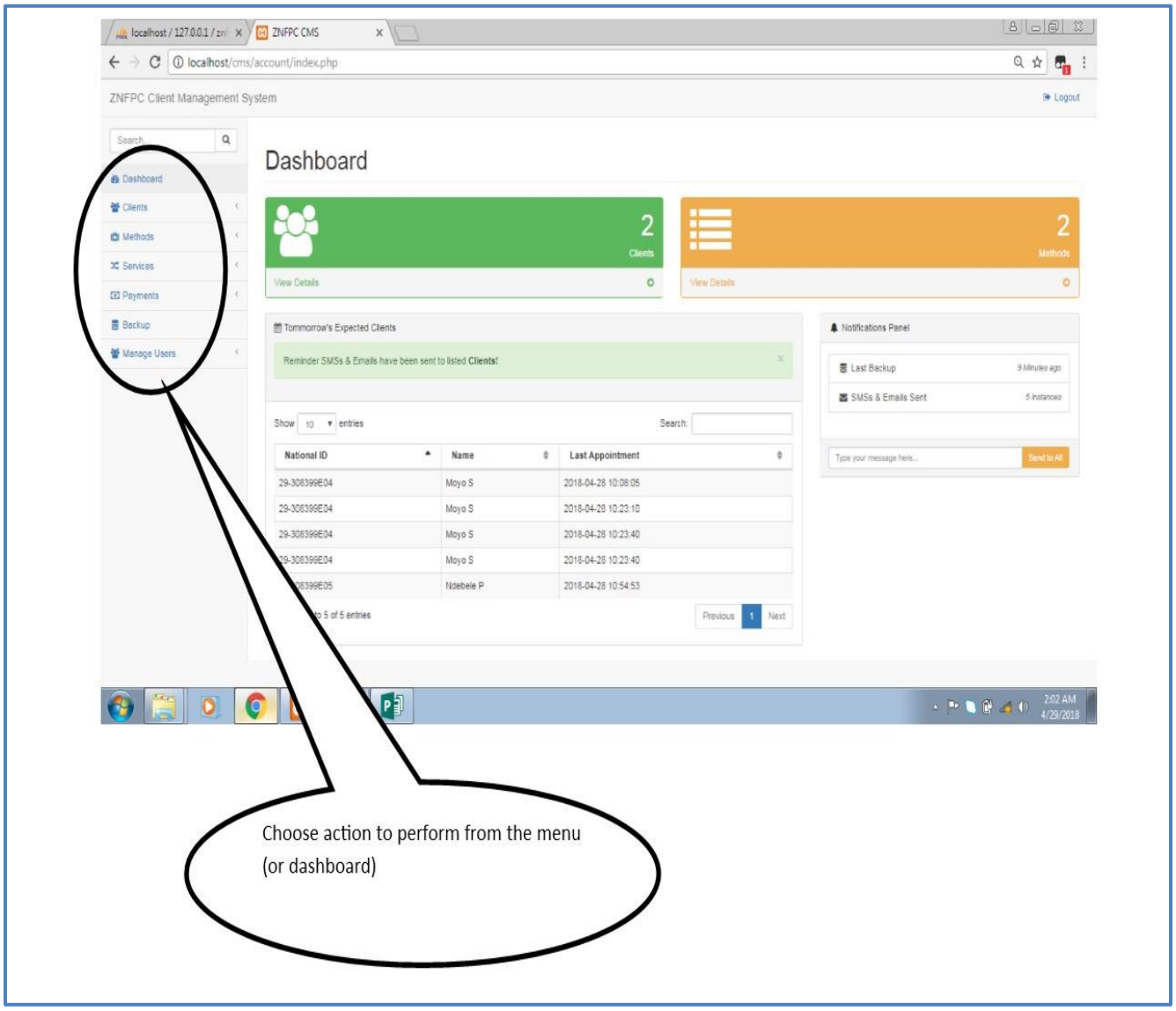
For any user to gain access to the system, he or she should be authenticated by way of entering logon details which should be matched with the database. When the user types the ZNFPC Client Management system website's uniform resource locator (URL) on a browser, the login page is displayed. When supplied login details match the database, the user is allowed access to the system's main Dashboard. Incorrect or non-existent logon details will result in denial of user access to the system. Based on the logon credentials entered by the user, the system is able determine each user's privileges within the system. As defined in the design of the system, each type of user has specific roles selected for them. The following snapshot shows the system's login page.


When login details matching the database are entered, the user will gain access into the system. Incorrect details will result in access denial.

**NB**: - any authentic user can only gain access when all the site supporting platforms are up and running as well. Users should seek for assistance from the Network Administrator when the site serves are down.

**System Dashboard**

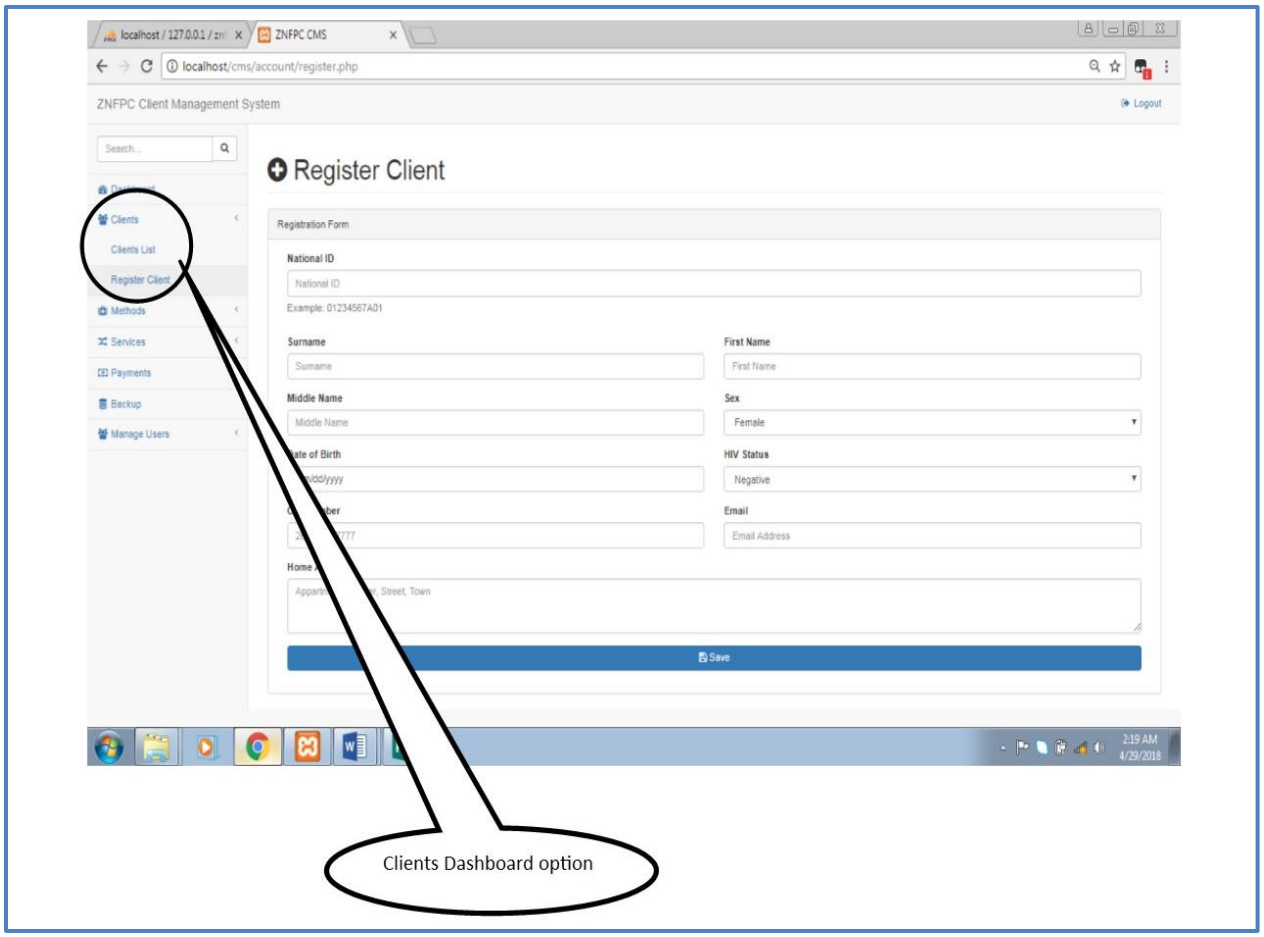
When the user successfully logs into the system, which is after the authentication, the user will directed to the system's main Dashboard. The dashboard is shown below:




From the dashboard, the user can navigate to any section of the system for as long as he or she has the privilege to access the sections according to user levels. The menu options on the Dashboard include the clients section, FP methods section, services section, payments section, backup section and the System Administrative section.

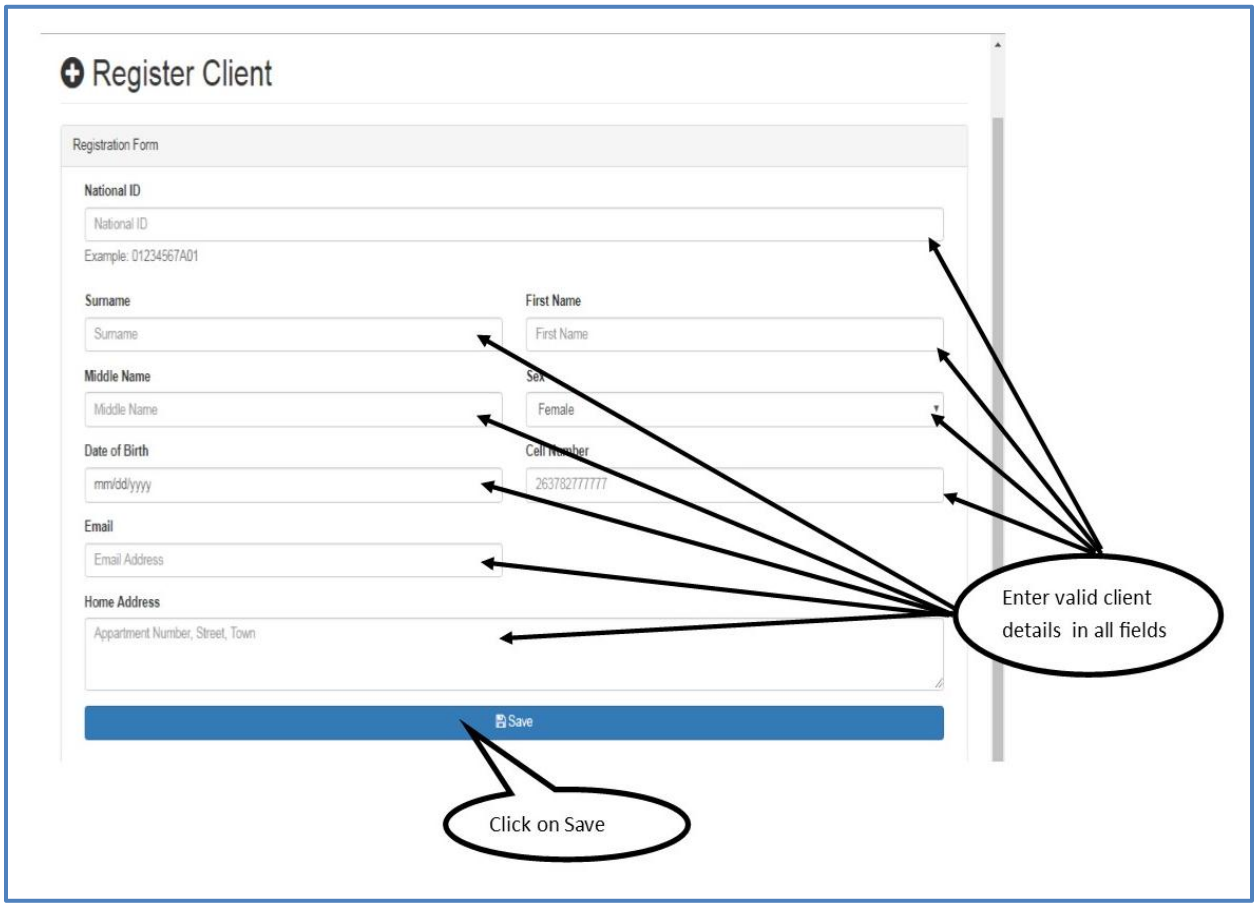
**Clients Section**

The clients menu on the dashboard allows for two main actions that is to create client records as well as to view Clients List Report as highlighted on the diagram below:



**Client Registration**

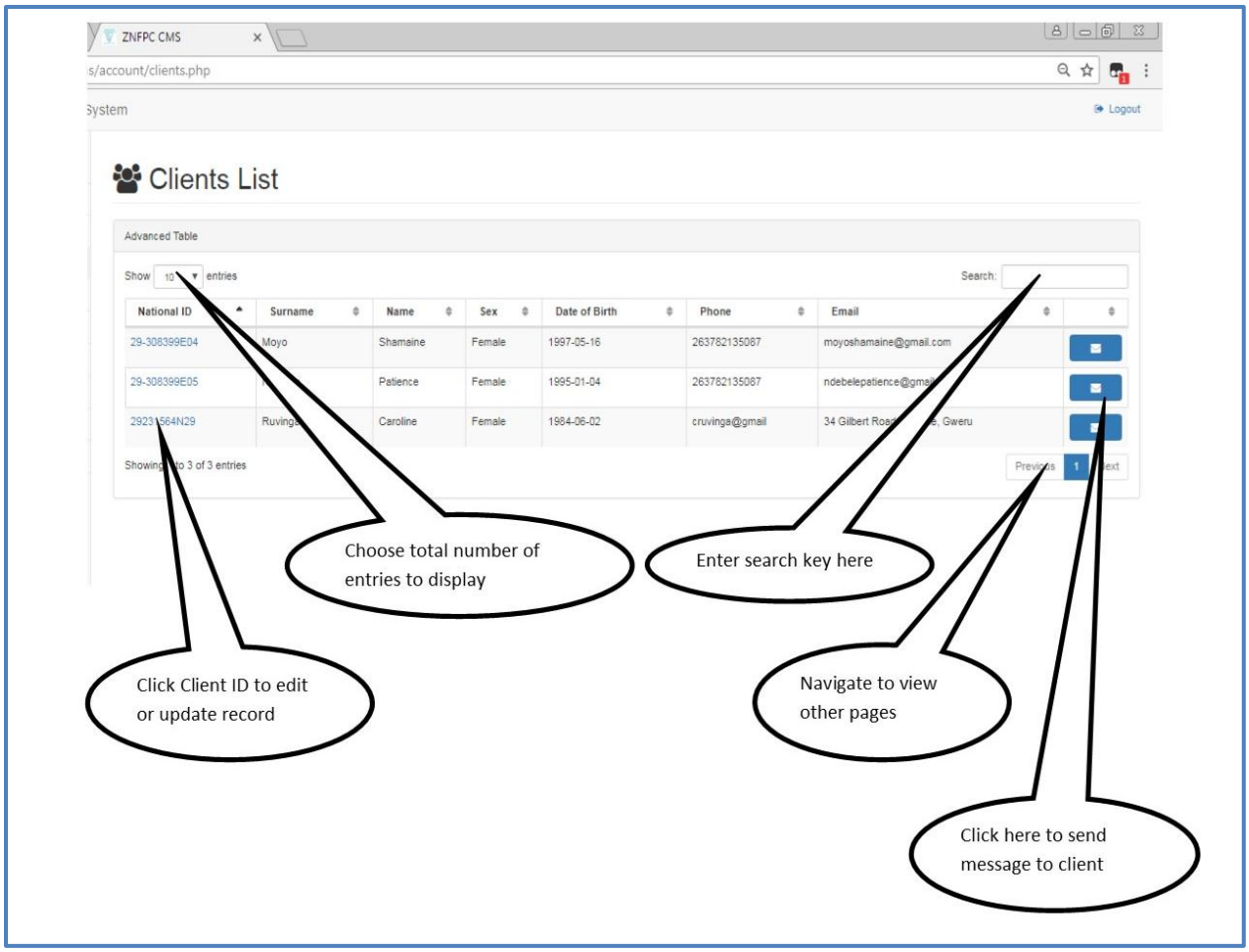
Only the Clinic Receptionist or Clinic Nurse has the right to create records for the organisation's clients. The following shows the client registration form.




All fields on the client registration form should be filled in. There are defined entry formats which should be followed such as national ID, date of birth, cellphone number and home address. Any deviations or omissions may result in the record not being saved to the database.

**Client List**

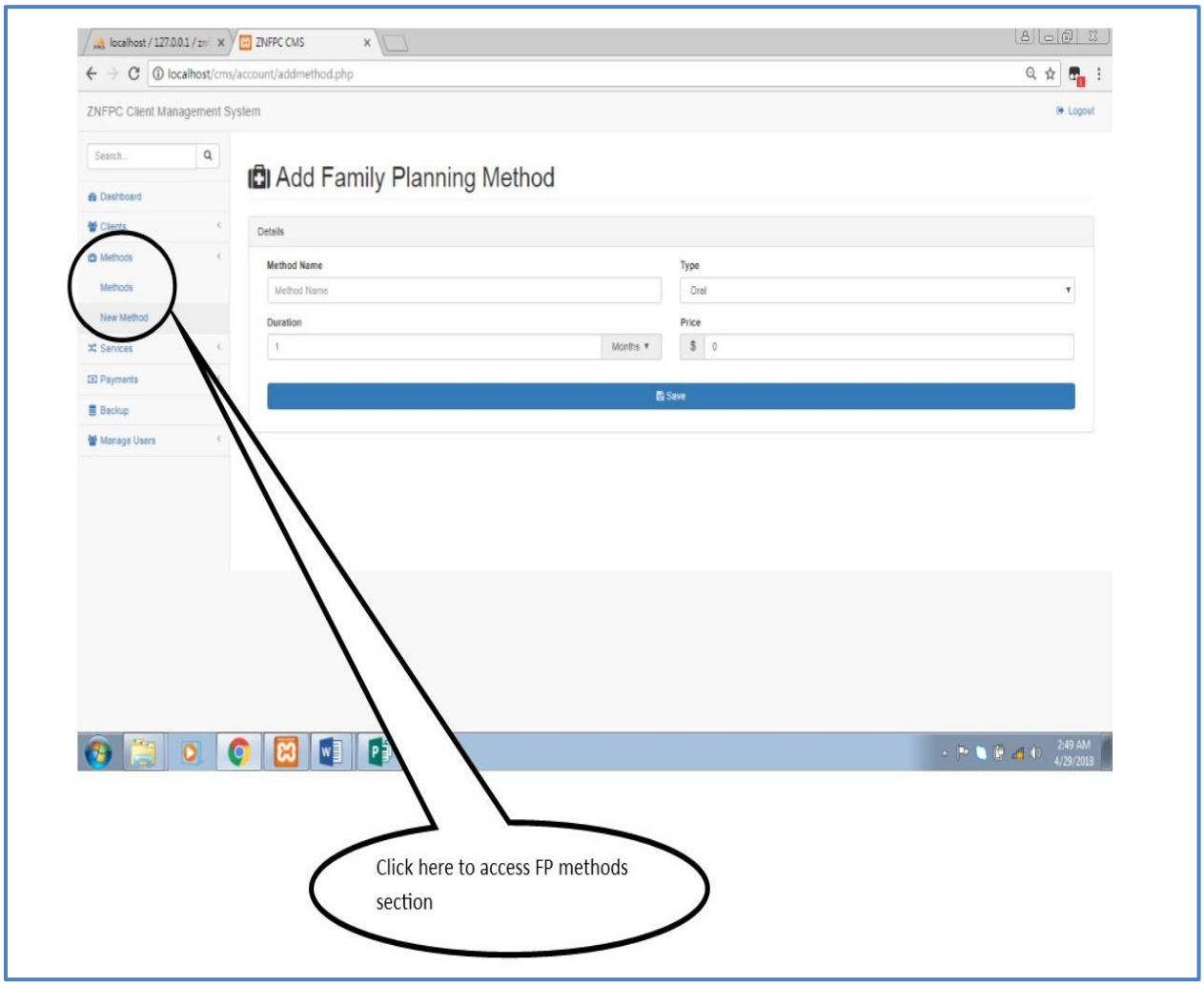
This option is a report that shows the list of all clients captured in the database. The diagram below shows a sample list.




The client list diagram also show other operations that can be done such as client record update, individual client messaging amongst other things.

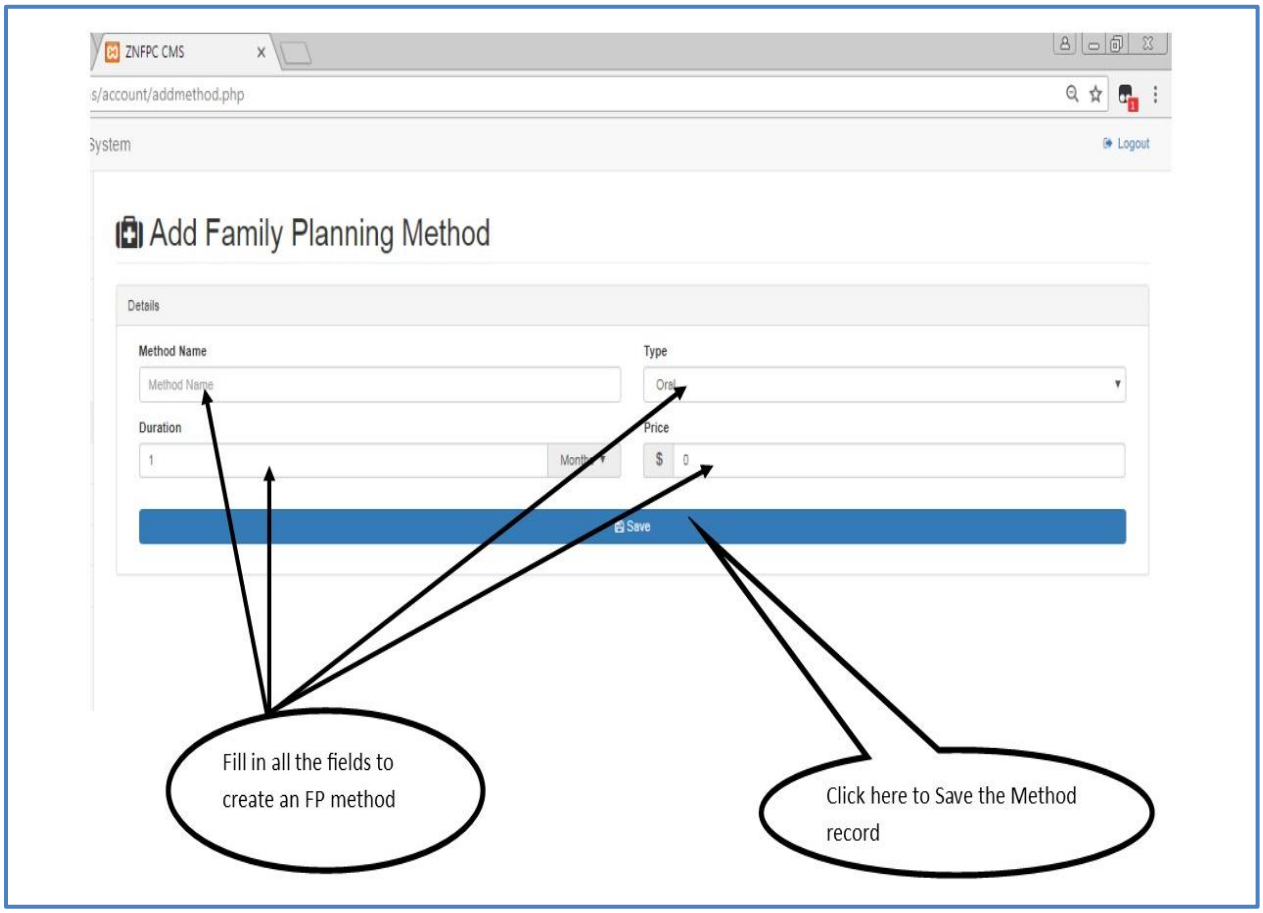
**Methods**

This section leads to creation of FP methods. It also allows viewing as well as editing or updating of existing FP methods. The diagram below shows where to access Methods from the system's dashboard.



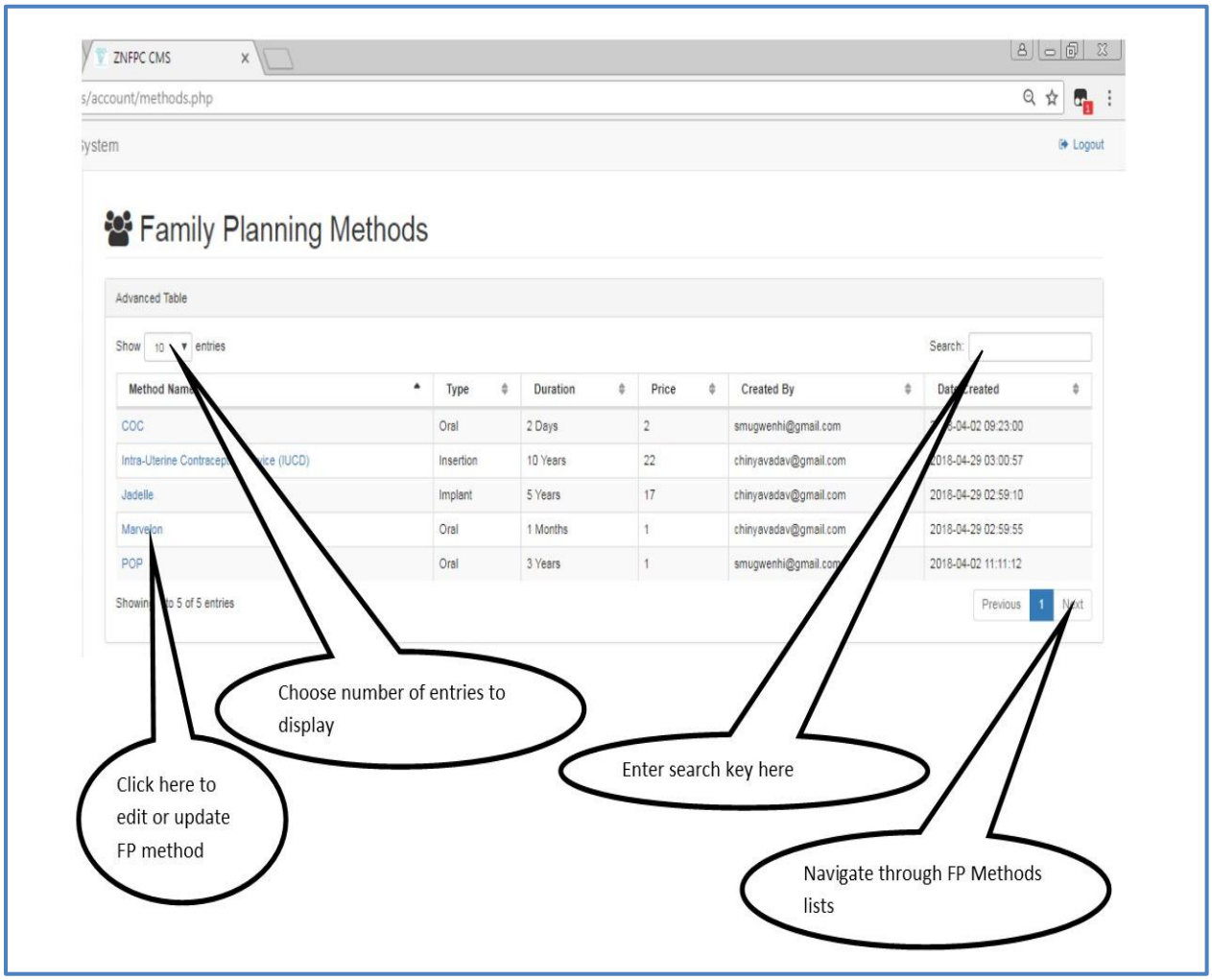
**Creating a New FP Method**

The system allows creation of new FP methods as shown in the diagram below.



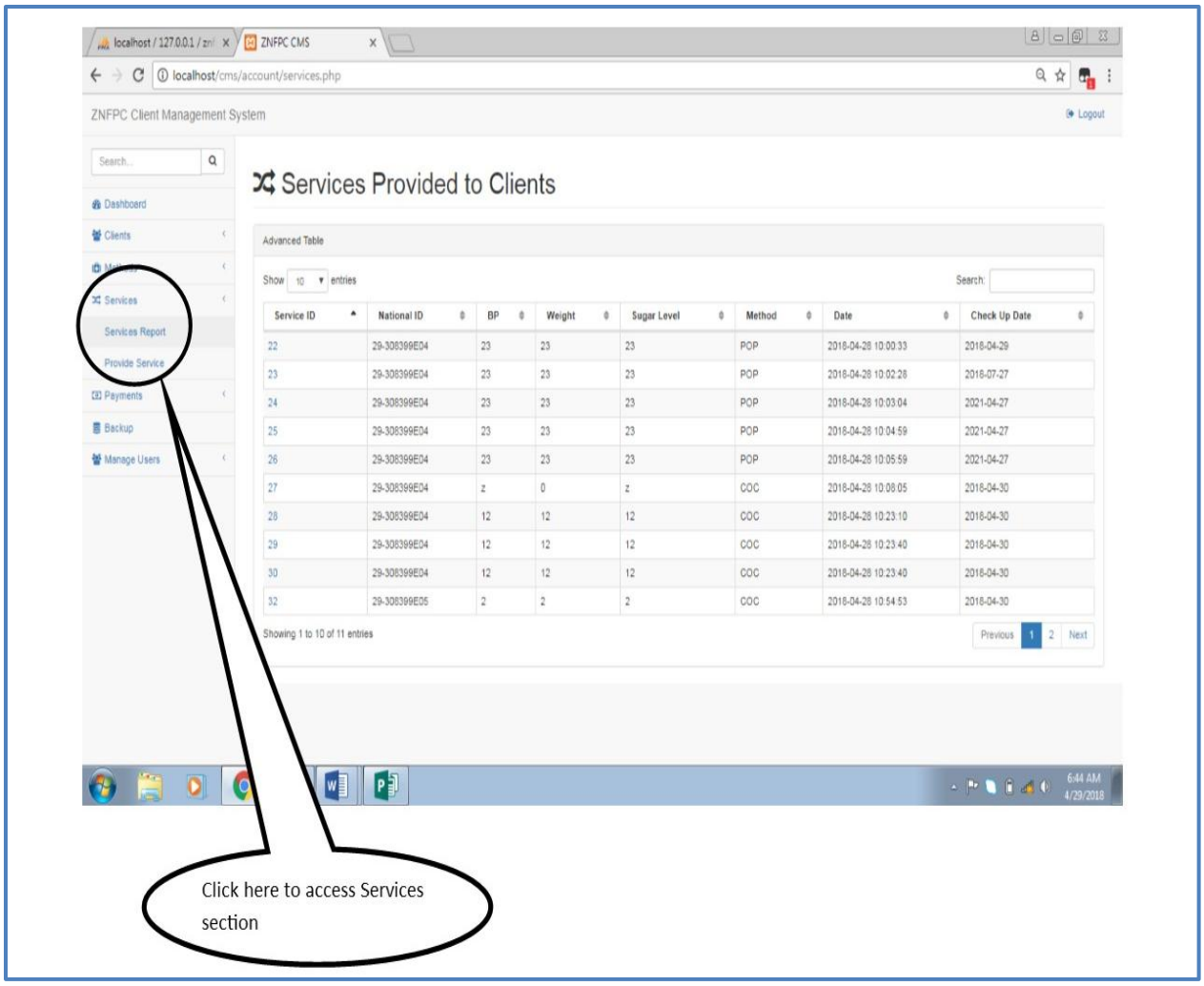
**FP Method List Report**

The system allows users to view the available FP methods as indicated on the diagram below.



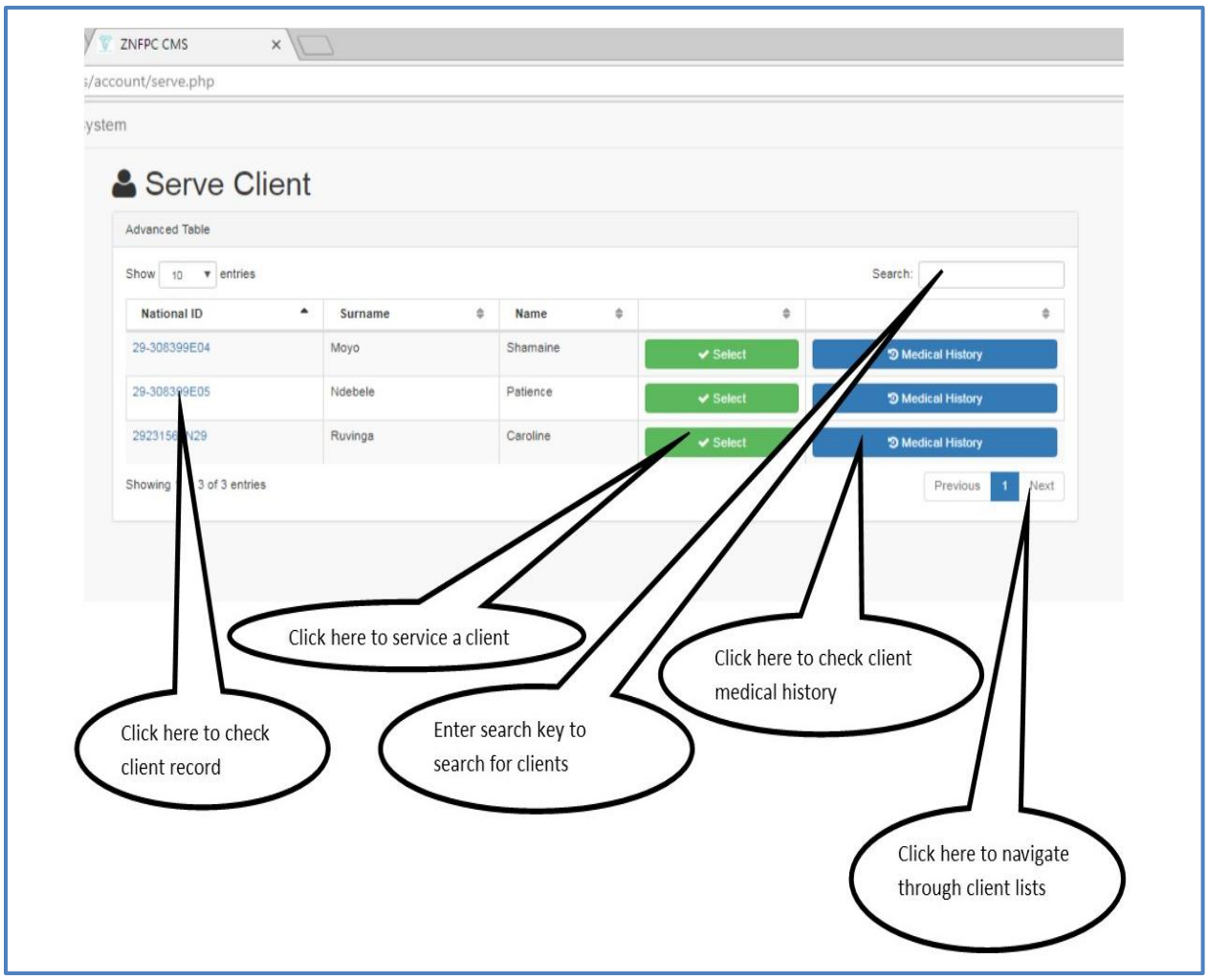
**Services**

The services section has two main components that is the provision FP services and the viewing the services reports. The diagram below shows the services section.



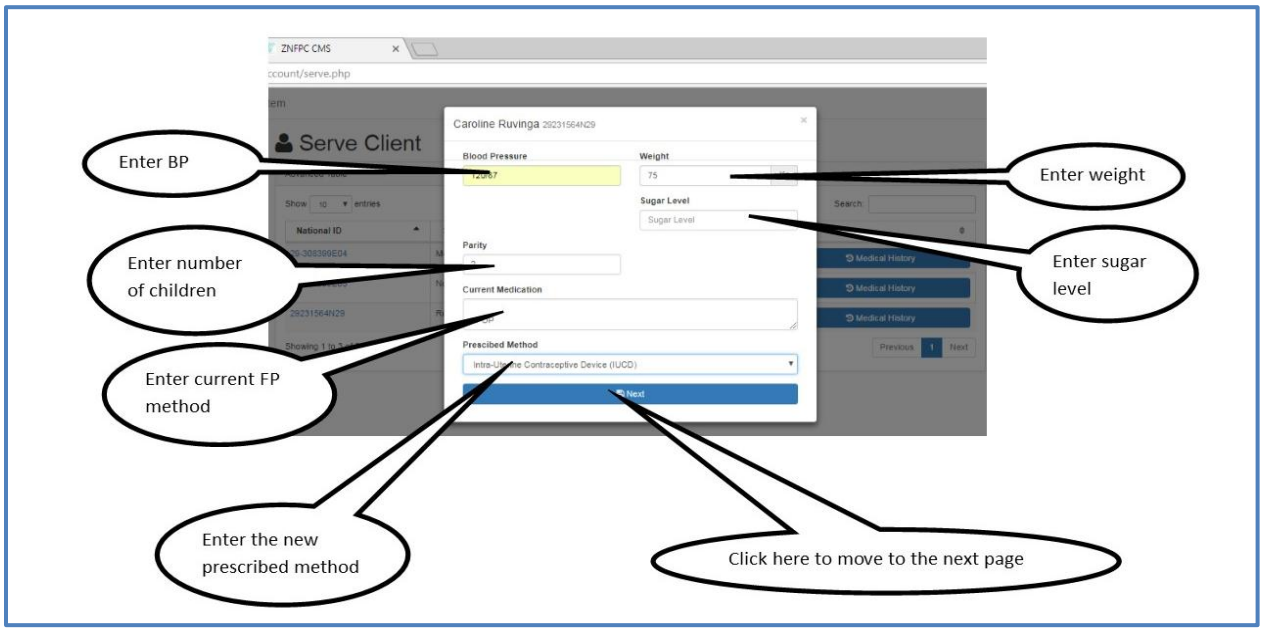
**Service Provision**

The diagram below stages in providing services to clients.

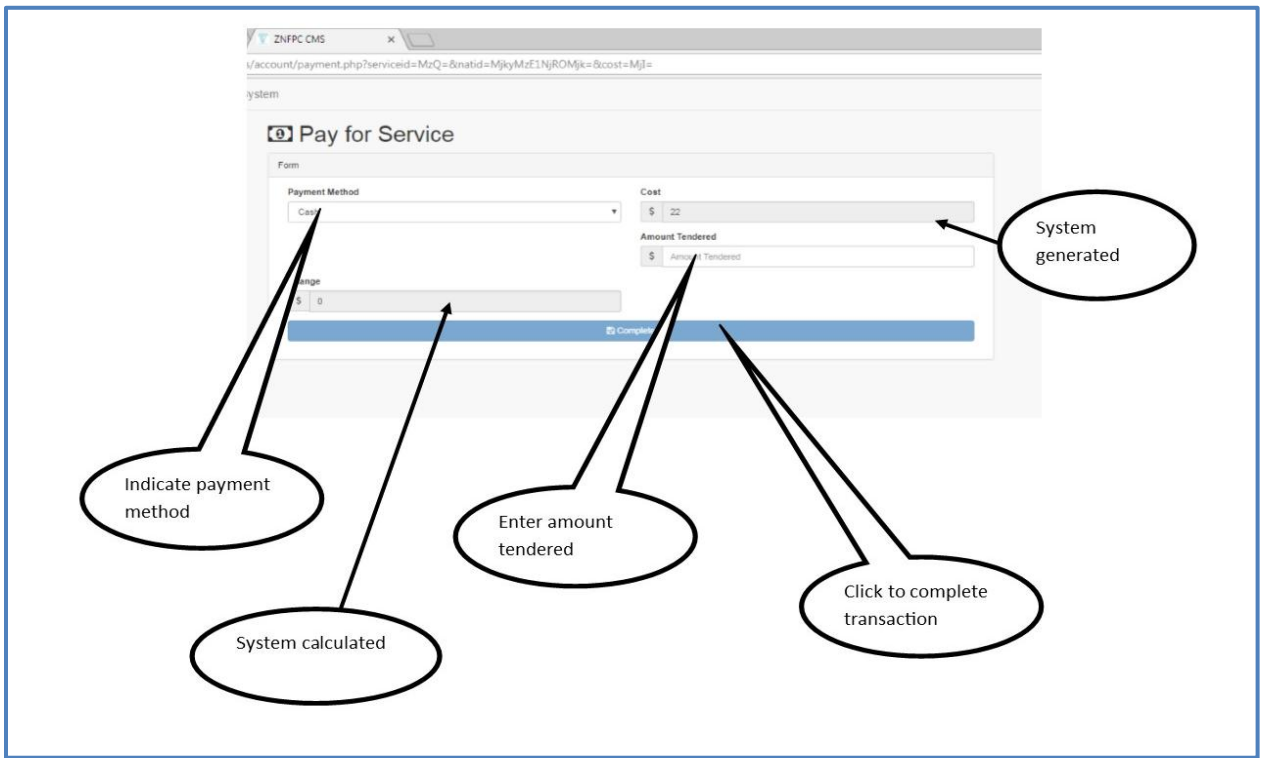



The FP services can only be rendered to registered clients. A specific client is selected as shown on the diagram above. The window also allows checking of client medical history.

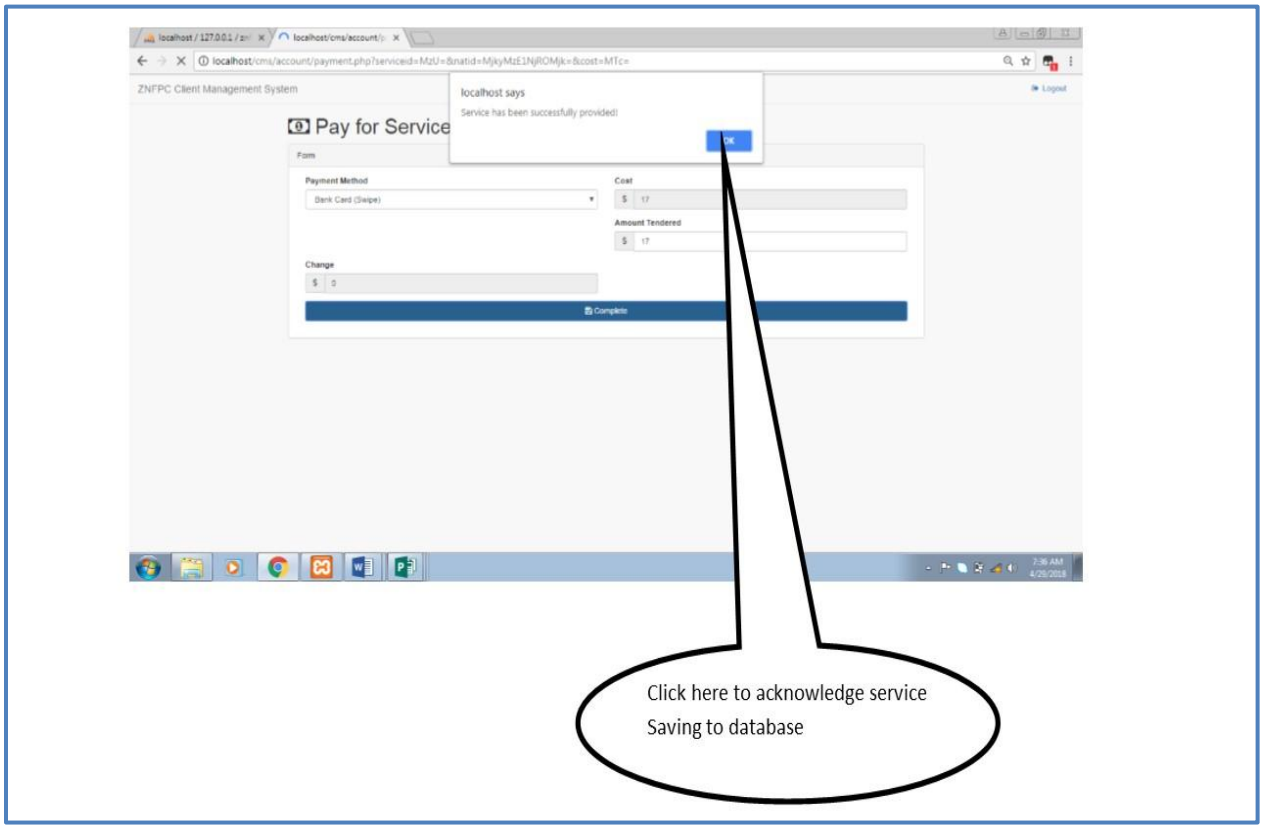
When a client is selected for a service the following window is displayed:




The following page after method prescription is the payment page shown in the diagram below:

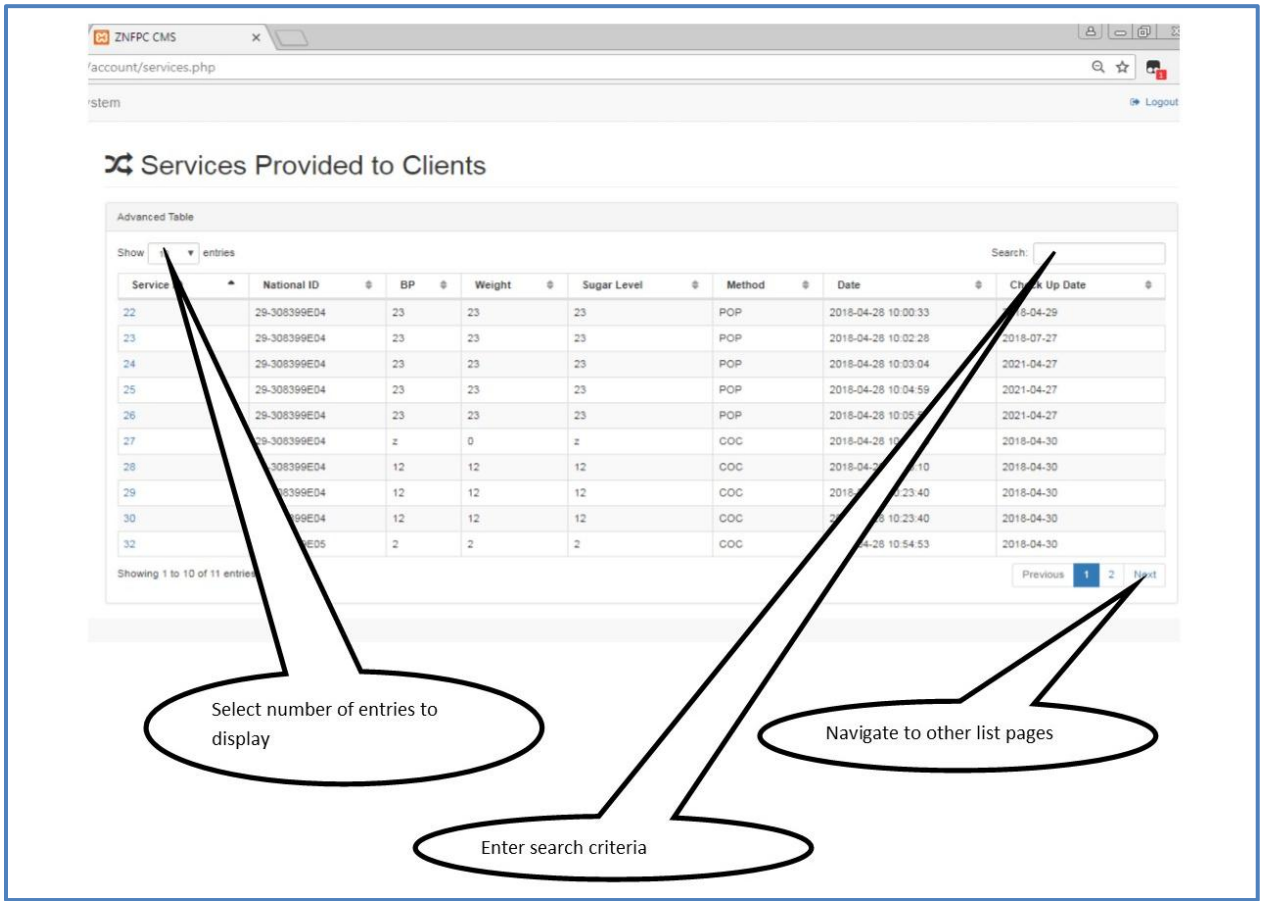


When the servicing transaction is complete, a database Saving notice pops up as highlighted below:



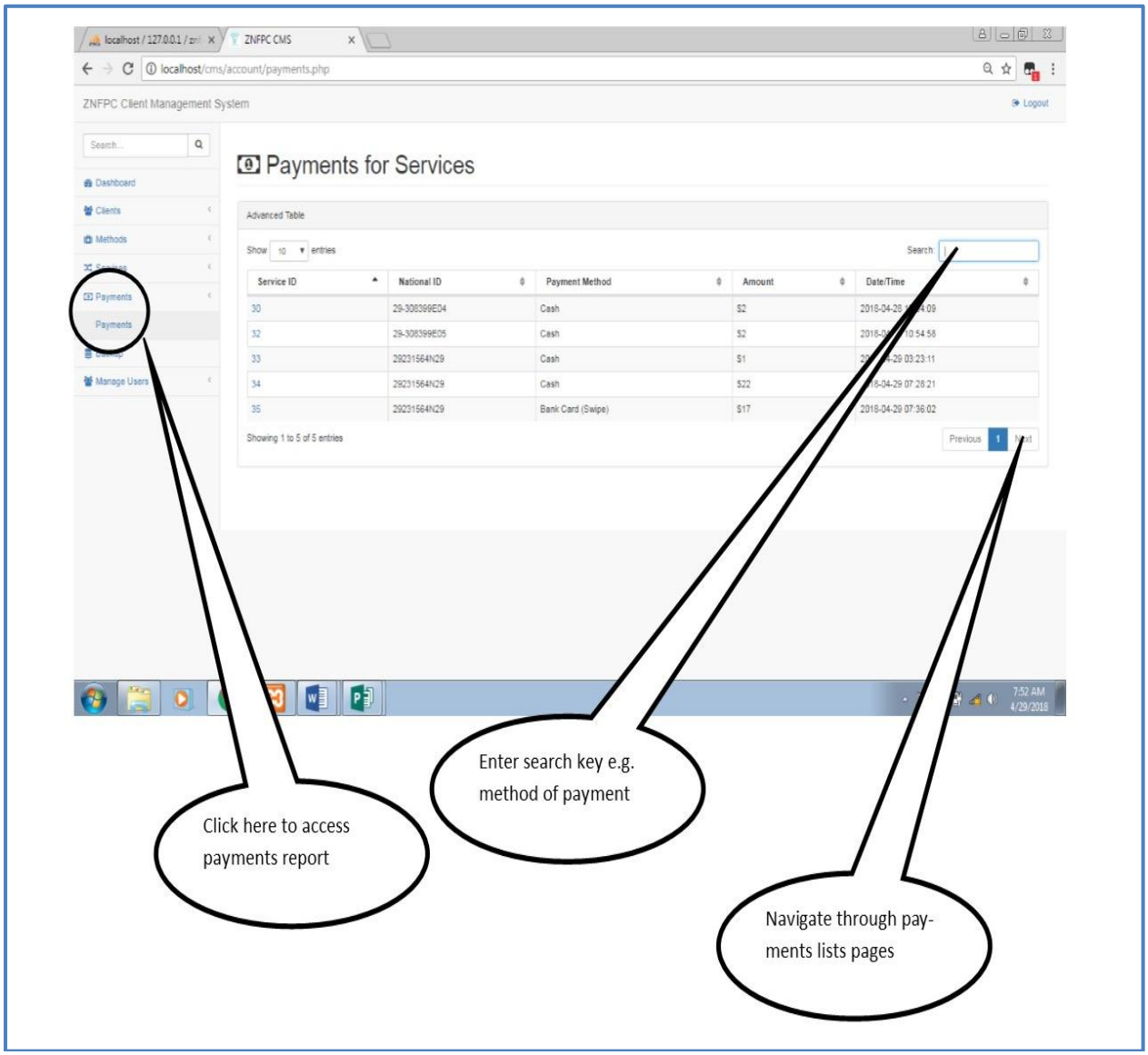
**Services Report**

The services report allows viewing of all services rendered to clients. The diagram below shows the services report window:



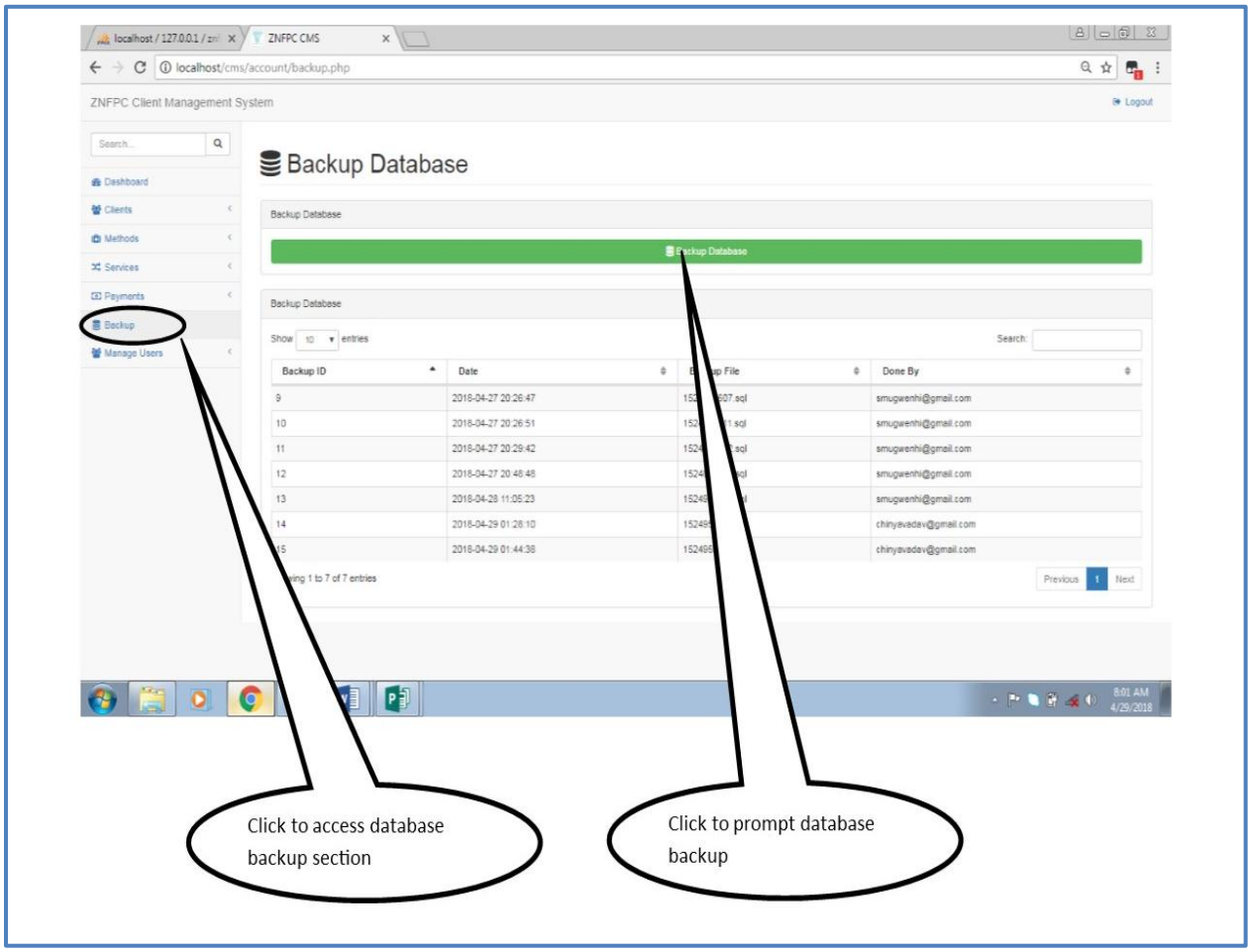
**Payments Report**

The payments report is accessed as highlighted in the diagram below:



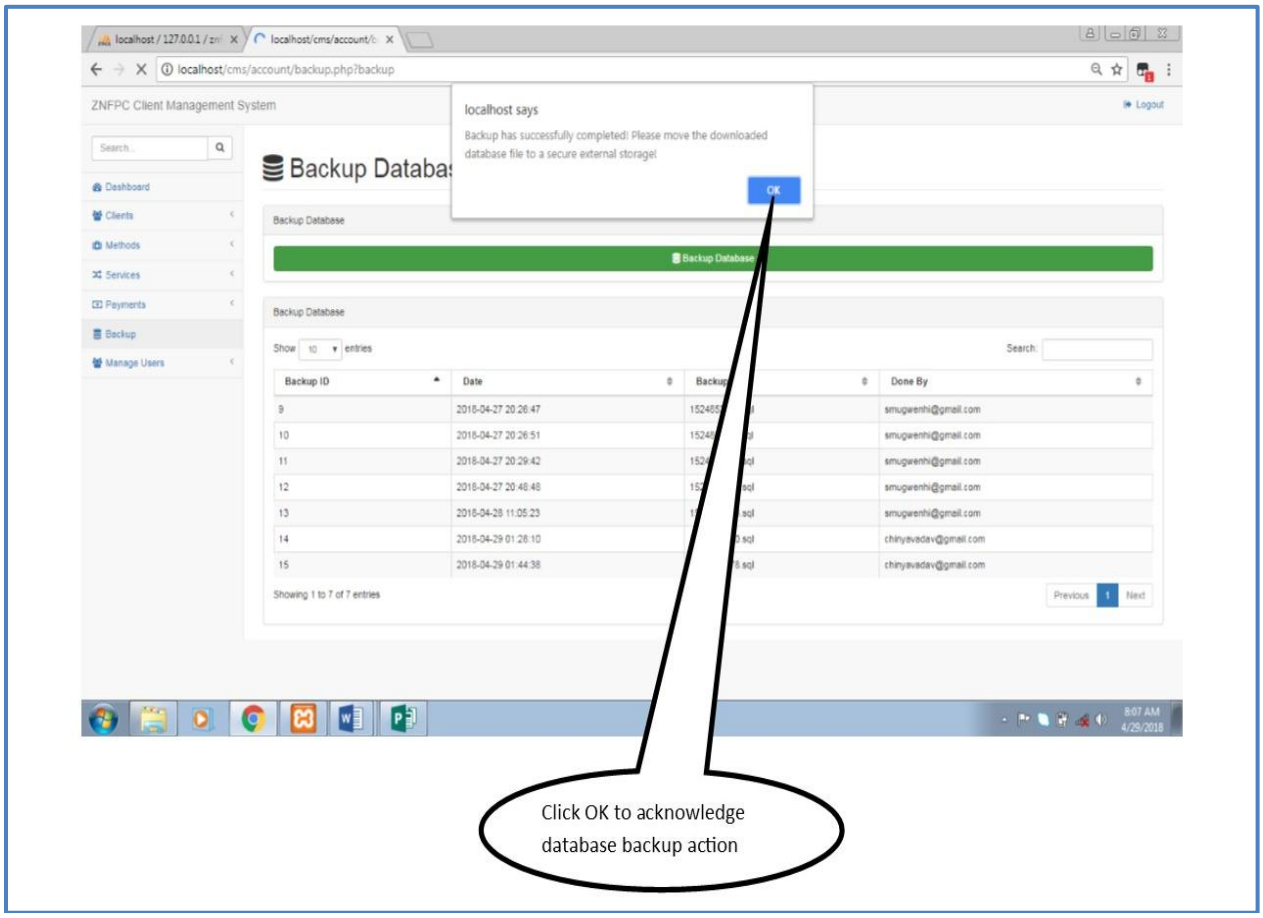
**Database backup**

The following screen shot shows how to access the database backup section:



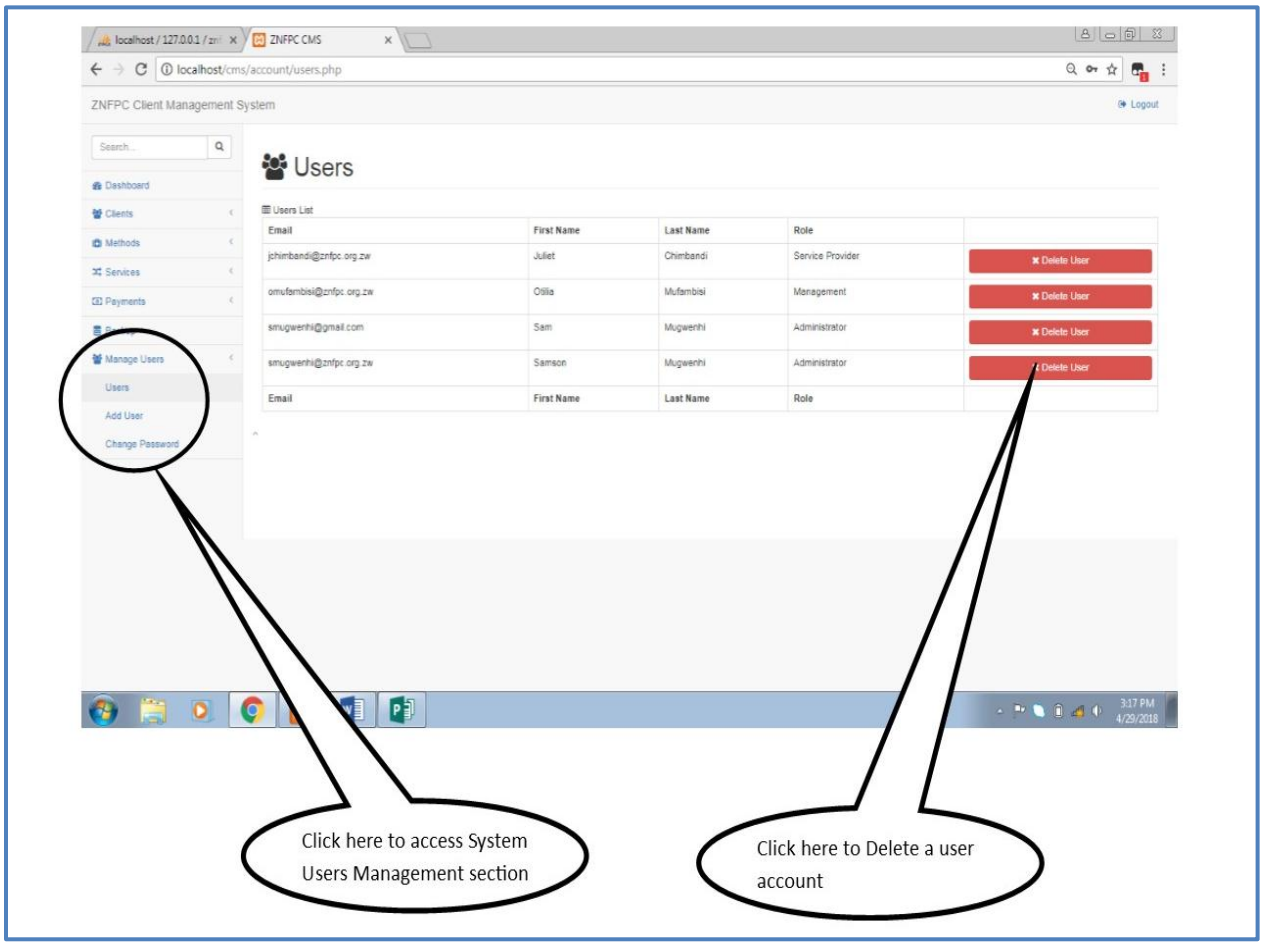
**Database backup confirmation**

Following a database backup prompt, the following pops up as a confirmation of the backup:



**System User Management**

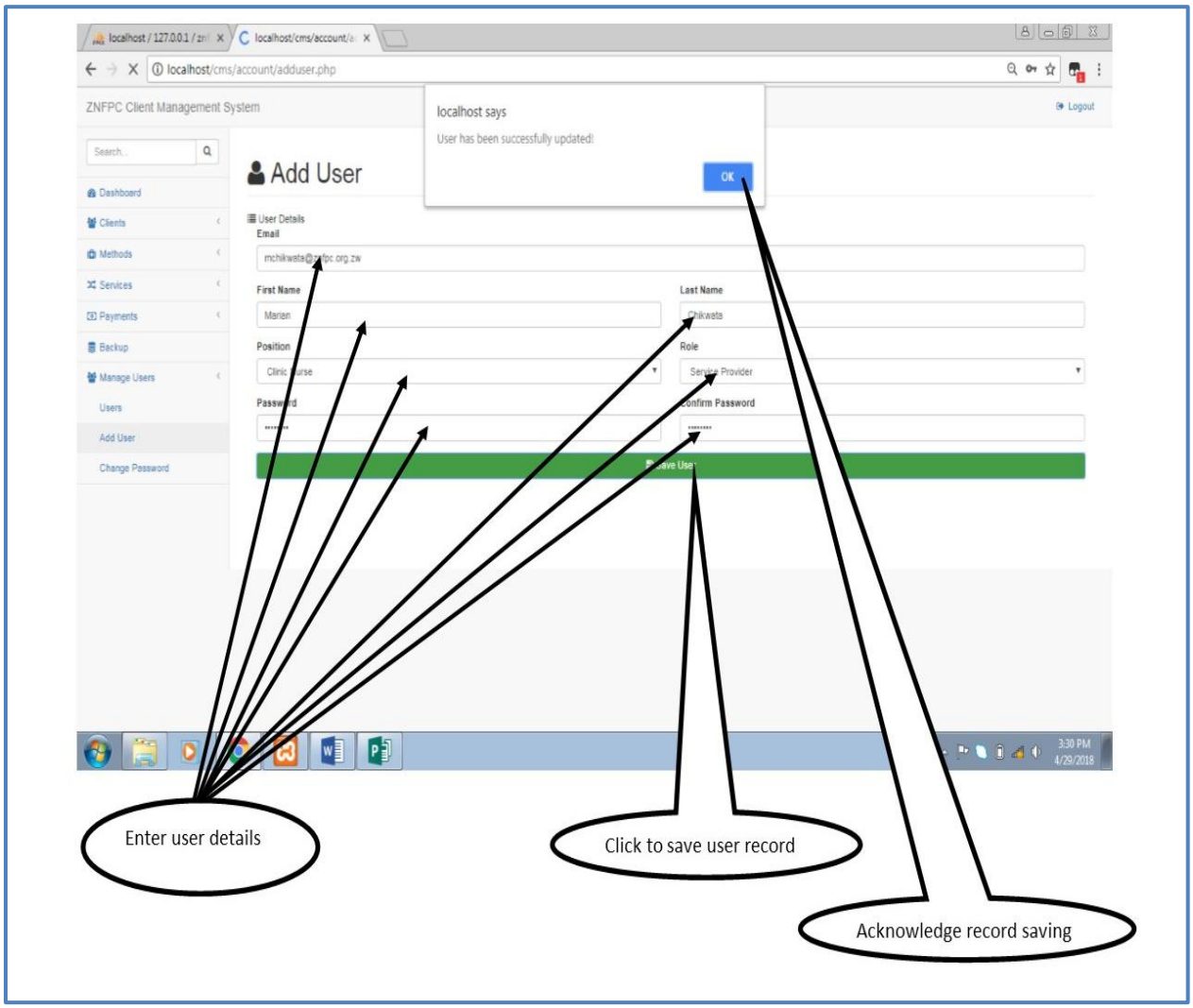
The Manage Users section allows authorised users to view systems users kept in the database. It also has option to create a new user account as well as to allow password changing by a user as a safety precaution. The following screenshot shows the User Management section:




There is also an option to delete a user account as highlighted above.

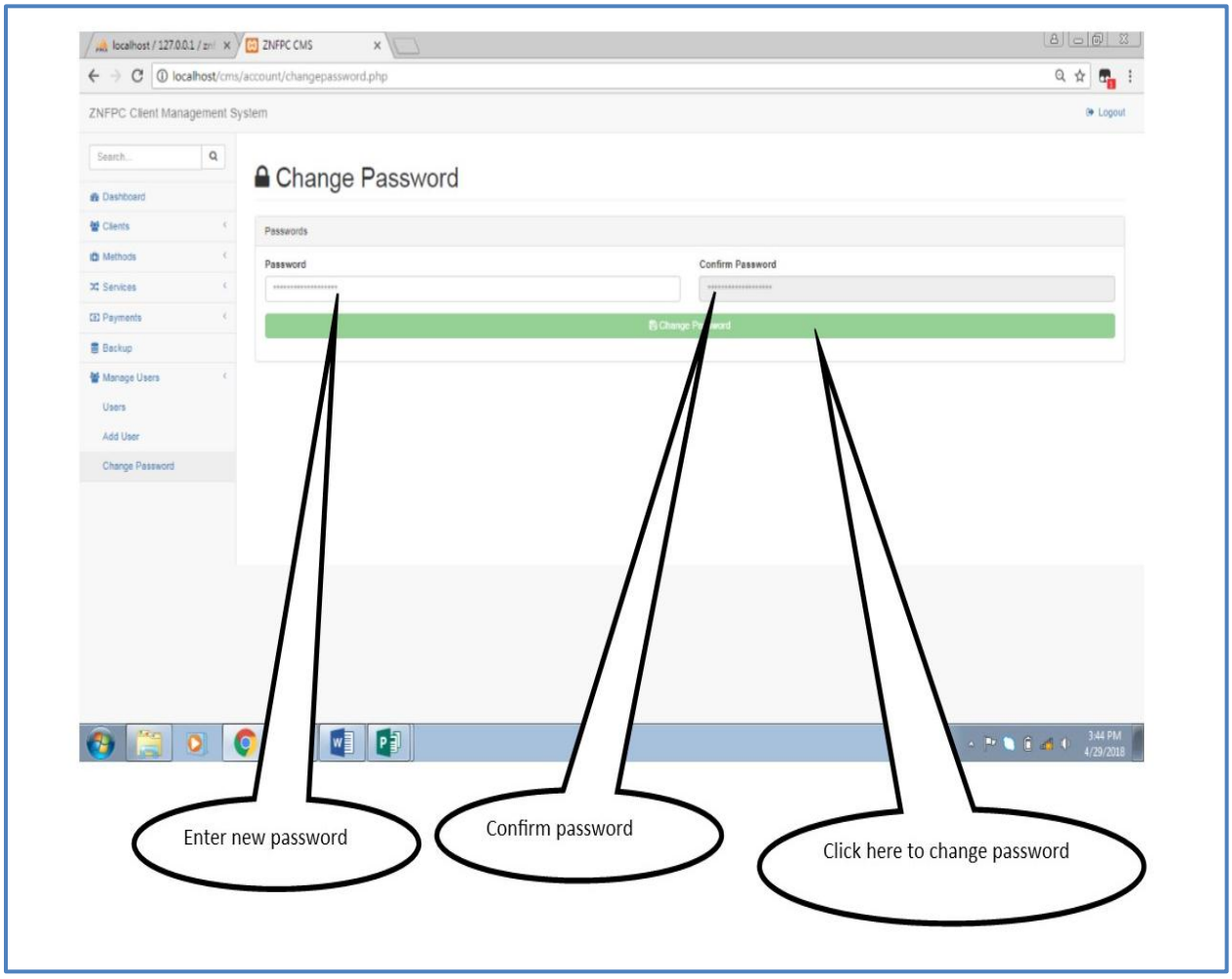
**New User Registration**

This page allows the system administrator create an account for a new authorised system user. Upon clicking the submit button, the new user's account is created and instantly the new user can login and use the system in the capacity of his or her user level.



**Password Changing**

Passwords are oftenly changed for security reasons. The following screenshot shows the password changing platform under the Manage Users section.



**APPENDIX B: INTERVIEW CHECKLIST**

NAME OF INTERVIEWER: ……...
INTERVIWEE'S NAME: ……

---

**1) ZNFPC Staff Members' Questions**

INTERVIEWEE DEPARTMENT: ……
INTERVIEWEE DESIGNATION: ……

a) Can you give a brief description of the current system of managing clients within your organisation?
b) Which activities do you carry out in your department that relates to client management?
c) Why is it important for your organisation to keep track of its clients?
d) In your own opinion, is the current system effective with regards to client information security?
e) Are you facing any challenges on client management using the current system
f) With the current system, how are reports generated?

---

**2) ZNFPC Clients' Questions**

a) What is the main reason that you typically visit the ZNFPC Static Clinic?
b) How do you describe the service process at ZNFC's Static Clinic?
c) Do you feel that the clinic should follow-up on its clients? If yes, why?
d) Are you comfortable giving your personal details and medical information to the clinic?
e) How long have you been getting services at the static clinic?

## APPENDIX C: QUESTIONNAIRE

## QUESTIONNAIRE

I am Mugwenhi Samson, an Information Systems student at the Midlands State University. The requirements of the BSc Information Systems Honors degree programme include a research project, with a practical running software. In this regard I am working on a Client Management System for the Zimbabwe National Family Planning Council (ZNFPC). This questionnaire is designed to gather information about the current ZNFPC's Client Management System. This will be the basis for building of a new system to counter challenges of the current system. In this respect I am kindly requesting for your assistance with information as coined out in this questionnaire. The respondents' identity and the information provided will be treated with utmost confidence and will only be used for scholarly purposes of this project. Your assistance is greatly appreciated

### ZNFPC Clinic Staff and Managerial Workers' QUESTIONNAIRE

NAME OF DEPARTMENT: ……

JOB TITLE: ……..

Gender: [Please tick the appropriate box]

Male ☐ Female ☐

Level of Education: [Please tick the appropriate box]

Degree ☐

Diploma ☐

Certificate ☐

Other: [specify] …….

1) In your day to day activities, do you interact directly with the organisation's clients?

……

……

……

……

2) Can you highlight the challenges that you encounter when attending to the clients?

……

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3) Why is it so important for your organisation to keep track of its clients?

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4) How do you keep records of your clients?

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5) Who compiles the reports for the static clinic?

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6) What kind of reports are produced?

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……

7) Do you think the introduction of a computerized web based ZNFPC's Client Management System would solve the problems of the current system?

……

……

……

……

……

---

***Thank you for your invaluable contribution!***

I am Mugwenhi Samson, an Information Systems student at the Midlands State University. The requirements of the BSc Information Systems Honors degree programme include a research project, with a practical running software. In this regard I am working on a Client Management System for the Zimbabwe National Family Planning Council (ZNFPC). This questionnaire is designed to gather information about the current ZNFPC's Client Management System. This will be the basis for the building of the new system to counter challenges of the current system. In this respect I am kindly requesting for your assistance with information as coined out in this questionnaire. The respondents' identity and the information provided will be treated with utmost confidence and will only be used for scholarly purposes of this project. Your assistance is greatly appreciated.

**ZNFPC Clients' QUESTIONNAIRE**

---

Gender: [Please tick the appropriate box]

Male ☐ Female ☐

Level of Education: [Please tick the appropriate box]

Degree ☐

Diploma ☐

Certificate ☐

Other: [specify] …….

1) Are you a new or revisit client to ZNFPC? [Please tick the appropriate box]

   Yes ☐ No ☐

2) If your answer to part (1) above is yes, how long have you been a client to ZNFPC?

   ……

3) During your visits to the ZNFPC Static Clinic, approximately how long do you wait to get a service?

   Weeks …….. Days ……. Hours ……. Minutes ……

4) Was there any form of communication you received from ZNFPC after getting services?

……

……

5) If your answer to number (4) above is yes, how was the communication made? [Please tick the appropriate box]

Phone call ☐

Text message ☐

WhatsApp message ☐

Email ☐

Other (specify) ……

6) How do you describe the client follow-up by ZNFPC?

……

……

……

……

……

7) Do you see the follow ups on clients by ZNFPC helpful?

……

……

……

……

……

8) How likely is that you will revisit the ZNFPC static clinic for further FP services? [Please tick the appropriate box]

Never ☐

Maybe ☐

Definitely ☐

---

***Thank you for your invaluable contribution!***

**APPENDIX D: OBSERVATION SCORE SHEET**

**OBSERVATION SCORE SHEET**

NAME OF OBSERVER: ……..

DATE: ……. TIME: ……

PLACE: …….

**Observation Focus Area:**

……

……

**Description of the current system:**

……

……

……

……

……

**Strengths of the current system observed:**

……

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**Weaknesses of the current system:**

……

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**Comments:**

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## APPENDIX E: CODE SNIPPETS

### Database connection code

```
<?php
        $host="localhost";
        $uname="root";
        $pwd="";
        $dbase="znfpc_cms";
        @$conn=mysqli_connect($host,$uname,$pwd,$dbase);
        if(!$conn){
                die(connectError());
        }
        function connectError(){
                echo "\n";
?>
        <div class='alert alert-danger alert-dismissable text-center lead'>
        <i class='fa fa-warning'></i>
        Database Error, Please Contact System Administrator!
        </div>
<?php
        }
?>
```

### Register User Code

```
<?php
   include("session.php");
   if($accessLevel!="Administrator"){
     echo "<script>alert('$accessLevel You cannot add a
user!');window.location='index.php';</script>";
     exit;
```

```
    }
    if($_SERVER["REQUEST_METHOD"]=="POST"){
        include("../includes/connection.php");
        $email0=mysqli_real_escape_string($conn,$_POST['txtemail']);
        $firstname=mysqli_real_escape_string($conn,$_POST['txtfirstname']);
        $lastname=mysqli_real_escape_string($conn,$_POST['txtlastname']);
        $depertment=mysqli_real_escape_string($conn,$_POST['cbodepartment']);
        $accesslevel0=mysqli_real_escape_string($conn,$_POST['cboaccesslevel']);
        $password=mysqli_real_escape_string($conn,$_POST['txtpassword']);

        $execute=mysqli_query($conn,"INSERT INTO tblusers
VALUES('$email0','$firstname','$lastname','$depertment','$accesslevel0','MD5($password)')") or
die(mysqli_error($conn));
        echo "<script>alert('User has been successfully
updated!');window.location='users.php';</script>";
        exit;
    }
?>
```

**Register Client Code**

```
<?php
    if($_SERVER["REQUEST_METHOD"]=="POST"){
        include("../includes/connection.php");
        $nationalid=mysqli_real_escape_string($conn,$_POST['txtnationalid']);
        $surname=mysqli_real_escape_string($conn,$_POST['txtsurname']);
        $firstname=mysqli_real_escape_string($conn,$_POST['txtfirstname']);
        $middlename=mysqli_real_escape_string($conn,$_POST['txtmiddlename']);
        $sex=mysqli_real_escape_string($conn,$_POST['cbosex']);
        $dob=mysqli_real_escape_string($conn,$_POST['dtdob']);
        $hivstatus=mysqli_real_escape_string($conn,$_POST['cbohivstatus']);
```

```
        $cell=mysqli_real_escape_string($conn,$_POST['txtcell']);
        $email=mysqli_real_escape_string($conn,$_POST['txtemail']);
        $address=mysqli_real_escape_string($conn,$_POST['txtaddress']);
        $statement="INSERT INTO tblclients
VALUES('$nationalid','$surname','$firstname','$middlename','$sex','$dob','$cell','$email','$addre
ss','$hivstatus')";
        $query=mysqli_query($conn,$statement) or die("<script>alert('Client could not be added
since a record already exists!');window.redirect='-1';</script>");
        echo "<script>alert('Client has been added into the
database!');window.location='register.php';</script>";
    }
?>
```

**Sending message Code**

```
<?php
    include("session.php");include("../includes/connection.php");
    if($_SERVER["REQUEST_METHOD"]=="POST"){
        $nationalid=mysqli_real_escape_string($conn,$_POST['txtnationalid']);
        $type=mysqli_real_escape_string($conn,$_POST['cbotype']);
        $message=mysqli_real_escape_string($conn,$_POST['txtmessage']);
        //$statement="UPDATE tblmethods SET fldtype='$type',fldprice='$price' WHERE
fldmethod_name='$method_name'";
        //$query=mysqli_query($conn,$statement) or die(mysqli_error($conn));
        echo "<script>alert('Message has been sent!');window.location='clients.php';</script>";
        exit;
    }
    if($_SERVER["REQUEST_METHOD"]=="GET" && isset($_GET['id'])){
        $nationalid=base64_decode(mysqli_real_escape_string($conn,$_GET['id']));
            $query=mysqli_query($conn,"SELECT * FROM tblclients WHERE
            fldnationalid='$nationalid' LIMIT 0,1") or die(mysqli_error($conn));
```

```
        $record=mysqli_fetch_assoc($query);
        $fname=$record['fldfirstname'];
        $lname=$record['fldlastname'];
        $cell=$record['fldcell'];
        $email=$record['fldemail'];
    }
else
{
        header("Location: clients.php");
        exit;
    }
?>
```

**Add New FP Method Code**

```
<?php
  include("session.php");include("../includes/connection.php");
  if($_SERVER["REQUEST_METHOD"]=="POST"){
    $name=$_POST["txtname"];
    $type=$_POST["cbotype"];
    $magnitude=$_POST["txtmagnitude"];
    $duration=$_POST["txtmagnitude"].' '.$_POST["cbounits"];
    $price=$_POST["txtprice"];
    $date=date('Y-m-d H:i:s');
    $query="INSERT INTO tblmethods
VALUES('$name','$type','$duration','$price','$userEmail','$date')";
    $execute=mysqli_query($conn,$query) or die(duplicate());
    echo "<script>alert('Method has been successfully
added!');window.location='index.php?link=methods';</script>";
  }
```

```
  function duplicate(){
    echo "<script>alert('Method already exists!');window.location='method.phps';</script>";
  }
?>
```

**Information backup code**

```
<?php
    include("session.php");include("../includes/connection.php");
    if(isset($_GET["backup"])){
        $datetime=date('Y-m-d H:i:s');
        $timestamp=time();
        $statement=mysqli_query($conn,"INSERT INTO tblbackups
VALUES('','$datetime','$userEmail','$timestamp.sql')") or die(mysqli_error($conn));
         echo "<script>alert('Backup has successfully completed! Please move the downloaded
database file to a secure external storage!');window.location='backup.php';</script>";
    }
?>
```