

DESIGN AND IMPLEMENTATION OF AN ONLINE PHARMACY MANAGEMENT SYSTEM

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Abstract

The purpose of an online pharmacy management system is to improve accuracy and enhance safety, communication and efficiency in the pharmaceutical store by automating the existing manual system through the implementation of a computerized equipment, and full-fledged computer software, fulfilling all requirements, in the process of data management and maintenance of records related to stock, liquid flows, staffs, customers and suppliers. This system is an integration of an aspect in Information and Communication Technology (ICT).

Information technology has done and still doing a lot to help solve and improve organization and management problems or challenges. It has been helpful in the area of empowerment, maintenance etc, to so many sectors such as business, finance, education, law, health, communication etc. Automated data storage, data security, data integrity and easy manipulation of stored data can only be possible and suitable by its use.

The methodology used in the implementation of the system is the waterfall model of System Development Life Cycle (SDLC). The required software and hardware are easily available and easy to work with. The tools used in designing the new system are PHP, HTML, CSS (the front end) for the user interface and MySQL (the back end) which is the database that the project detail will be saved into. The PHP script will handle authentication to the database. PHP will also be used for validating entry made by the user.

The program can be used in a pharmaceutical shop that has computerized systems which are not web-based. The software can generate reports, as per user's requirements, prints invoices, bills, receipts etc. It can also maintain the record of supplies sent in by the supplier, and ensure an effective communication between a customer and the pharmacy.

Keywords – Pharmacy, Management, Online, Design, Database, Automation, System, Implementation.

INTRODUCTION

Online pharmacy management system represents a concept to encompass the overall management of the activities in a pharmaceutical shop. The use of paper work in a pharmacy which involves manpower requirement has proven to be less secure, time consuming and less productive. Even though computerized systems are used, they are not web-based and are very insecure and improperly managed, thereby making it impossible to capture and retain customers as well as maximize profit to the growth of the pharmacy. This is due to the increasing nature of competition with the business world in promoting goods and services. This study is aimed to improve accuracy, enhance safety, efficiency and communication in the pharmaceutical store. New features, modules, and other components can be incorporated into the system as per user requirements in future, by reason of the technologies used to build it.

In this study, HTML, CSS, JAVASCRIPT, PHP will be utilized to implement both the front end and MySQL for the back end. HTML which means Hyper Text Markup Language is a syntax used to format a text document on the web. CSS (Cascading Style Sheet) is a style sheet language used for describing the look and formatting of a document written in a markup language. JavaScript (JS) is a dynamic computer programming language used to create dynamic functionalities to the system. Hypertext Preprocessor (PHP) handles the business logic of this system and communicates directly to the database. PHP creates a connection between the model (database) and the view (front end). MySQL which is used to design the database is the world's second most widely used open-source relational database management system (RDBMS). The SQL phrase stands for Structured Query Language.

Statement of Problem

The management and administration of a very large pharmacy to its optimum with records on papers and an inventory control system alone in a time where there is high business competition, will be fixed with a number of challenges, very tedious, difficult and incompetent in keeping up with the standard towards achieving the best as a firm, and ensuring the trust of customers.

The following problems which occurred in the pharmacy are;

1. There has been difficulty in maintaining record books to its effective use.

2. There have been issues in the effective communication and interaction between a customer and the pharmacist.
3. It has been time consuming and stressful.
4. There has been difficulty in establishing a secure database.
5. There has been issues with payment and transactions made.

Objectives

The aim of this project is to develop a web based software for the effective management of a pharmaceutical store, enabling an effective communication between the pharmacy and its customers, thereby making the purchase of drugs and other activities easy and well detailed.

This serves to achieve the following objectives:

1. Ensuring an effective purchase of drugs as well as other transactions and operations in the pharmacy.
2. Ensuring an effective policing by providing a statistical information of the drugs in stock.
3. Establishing a secure and correct database of all drugs in stock.
4. Improving the efficiency of the system by ensuring effective monitoring of services and activities.
5. To ensure that there exists a level of restricted access based on functionality and role.
6. To ensure that the system is user friendly.

Literature Review

Existing Approach(es) to the problem identified and challenges

Concept of Online Pharmacy Management System

The pharmacy management system, also known as the pharmacy information system, is a system that stores data and enables functionality that organizes and maintains the medication use process within pharmacies.

These systems may be an independent technology for the pharmacy's use only, or in a hospital setting, pharmacies may be integrated within an inpatient hospital computer physician order entry (CPOE) system.[1]

Necessary actions for a basic, functioning pharmacy management system include a user interface, data entry and retention, and security limits to protect patient health information.[2]

[3] Pharmacy computer software is usually purchased ready-made or provided by a drug

wholesaler as part of their service. Various pharmacy software operating systems are used throughout the many practice settings of pharmacy across the world.[4] [5] [6]

The pharmacy management system serves many purposes, including the safe and effective dispensing of pharmaceutical drugs. During the dispensing process, the system will prompt the pharmacist to verify the medication they have filled is for the correct patient, contains the right quantity and dosage, and displays accurate information on the prescription label. Advanced pharmacy management systems offer clinical decision support and may be configured to alert the pharmacist to perform clinical interventions, such as an opportunity to offer verbal counseling if the patient's prescription requires additional education.

The pharmacy management system approach can in general be argued to consist of two different dimensions. The first is an **inpatient pharmacy management** system which operates within hospitals and dispense medications to admitted patients receiving treatment. Inpatient pharmacists manage patient health alongside doctors and nurses, and the pharmacy management system must integrate with the various systems operating throughout the hospital to maintain accurate Electronic Medical or Health Records (EMR, EHR) and the second is an **outpatient pharmacy management system** which are retail pharmacies that offer patient care services outside of hospitals and hospital treatment facilities. The difference between inpatient and outpatient care can be seen in a wide variety of positions in healthcare.

Inpatient Pharmacy Management System

The inpatient pharmacy management system [7] allows for the following service process:

1. Upon admission, each patient's medical record is reviewed and the patient is interviewed by a pharmacist to obtain an accurate admission medication history. This facilitates the pharmacist's ability to document current medications, document compliance, ascertain what the patient took on the day of admission, understand the past medical history and history of present illness, review all allergies, identify adverse drug reactions and be involved with caring for issues such as alcohol, tobacco use and immunization status.
2. All new medication orders are reviewed for appropriateness by a pharmacist to determine and eliminate any medication therapy problems.
3. Pharmaceutical needs of the patient are reassessed as needed or as the patient's condition changes.

4. Pharmacists prescribe drug therapy regimens as authorized by hospital protocols, including ordering of tests and laboratory values to monitor drug therapy for appropriateness.
5. Patient progress and medication recommendations are communicated to the primary provider and documented in the electronic medical record.
6. Pharmacists play a key role in discharge plans for patients with discharge medications, including educating patients and/or caregivers, facilitating continuity of care, assisting with reimbursement issues, providing medication adherence aids and documenting all activities in the medical record.
7. Pharmacists control the drug distribution systems to ensure that the right medication and the right dose is administered via the right route to the right patient at the right time, as well as maintain the safety of the medication use system.
8. Pharmacists assist in the development, implementation and maintenance of decision support software systems aimed at decreasing costs and improving the quality of care.
9. Pharmacists help to educate future caregivers by precepting pharmacy students and pharmacy residents and are involved with continuing education by providing in-services.
10. Pharmacy staff coordinates the storage, preparation and distribution of all medications, including sterile products, and ensure full compliance with national standards of practice
11. Pharmacy staff members monitor medication shortages, and when necessary, work with physicians to determine appropriate alternative therapies.
12. The pharmacy department periodically conducts patient and internal customer satisfaction surveys to determine customer expectations and to identify performance improvement initiatives. The results of those surveys are used to improve pharmacy services by aligning services to patient needs and expectations.

Outpatient Pharmacy Management System

The outpatient pharmacy management system [8] allows the pharmacy to carry out daily operations. Available features vary across different systems, but all pharmacies require core functions and capabilities to perform their duties.

1. **Dispensing Workflow Management:** The action most associated with pharmacy is the dispensing of medication. Dispensing occurs from receiving the prescription from the patient or prescriber to finalizing the prescription before it is picked up by the patient. This includes operations like Intake, Pre-Check, Fill and Check.
2. **Third Party Claims Adjudication:** Pharmacists work alongside physicians and payers to coordinate patient insurance benefits. The pharmacy management system can be an asset in this process. In cases involving a medication not covered by the patient's insurance company, the pharmacist must receive prior authorization from payers to dispense the medication. Some available systems are capable of automatically generating prior authorization requests and completing claim adjudications.
3. **Clinical Information Management:** The Patient Profile summarizes patient data in a cohesive display. Pharmacies use patient profiles to document basic information (age, address, phone number, allergies), known health conditions, insurance and prescriber information, laboratory values, immunization history, and other necessary details related to patient care management. Prescription Profiles record patient fill histories (both prescription and non-prescription medications) so pharmacists can monitor adherence, prevent duplicate or conflicting therapies, and avoid negative drug interactions. Medication Synchronization, or med sync, is ideal for patients with multiple maintenance medications. The pharmacist organizes all of the patient's medications to be filled on the same date each month, minimizing patient confusion and the number of visits to the pharmacy.
4. **Inventory Management:** Various systems provide inventory management tools that allow pharmacists to reorder items, return unused stock, and organize shelf labels. Ideally, pharmacies keep a lean inventory to avoid spending money on products that remain undispensed on their shelves. Pharmacy management systems also support the electronic data exchange (EDI) between pharmacies and wholesalers, which digitizes shipping and receiving orders, catalog updates, and pricing changes.
5. **Pricing and Billing:** Within a pharmacy, financial intelligence is crucial for maintaining the store's business. Pharmacy management systems are capable of identifying profit and losses from direct and indirect remuneration (DIR) fees, rebilling third parties for claims resubmissions, and tracking market changes so the pharmacy can continually offer competitive prices.
6. **Reporting:** Because pharmacies interact with patients and multiple facets of healthcare (payers, prescribers, facilities, etc.), they gather and store data within their pharmacy

management systems. This data may be utilized for implementing business intelligence practices, documenting patient responses to new care strategies, or supplied to an auditor during an inspection or certification process.

Challenges of the Traditional Pharmacy Management

- 1) Data was constantly being duplicated. This was time-consuming and resources were being wasted (For example, the use of stationary).
- 2) Some of the data entered were redundant as there was no repetition check as with a computer.
- 3) The office space had to be increased as more space was needed to store filing cabinets as the amount of paper increased.
- 4) Lack of security as data was stored in filing cabinets. Without the knowledge of the pharmacy, unauthorized users may have had access to confidential information.
- 5) Data was only being accessed by one employee at a time. This was time-consuming. Hence, this made the service rendered unproductive.
- 6) Data was constantly being misplaced. This jeopardized the pharmacy's business work.
- 7) In some instances, it took a long period to locate the relevant data when a customer came to make a purchase. This led to sales being drastically being dropped most pharmacies got a bad reputation to customers.
- 8) Risk of data being destroyed due to natural disasters, age, etc
- 9) Manual inventory system were being used in some pharmacies but it was highly labour-intensive to operate. This was so because they require continuous monitoring to ensure that each transaction is accounted for and that products are maintained at the appropriate stocking levels. It was also more difficult to share inventory information, because the lack of computerization made accessing inventory records a more cumbersome process.
- 10) The manual inventory system which relies heavily on the actions of people, increases the possibility of human error. The pharmacists or workers forgetting to record a transaction or simply miscounting the number of pharmaceutical products, resulted in needless additional orders that increased to the company's inventory carrying costs and using up precious storage space.

All the mentioned challenges have brought an increasing tension between the needs of pharmacy customers – the need for a patient to be properly educated about their own care, and how the dispensed medications must be used to facilitate that care – and the pharmacist's ability, in terms of time and knowledge, to meet them.

Efforts to counter or solve the existing challenges

The Outpatient software vendors are:

- i. **PioneerRx:** PioneerRx's windows-based pharmacy management system first debuted in 2008. The software is updated weekly and includes functionality suggested and voted on by its users. Its main features include medication synchronization management, configurable clinical decision support, user-customizable reports, financial intelligence, and an enhanced workflow. It also offers mobile applications for inventory management, delivery, and patient counseling [9].
- ii. **Rx30:** It was developed in Florida in 1980, as a multi-platform software that offers automated pharmacy processes, vendor integrations, and compounding functionality [10][11]. The Core Services include Accounts Receivable, Point of Sale, and Virtual Pharmacist, a feature that automates the refill process. On the 6th of October 2016, this computer software announced its merger with Computer-Rx [12].
- iii. **NRx by QS/1 :** QS/1 offers healthcare software to effectively manage independent, chain, hospital outpatient and long-term care pharmacies and HME (Home Medical equipment [13]) businesses. QS/1 is the only vendor with an integrated suite of products, including point-of-sale, IVR (Interactive Voice Response), document management, mobile refills, delivery apps, built-in prescription synchronization and HME documentation [14]. QS/1 offers multiple pharmacy software solutions, including NRx. NRx's capabilities include advanced security, real-time workflow monitoring, patient education monographs, etc [15] [16].

The outpatient software vendors were all Computer-Rx pharmacy software. Rx on the other hand is short hand for the latin imperative recipere, meaning "**take**". It was a directive to the pharmacist to "take" a set of ingredients to make up the drug by hand. Rx has carried over since then as one of the latin abbreviations that we continue to use in the modern medical world [17].

The Inpatient software vendors are:

- i. **Epic Willow:** Epic software currently manages over 200 million patient electronic records [18]. The Willow Inpatient Pharmacy System, when combined with other Epic systems, allows pharmacies access to medical administration records (MAR) and links all aspects of the ordering and dispensing process to simplify collaboration amongst all parties involved in patient care management [19].

- ii. **Cerner PharmNet Medication Manager:** Cerner Corporation has provided health information technology (HIT) to hospitals and healthcare systems since 1979 [20]. Cerner PharmNet enables pharmacists to automate their workflow processes and center care around the patient. This software allows pharmacists and doctors to manage prescriptions and verification from the same order in order to streamline medication management [21].

System Analysis

Analysis of Existing System

1. The pharmacy runs a computerized inventory control system to keep track of the amount of medication that is available and help reduce costs, monitor expired medications and par levels. It keeps records of when medications are received, dispensed, recalled, or sent for waste. Drugs are purchased from a wholesaler, each of which has a unique system for ordering and in some situations have the ability to establish a perpetual inventory that automatically maintains set quantities of commonly used medication. The pharmacist keeps adequate inventory that fulfils patient needs with minimizing unnecessary stock.
2. The pharmacist maintains the pharmacy record as a paper-based record, alongside the pharmacy procedures.
3. The pharmacy maintains orders by collecting customers'/patients' purchases orders and issues an order form to new customers.
4. The pharmacy has a supermarket unit which offers a wide range of Fast-Moving Consumer Goods (FMCG) which includes but not limited to cosmetics, household equipment, water, drinks and beverages, foods, confectionaries, stationaries etc.
5. The pharmacy has sales and distribution unit where Pharmaceutical products, medical, laboratory and diagnostic equipment, medical reagents and consumables, Chemicals and other related products are sold and distributed.
6. The pharmacist as well as the employees most times get to see the customer or patient one on one for medication counselling, drug information services, adverse drug reaction monitoring, referral/linkage services, medication profiling etc.

Problems of the existing system

The process of the pharmaceutical management of both drugs, customers/patient, and other services is very stressful and time consuming. Problems associated with the existing system are as follows:

1. Inadequate Record Keeping and purchase ordering: The process of collecting customers'/patients' purchases order is very tedious. The record keeping system is very poor. Losses of vital records have been reported in the past and besides, protecting the file system from unauthorized access is a problem that has defied solution.
2. Delay in conveying vital information: Unnecessary time is wasted conveying information through the ladder of authority. Management at times seeks to get a copy of the customer's order form and this may take a lot of time to obtain it.
3. Due to problems above, there has been reduction in production flow.
4. There have been issues publicizing the pharmacy with its wide range of pharmaceutical services to the public, leading to low revenue and loss of value for the pharmacy.
5. Too much work load has been on the employees as well as the pharmacist.

Analysis of Proposed System

From the problems listed in the existing system, the implementation of the proposed system shall focus on;

1. Both the pharmacists and customer having access to the proposed system at any time.
2. Ensuring effective publicity of pharmaceutical products and services in the pharmacy.
3. Reducing the employees and pharmacist workload by creating an easy avenue for communication between customer and pharmacy.
4. Improving the efficiency of the system by ensuring effective monitoring of services and activities.
5. Providing accuracy and security to all the information of a customer, thereby leading to no unnecessary losses.
6. Providing an information retrieval system for data stored.

Data Flow Diagram (DFD)

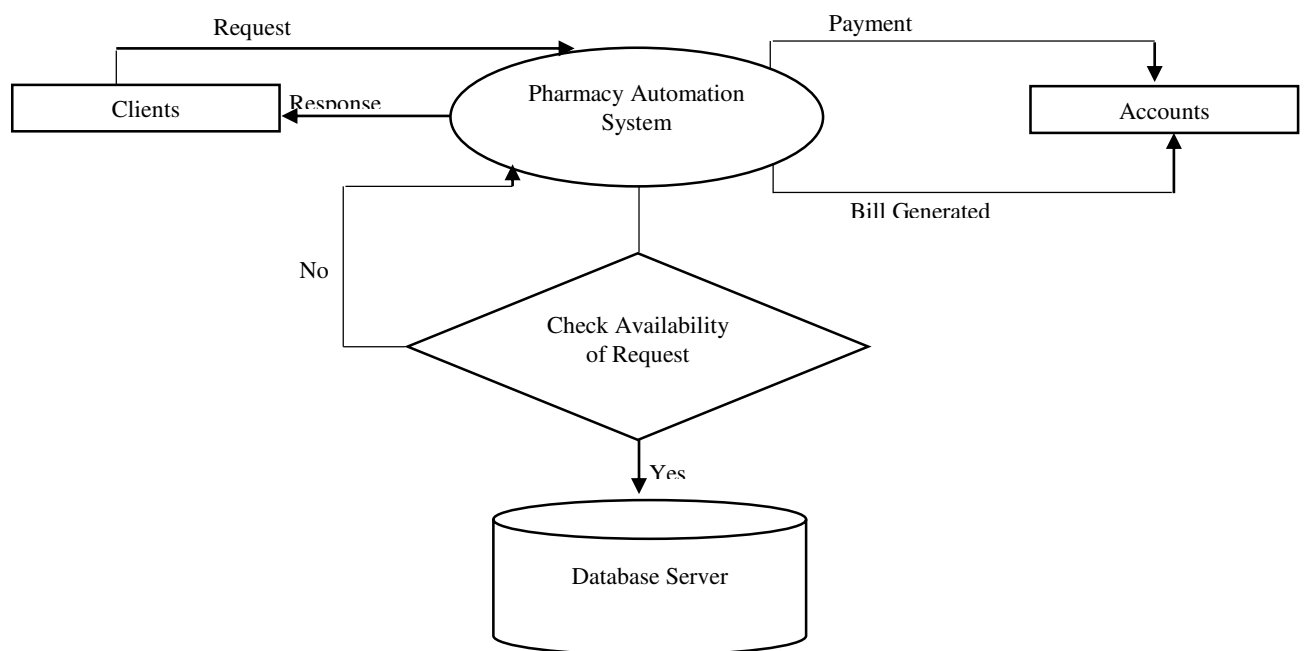


Fig. 1.1 DFD

System Design

Main menu specification

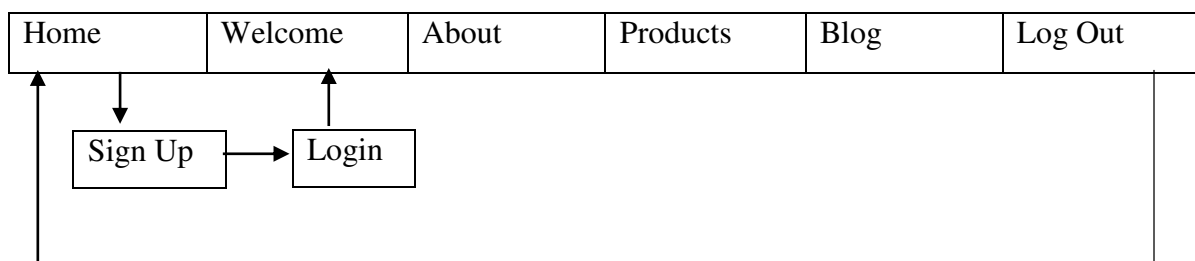
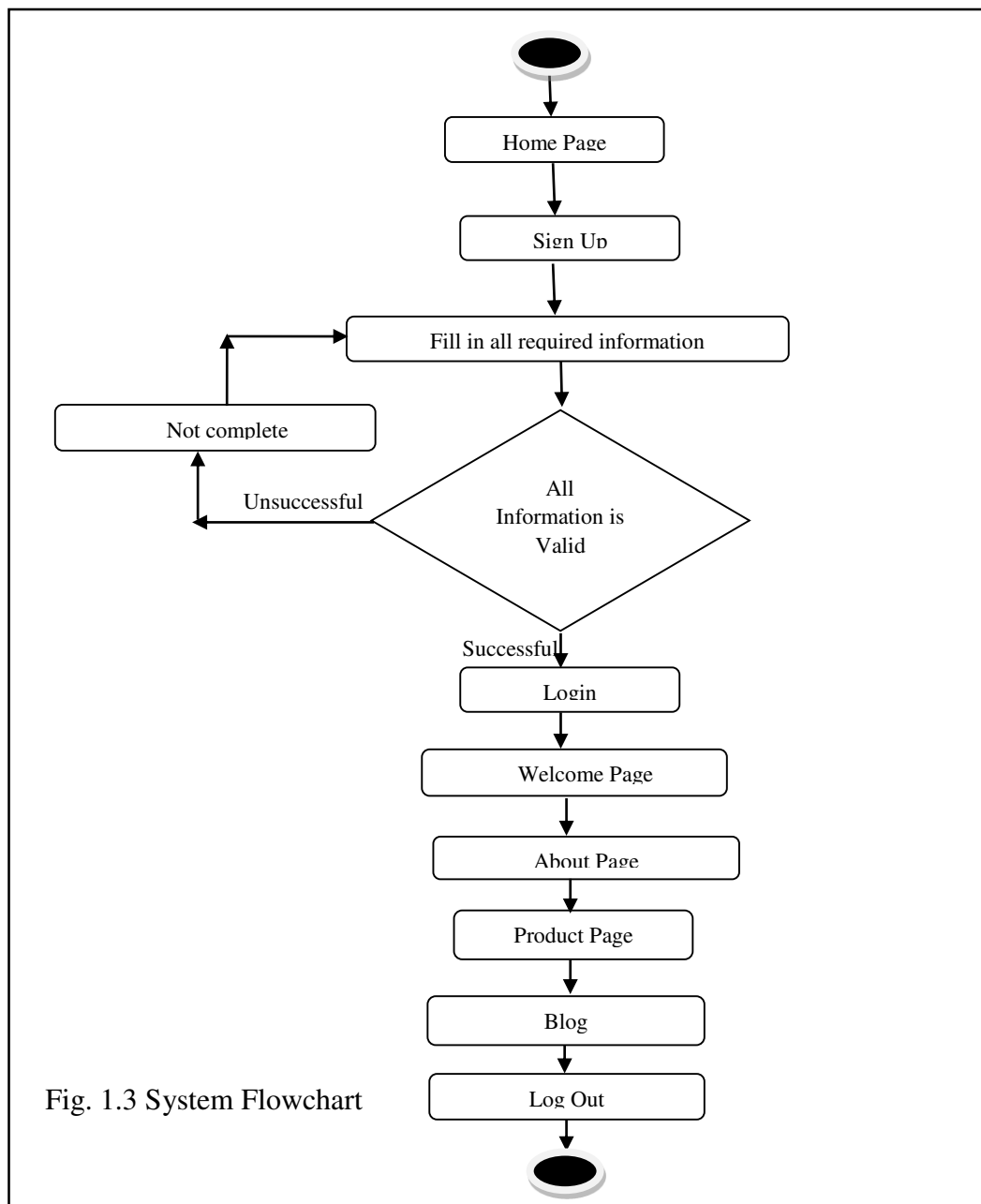
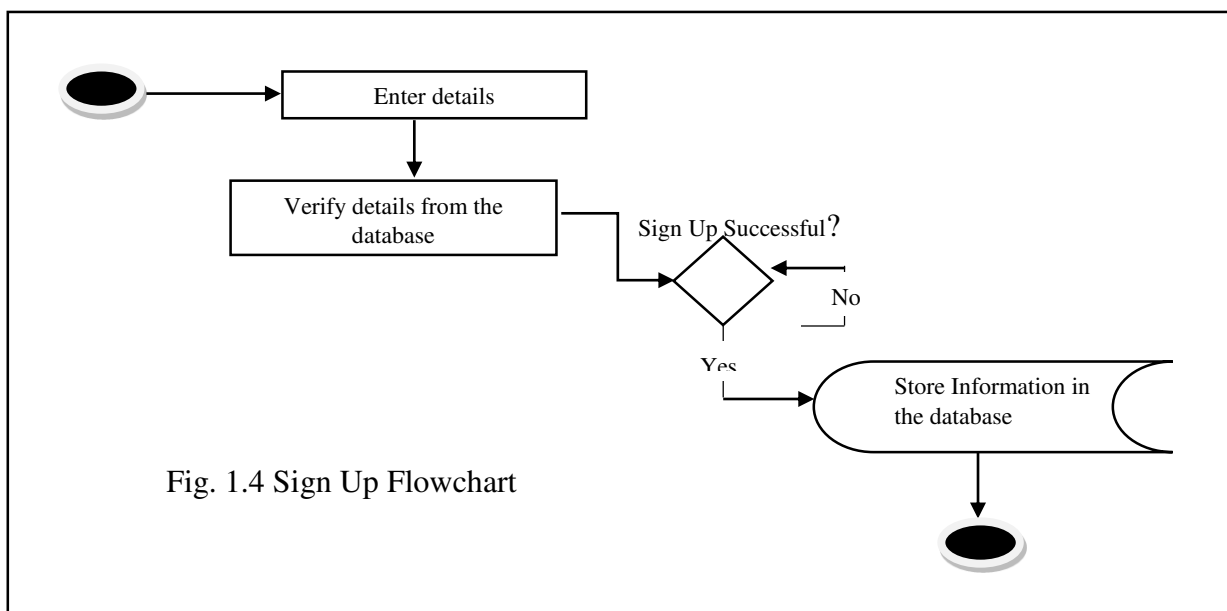


Fig. 1.2 Main Menu Design

Overview of the system flowchart



Procedural flowchart - Patient's Registration Sign Up Flowchart



Patient's Login Flowchart

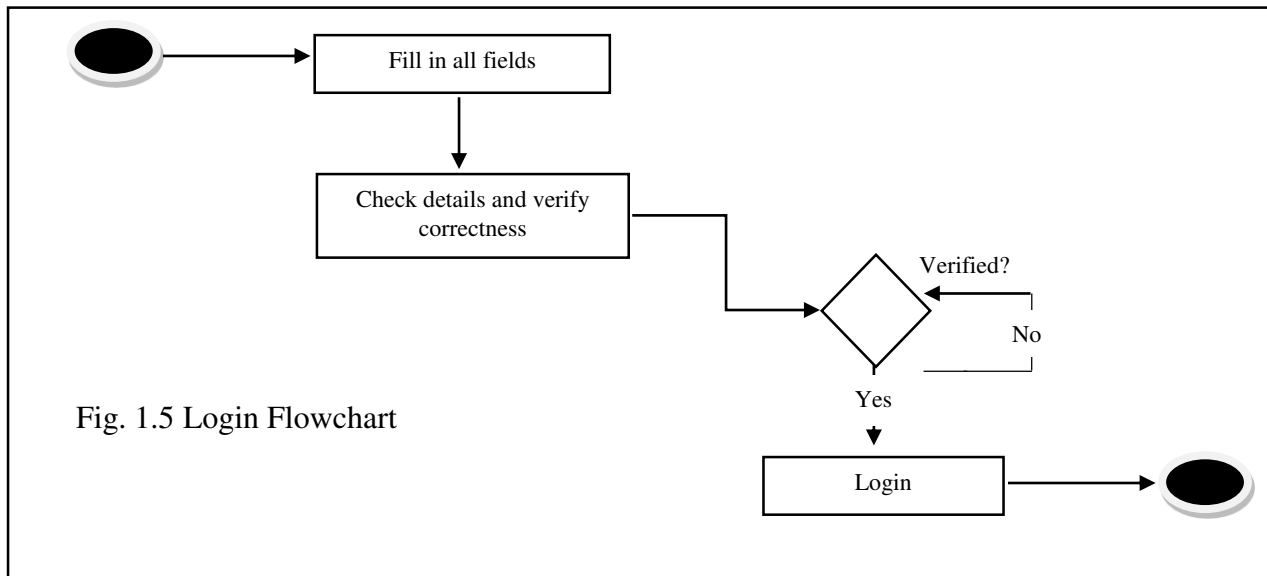


Fig. 1.5 Login Flowchart

Conclusion

In conclusion, the new computerized system which handles, the verification of an authorized user into the pharmacy, the security to the database of the pharmacy management system and the purchase of drugs has achieved 85% of its' objectives as stated in chapter one of this research report. This new proposed system would ensure data authenticity and validations.

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