CHRISTIAN SERVICE UNIVERSITY COLLEGE

DEPARTMENT OF COMPUTER SCIENCE

NWOMA-BOOKSHOP (ONLINE E-BOOKSHOP)

THIS PROJECT IS SUBMITTED TO THE DEPARTMENT OF COMPUTER SCIENCE IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

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JUNE, 2015

DECLARATION

"I declare that I have wholly undertaken the study reported herein submitted"

_____ _____

Tweneboah Emmanuel Date

SUPERVISOR

"I declare that I have supervised this student in undertaking the study herein and I confirm that the student have my permission to present it for assessment."

_____ _____

Dr. Thomas Yeboah Date

DEDICATION

This project is dedicated to the Lord God Almighty for His grace and mercies and faithfulness towards me throughout my stay on campus. Also to my family, friends and loved ones who have supported me in one way or the other.

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It has been an interesting semester to say the least and the memories of this semester will not be forgotten.

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CHAPTER ONE

INTRODUCTION

1.1 OVERVIEW / PROJECT BACKGROUND

It is quite burdensome when one has to carry hardcopy books from one place to another even if it's just one book and has a lot of pages, they all add up to the weight.

Also, one might have a liking to novels and would want to read two or more of novel books in specified times but because of weight, it discourages one to proceed with the initial plan. In most cases too especially with novels, one might find it difficult to remember the pages they got; thus theywould be flipping through pages for some time before they locate where they left off.

Hardcopy books on the other hand are subject to time and usage. No matter how much one is careful with such books, over time and usage, they are subjected to age and tear. With the recent uproar of blackout being experienced across the country, reading becomes very difficult at night when there is a blackout.

In some cases, the font sizes of some books are small to the extent reading becomes difficult for some people with eye defects.

Has search functionality where users can type in the name of the book they are looking out for and in less than a minute results are returned with book availability or not. With this users do not waste time in searching for desired books. Again the shop owner can search for books by their ISBN numbers and even users.

Payment method is by voucher which will be sold at certain outlets and kiosks for easy purchase. By the use of voucher users are able to top-up their account balance which in turn are used to make purchasing of books.

Tracking of users' purchases is possible in order to know which books are being purchased the most possibly lead to most popular book or author of the week.

NWOMA-BOOKSHOP is an electronic bookshop where people can buy and download their desired books under various categories such as Art and Photography, Graphics and Comic Novels and others.

The advancing technological world as we have now is gradually being dominated with what is termed as smart phones and tablets. These devices operate on several operating systems such as android, windows, IOS, Ubuntu. Almost all these systems are able to view data in pdf format. These devices include Apple Ipad, Samsung Galaxy tablets, Lenovo, HP and others.

Although there are different file extensions in each of the operating systems, there is the availability for each of these operating systems to view pdf files.

The portability of these devices makes it possible for people to move all the books they will need from one place to the other with minimal problems. This clearly eliminates weight and bulky nature of physical books.

Again there is the ease of storage of books on electronic devices and ease of retrieval when needed and E-Bookshop makes it easier to store by eliminating the copying from PC to mobile devices like phones, tablets and Ipads since one can login to his/her account and access the download page of bought books to download directly to the preferred device.

Unlike books arranged on shelves at a physical bookshop or in the library, E-Bookshop can be seen as such but with a simplified search system where one can find the desired book easily without any hustle and in a short amount of time. In some cases, one can go through all the shelves in a bookshop without fining the desired book but with E-Bookshop, the desired book is either found or not in a matter of seconds.

1.2 MOTIVATION

With the increase in technological advancement in payment systems electronically, there is the need for local bookshops to also take advantage of these and expand their market niche. With the orthodox way of selling and buying of books where one goes to the book shop, goes through a number of books on shelves in order to find what he/she is looking for or find an interesting book. These tend to be time consuming and time wasting especially when the book in search for is unavailable.

Henceforth, the motivation behind this project to simplify the processes involved in bookshops and speed up the searching and buying of books.

1.3 PROBLEM DEFINITION

The essential purpose of creating this web application is to help reduce and possibly eliminate the issues presented by hardcopy books such as portability inconvenience, health related conditions over extended carrying of books around, keeping of the books in good shape over time and even with our current “dumsor” problem, reading cannot be made at night when there is no light.

Hard copy books as we have now have good covers to last for a long time but no matter how well they are kept, they are subject to age and over time will start to worn out even after extended usage. Again there are people who are not good at keeping books well, mishandle them and end up increasing the rate of their deterioration.

In addition, with the current electricity problem (dumsor) reading in the dark becomes very difficult and not much homes, work places and schools have generators to give power at night. This brings about difficulty in reading. In most cases workers who have to read on aspects of their project in order to present to a committee or panel find themselves wanting. Tertiary students on the other hand face similar problems especially those in Humanities and Linguistics. The deal with a lot of reading and without light on various campuses and even hostels, reading at night becomes a challenge to them.

Moreover, faced with situations where the eye sights of readers are poor books with small font sizes pose a challenge to them especially where they do not have their spectacles with them. This is because there is no way that one can enlarge the fonts of hard copy books after they have already been printed.

Last but not least, portability of a number of books in backpacks is quite troublesome when one has to move from one place to another with all the weight behind him. This in a way can kill interest in people to read books wherever they go and even health related cases such as coughs.

Finally with the release of new books like “Bound to lose, Destined to Win” back in the year 2013, such books (hard copy) are not available in a country like Ghana and would

take months before copies of these new releases will get to our country; this can go as far as a year and the price for such books are very expensive.

1.4 AIM OF PROJECT

The aim of the project is to develop a web application for the bookshop (NWOMA-BOOKSHOP) owner and customers both near and far and to totally eliminate delivery problems like, delivering to wrong address or customer providing incorrect address.

1.5 SPECIFIC OBJECTIVES

The application will enable users to:

- Upload e-books online to be sold to registered users and to view books description by both new and old users before making a purchase for the desired book
- Reduce the time spent in searching for books in shelves.
- Help with customer service in terms of funds and purchases made.
- Search for users easily by their names to view their full info
- Download purchased books to their devices anytime anywhere with internet access.
- Brings books unavailable in the country to users in the country and afar

1.6 DEFINITION AND TERMINOLOGIES

- ISBN: it is a unique numeric commercial book identifier. An ISBN is assigned to each edition and variation (except reprinting) of a book. For example an e-book, a paperback and a hardcover edition of the same book would each have a different ISBN. The ISBN is 13 digits long if assigned on or after 1 January 2007, and 10 digits long if assigned before 2007. The method of assigning an ISBN is nation based, and varies from state to state often depending on how large the publishing industry is within a state.
- SMARTPHONE: a smartphone (or smart phone) is a mobile phone with an advanced mobile operating system. They typically combine the features of a cell phone with those of other popular mobile devices, such as personal digital assistant (PDA), media player and GPS navigation unit. Most smartphones have a touchscreen user interface, can run third-party apps and are camera phones. Most smartphone produced from 2012 onwards also have high-speed mobile broadband 4G LTE internet, motion sensors and mobile payment mechanisms.
- VOUCHER: A voucher is a bon of the redeemable transaction type which is orthaertain monetary value and which may be spent only for specific reason on a specific goods. Examples include (but are not limited to) housing, travel and food vouchers. The term voucher is also a synonym for receipt and is often used to refer to receipts used as evidence of, for example, the declaration that a service has been performed or that expenditure has been made.
- VOUCHER GENERATION: This is the process or procedure involved in the creation or the making of the voucher code.
- CART: This is what is seen in most supermarkets are shopping baskets where items are put in and then moved to the counter to make payment.

1.7 PROJECT BENEFICIARIES

The project will go a long way to benefit students, lecturers, workers and even dignitaries. This is because a platform will be developed for all these people to be able to browse through books electronically, make purchase and download them to their device for immediate or later usage.

1.8 SCOPE

The project is a web application system which with internet access and when the URL is known, anyone anywhere around the world can have access to the website but currently it is made to support only payment for locals since voucher will not be sold online at the moment.

1.9 DELIVERABLES

This project is to deliver a working web application (software) and its documentation.

CHAPTER TWO

LITERATURE REVIEW

2.1 REVIEW OF SIMILAR WORKS

There are quite a number of e-book stores in various countries like the United Kingdom, Australia, Turkey, Thailand and other countries. So far there is not a system like this in Ghana. Although there are other bookshops available with their respective websites but none of them has implement the selling of e-books online. For the purpose of this project we will concentrate on a few of the most popular electronic book stores in the United States of America.

2.1.1 BARNES AND NOBLE

Barnes & Noble, Inc. is a Fortune 500 company, the largest retail bookseller in the United States, and a leading retailer of content, digital media and educational products in the country. The company operates 658 retail stores (as of November 1, 2014) in all 50 U.S. states in addition to 714 college bookstores that serve over 5 million students and more than 250, 00 faculty members across the country. Barnes & Noble also operates BN.com

2.1.1.1 SOME FEATURES OF THE SYSTEM INCLUDE:

- Barnes & Noble Members get Unlimited Free MemberExpress Shipping in 3 days or less on eligible orders. Non-member can get Free Shipping on orders of 25$ or more of eligible items.
- Users can send or redeem Gift Certificates or sign up for email alerts about new releases from their favorites.

2.1.1.2 LIMITATIONS

- They have limited the purchase of electronic books on their tablet device, Nook or Nook HD.
- Customers that do not own a Nook device is only limited to the purchase of hard copy books online.
- In some cases ordering for a particular book for home delivery, company sends a different book either than the intended one.
- Do not ship to places outside of the country.

2.1.2 AMAZON INC.

Amazon.com, Inc. is an America Electronic commerce company with headquarters in Seattle, Washington. It is the largest Internet-based retailer in the United States. Amazon.com started as an online bookstore, but soon diversified, selling DVDs, Blu-rays, CDs, video downloads/streaming, MP3 downloads/streaming, software, video games, electronics, apparel, furniture, food, toys and jewelry. They also have and e-book reader known as the Amazon kindle and the latest one being the kindle fire and is a major provider of cloud computing services. Amazon also sells certain low-end products like USB cables under its in house brand Amazon Basics.

2.1.2.1 SOME FEATURES OF THE SYSTEM INCLUDE:

- Offers variety of services including electronics, apparel, stationary and others
- Most of the E-books are sold on the kindle devices
- Have separate online systems for most countries such as UK with amazon.co.uk and others.

2.1.2.2 LIMITATIONS

Have the same limitations as that of Barnes and Noble discussed earlier but in Addition to them, Amazon also allows third party to sell their books online which may not live up to the standard advertised by some sellers.

2.2 PROPOSED SOLUTION

With these two systems discussed, we get to know that they've integrated quite a number of services with the online bookshop and the only place to have the online bookshop without other services is by using their tablet devices like Amazon Kindle and Nook HD.

Also from inspection, it seems the web based system is meant for hardcopy books which will be shipped to customers' physical address. This copy is still subjected to the problems discussed earlier. In cases of shipping, there are occasions where the wrong book is sent or delivery will be made to a different address either than the intended one.

JL E-bookshop is a web application with the primary focus on selling of e-books. With this physical stores will not even be necessary and can even be operated from home with convenience. Also with the voucher system, account funding is simple.

Focusing only on electronic books helps to respond to problems or troubleshoot errors in a very swift manner in that any customer problem will be related to either account funding or download problems and other minute problems which can be handled with ease unlike shipping problems which needs to be verified and can take days or even weeks to solve.

In cases where a user would want to cheat the system especially concerning balance, rectifying that problem is easy since all purchases are recorded and can be viewed by the administrator, thus if what the user is saying is the truth or not.

2.2.1 SOFTWARE FEATURES

The system runs best on a system with the following capabilities and features.

- The system should run on a web browser on a smartphone, tablets, Ipads and laptops
- The device should have good internet connectivity
- Must have adobe flash player plugin installed in the default browser or related plugins.

2.2.2 DEVELOPMENT TOOLS AND ENVIRONMENT

In developing this application on the server side, below are the lists of the development tools and platform to be used:

- **MySQL:** MySQL is the world's most popular open source database, enabling the costeffective delivery of reliable, high-performance and scalable Web-based and embedded database applications. It is also currently the number 1 database for Web-based applications, used by Facebook, Twitter, LinkedIn, Yahoo!, Amazon Web Services and virtually all the largest Web properties and successful start-ups. The SQL phrase stands for Structured Query Language. The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements. MySQL is a popular choice of database for use in web applications, and is a central component of the widely used LAMP open source web application software stack (and other 'AMP' stacks). LAMP is

an acronym for "Linux, Apache, MySQL, Perl /PHP/Python." MySQL is a relational database management system (RDBMS), and ships with no GUI tools to administer MySQL databases or manage data contained within the databases. Users may use the included command line tools, or use MySQL "front-ends", desktop software and web applications that create and manage MySQL databases, build database structures, back up data, inspect status, and work with data records. The official set of MySQL front-end tools, MySQL Workbench is actively developed by Oracle, and is freely available for use. In addition to MySQL's ease of use, high performance and reliability we can benefit from advanced features, management tools and technical support to develop, deploy and manage our application.

- XAMPP: It is a completely free and easy to install and open source cross-platform web server solution stack package, consisting mainly of the Apache HTTP Server, MySQL database, and interpreters for scripts written in the PHP and Perl programming languages. The name XAMPP is anacronym which stands for:

- X (to be read as "cross", meaning cross-platform)
- A Apache HTTP Server
- M MySQL
- P PHP

• P Perl XAMPP requires only one zip, tar, 7z, or exe file to be downloaded and run, and little or no configuration of the various components that make up the web server is required. XAMPP is regularly updated to incorporate the latest releases of Apache, MySQL, PHP and Perl. It also comes with a number of other modules including OpenSSL and php My Admin. Self-contained, multiple instances of XAMPP can exist on a single computer, and any given instance can be copied from one computer to

another. It is offered in both a full, standard version and a smaller version. XAMPP has been designed for use as a development tool, to allow website designers and programmers to test their work on their own computers without any access to the Internet; which is the use of XAMPP in the development of our application. To make this as easy as possible, many important security features are disabled by default. In practice, however, XAMPP is sometimes used to actually serve web pages on the World Wide Web. XAMPP also provides support for creating and manipulating databases in MySQL and SQLite among others. Once XAMPP is installed, it is possible to treat a local host like a remote host by connecting using an FTP client.

- HYPERTEXT MARKUP LANGUAGE: HTML or Hyper-text Mark-up Language is a globally accepted programming language for formatting web pages. HTML is the main markup language for creating web pages and other information that can be displayed in a web browser. HTML is commonly used along with JavaScript and Cascading Style Sheets (CSS) to give web pages the look and feel we desire. It is also optimal for most small and growing businesses that do not really need advanced functionality on their website. Below are some of the benefits of using HTML while creating your website:

HTML is easy to use and understand: Almost anyone in the web development business would know HTML – be it a freelancer or a large agency. If at any point in time you need to hire the services of a different web design firm or professional for making changes or updates to the website, it would be relatively easy to find costeffective and affordable solution providers who can make the changes you need to your website.

All browsers support html: Almost – if not all – browsers support HTML. Certainly more browsers support HTML than any other web programming language. As a result, when you build a website using HTML, it would show up on most browsers around the world, as long as we take care to optimize the website for the most commonly used browsers. Optimizing HTML based websitefor browser compatibility is neither difficult nor complex.

HTML is free: A major advantage of using HTML is that it is free. You do not need any software for HTML, no plug-ins are needed and you can save considerably on your website development cost.

Most development tools support html: Whether it is FrontPage, DreamWeaver or any other programming tool, there are more web development tools that allow you to create HTML basedwebsites, than any other web programming language.

HTML is most search engine friendly: Of all the web programming languages, HTML is the most search engine friendly. Creating Search Engine Oriented (SEO) compliant websites using HTML is significantly easier than any other programming language. HTML causes the least Creating Search Engine Oriented (SEO) complications and provides the greatest flexibility when trying to build aCreating Search Engine Oriented (SEO) compliant website.

-EXTENSIBLE MARKUP LANGUAGE (XML): Extensible Markup Language (XML) is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. XML is not a true markup language, but rather a system for defining other languages. In other words, XML is a language for writing markup languages. XML is not tied to any programming language,

operating system, or software vendor. XML provides access to a plethora of technologies for manipulating, structuring, transforming and querying data. Below are the mainreasons for using XML.

Extensibility: There is no fixed set of tags. New tags can be created as they are needed. **Self-description**: XML documents can be stored without schemas because they contain Meta data; any XML tag can possess an unlimited number of attributes. This helped in easy design of the android layout.

Can embed multiple data types: XML documents can contain any possible data type from multimedia data (image, sound, and video) to active components (Java applets, ActiveX). This helped in the easy transfer of data between the android and the server.

- PHP (*HyperTEXT Preprocessor*): It is a server-side scripting language designed for web development but also used as a general-purpose programming language. PHP code is interpreted by a web server with a PHP processor module, which generates the resulting web page. PHP is free software released under the PHP License. PHP can be deployed on most web servers and also as a standalone shell on almost every operating system and platform, free of charge. I used the Net Beans platform to develop the PHP aspect of the application. The PHP language was originally implemented as an interpreter, and this is still the most popular implementation. Several compilers have been developed which decouple the PHP language from the interpreter. Advantages of compilation include better execution speed, static analysis, and improved interoperability with code written in other languages. PHP can perform any task that any CGI program can do, but its strength lies in its compatibility with many types of databases.

- JAVA SCRIPT: JavaScript is a scripting language designed primarily for adding interactivity to Web pages and creating Web applications. JavaScript (JS) is a dynamic computer programming language. It is most commonly used as part of web browsers, whose implementations allow client-side scripts to interact with the user, control the browser, communicate asynchronously, and alter the document content that is displayed. Below are some of the main reasons why JavaScript was used in the development of the web application:

JavaScript is executed on the client side: This means that the code is executed on the user's processor instead of the web server thus saving bandwidth and strain on the web server.

JavaScript is a relatively easy language: The JavaScript language is relatively easy to learn and comprises of syntax that is close to English. It uses the DOM model that provides plenty of prewritten functionality to the various objects on pages making it a breeze to develop a script to solve a custom purpose.

JavaScript is relatively fast to the end user: As the code is executed on the user's computer, results and processing is completed almost instantly depending on the task (tasks in JavaScript on web pages are usually simple so as to prevent being a memory hog) as it does not need to be processed in the site's web server and sent back to the user consuming local as well as server bandwidth.

JQUERY: JQuery is very compact and well written JavaScript code that increases the productivity of the developer by enabling them to achieve critical User Interface functionality by writing very small amount of code. JQuery is a cross-platform JavaScript library designed to simplify the client-side scripting of HTML. It can

produce dynamic web pages as well as Flash-like animations. Beloware some of the advantages of using JQuery in developing web applications:

Ease of use: This is pretty much the main advantage of using JQuery, it is a lot more easy to use compared to standard JavaScript and other JavaScript libraries. Apart from simple syntax, it alsorequires much less lines of code to achieve the same feature in comparison.

Strong open source community. (Several jQuery plugins available): JQuery, while relatively new, has a following that religiously devote their time to develop and enhance the functionality of JQuery. Thus there are hundreds of prewritten plugins available for download to instantly speed up your development process. Another advantage behind this is the efficiency and security of the script. **Ajax support:** JQuery lets you develop Ajax templates with ease; Ajax enables a sleeker interface where actions can be performed on pages without requiring the entire page to be reloaded.

CHAPTER THREE

REQUIREMENT SPECIFICATION

3.1 REQUIREMENT SPECIFICATION OVERVIEW

Requirement specification defines the behavior of a system in development and determines the method for requirements documentation (i.e. natural language documents, process models, business definitions, use cases, user stories or process specifications). Also it is a research exercise that is embarked on in the early stages of a project lifecycle to establish and modify the scope of the project. The aim of the research is to understand the product from a user's perspective and to establish users' common needs and expectations.

In software engineering, such requirements are often called functional specifications. System requirements determine what criteria a system or modified system must meet. Requirements Analysis and Definition is the first stage in the systems engineering and software development process. This stage breaks down functional and non-functional requirements to a basic design view to provide a clear system development process framework.

Effective requirements analysis includes four types of activity:

- Requirements Elicitation: the elicitation activity consists of gathering information, understanding the stakeholder need, and articulating high level requirements.

- Requirements Analysis: The analysis activity examines the high level requirements and determines if they are clear, complete and free of contradictions, and then defines the strategy to address these issues.
- Requirements Specification: The specification activity defines the behavior of a system in development and determines the method for requirements documentation (i.e. natural language documents, process models, business definitions, use cases, user stories or process specifications).
- Requirements Validation: the validation activity involves sessions with users, stakeholders, and functional experts to determine mitigation and issue resolution plans for conflicting requirements before projects move into the development phase.

Requirements Analysis and Definition can define existing requirements to determine their impact on current business processes, systems, and modifications or can be applied in future design efforts to meet evolving information technology, systems integration and business needs and challenges. When future design efforts involving system upgrades or enhancements are analyzed, Fit/Gap analysis activities are often performed to understand the differences between current and proposed systems or applications.

3.2 FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENT

3.2.1 FUNCTIONAL REQUIREMENT

The functional requirement specifies the functionality provided by the software system or its components. A function is described as a set of inputs, the behavior outputs and how the system is able to evolve to meet the changing environment. Hence, it describes into details what the system is supposed to perform and provide as well. Thus, consists

of what the system is expected to do to satisfy the user's needs and also dependent on the required user and the software in question. Functional system requirements vary from general requirements covering what the system should do to very specific requirements reflecting local ways of working or an organization's existing systems.

The functional requirements or operations within this system include:

The User being able to do the following:

- Register or Create and account with email, password, name and phone number
- Able to browse through the books available in the store.
- Read the gist of books.
- Add preferred book to cart.
- Fund account with voucher code.
- Make purchase of the book(s).
- Download bought book(s)
- Sign-out from the system

3.2.2 NON-FUNCTIONAL REQUIREMENTS

Non-functional requirements define system properties and constraints such as reliability, response time and storage requirements. Constraints are input/output device capabilities system representations and many more. Non-functional requirements are those requirements that are not directly concerned with the specific functions delivered by the system. They may relate to emergent system properties such as reliability, response time, data representation and many more.

Non-functional requirements may be more critical than functional because when non-functional requirements fail, the whole system may be useless and is bound to fail. The software shall be written in HTML, CSS, PHP and JAVASCRIPT.

The main form interface of the system shall be implemented using multiple document interfaces and they will be user friendly as well. The system shall run on any computer i.e. both online and offline.

Non-functional requirements may come from required characteristics of the software (product requirements), the organization developing the software (organizational requirements), or from external sources (external requirements). Some non-functional requirements of the system include thefollowing:

3.2.3 PRODUCT REQUIREMENT

These requirements specify or constrain the behavior of the software. Examples include performance requirements on how fast the system must execute and how much memory it requires, reliability requirements that set out the acceptable failure rate, security requirements, andusability requirements.

Ease OfUse

Ease of use is the ease with which users can use and learn about the application. The system can be used by Customers and the Administrator who know how to operate phones, PCs and tablets. The features are user friendly, easy to learn and easy toadapt.

Form Factor

Form factors refer to the PCs', tablets and mobile phone's size, shape, and style, as well as the layout and position of their major components. The Online Bookshop shall be developed with advanced features which will enable the individual widgets within the application to automatically adjust themselves when there is a change in the orientation of the devices running the application. The application will also support all the various screen sizes of the various devices.

Portability

Portability, in relation to software, is a measure of how easily an application can be transferred from one environment to another. A computer software application is considered portable to a new environment if the effort required to adapt it to the new environment is within reasonable limits. The Online Bookshop shall be developed to work with all the types of web browsers available. The server side which will be mainly used by the developers shall also be developed with technologies which will be compatible with almost all the popular browsers.

Network conditions

Network conditions are one of the key factors which have to be considered when developing any web applications. The Online Bookshop will be developed with advanced catching and filling techniques which will enable access to the network a bit faster as compared to the normal way of accessing the network. Images andother files shall be down sampled before being transmitted over the internet to make transmission even faster.

Operability

Operability is the ability of systems, units, or forces to provide services to and accept services from other systems, units, or forces. This system shall be synchronized upon every update to make operations in the Bookshop faster and efficient.

Fault Tolerance

Fault Tolerance is the property that enables a system to continue operating properly in the event of the failure of some of its components. All the components in the system will be developed to work independently without relying on any other components or pages. Failure in a component will have no effect in any other component.

Response Time

Response time is the total time that a system takes to process a request. It's possible to write a set of codes that wins every performance test in the world, but still sluggish, hang or freeze for significant periods, ortake too long to process input. In order to reduce the response time for the system, all situations in which the application performs a potentially lengthy operation**,** shall not be performed on the main UI thread**,** but instead create a worker thread (asynchronous or background) and do most of these work there.

Maintainability

The nature of design of the system and the accompanying documentation makes it easy to maintain even by programmers who were not involved in the initial design of the system. New features can also be added without much difficulty.

Robustness

The software shall be able to recover quickly in events of failure and also its time to restart in case of system failure is miniature. To be precise, there should be little or no event that may cause failure of the system.

Efficiency

Efficiency is how consistently and predictably a software performs the required functions. To be efficient, we ensured that:

- The rate of failure occurrence shall be kept low
- Percentage of events causing failure shall be kept as low as possible
- Response time is very fast
- Processing of data and request is also very encouraging

3.2.4 ORGANIZATIONAL REQUIREMENTS

These requirements are broad system requirements derived from policies and procedures in the customer's and developer's organization. Examples include operational process requirements that define how the system will be used, development process requirements that specify the programming language, the development environment or process standards to be used, and environmental requirements that specify the operating environment of the system. Below are the operational requirements for the system;

- Users shall register with the application at the first use to serve as an authentication.

- Upon login, the system shall give one user access to only one account at a time and users shall be able to migrate their account from one device to another.
- HTML and CSS programming language shall be used to develop the design part i.e. the web part of the system and PHP, MySQL, and JavaScript shall be used to develop the server side of the system.
- The Online Bookshop shall operate on Windows, Linux and android environment provided they all have web browsers installed on them.

3.2.5 EXTERNAL REQUIREMENTS

This broad heading covers all requirements that are derived from factors external to the system and its development process. These may include regulatory requirements that set out what must be done for the system to be approved for use by a regulator, such as a central bank; legislative requirements that must be followed to ensure that the system operates within the law; and ethical requirements that ensure that the system will be acceptable to its users.

3.3 USER AND SYSTEM REQUIREMENT

3.3.1 USER REQUIREMENT

User requirements for a system describe the functional and non-functional requirements so that they are understandable by system users who don't have detailed technical knowledge. Ideally, it specifies only the external behavior of the system. The requirements document should not include details of the system architecture or design. Consequently, if you are writing user requirements, use of software jargon, structured notations, or formal notations are not advisable. User requirements must be written in natural language, with simple tables, forms, and intuitive diagrams.

The following are the user requirements for the system:

- The user should be able to upload books for sale.
- The user should be able to view total number of registered customers
- The user should be able to search for uploaded books
- The user should be able to track number of times a book has been sold
- The user should be able to generate voucher with attached fund
- The user should be able to save generated voucher

3.3.2 SYSTEM REQUIREMENTS

System requirements are expanded versions of the user requirements that are used by software engineers as the starting point for the system design. They add detail and explain how the user requirements should be provided by the system. They must be used as part of the contract for the implementation of the system and should therefore be a complete and detailed specification of the whole system.

Ideally, the system requirements should simply describe the external behavior of the system and its operational constraints. They should not be concerned with how the system should be designed or implemented. However, at the level of detail required to completely specify a complex software system, it is practically impossible to exclude all design information.

3.4 UML DIAGRAMS

Unified Modeling Language (UML) is a standardized general purpose modeling language in the field of object oriented software engineering. In the designing of software, it is vital to go through the classic life-cycle of software development. As part of thesteps under this paradigm, the use of some UML diagrams is used to

support, explain further and give simple relational diagrams to the software application being built.

3.4.1 USE CASE ANALYSIS

Use case analysis is a technique used to identify the requirements of a system and the information used to define the processes used and the classes which will be used. The use case analysis is the foundation upon which the system will be built. The primary goals of the use case analysis are:

- Designing a system from the user's perspective
- Communicating the system behavior in the user's term
- Specifying all externally visible behaviors

Another set of goals are to clearly communicate how the system is to be used, the role the users will play in the system, how the system responds to stimulus, what the user receives from the system and the value the customer will receive from the system.

3.4.2 USE CASE DIAGRAMS

It is a type of behavioral diagram defined by and created from use case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of actors in the system can be depicted.

The diagram below is the use case diagram for the User's functional requirements:

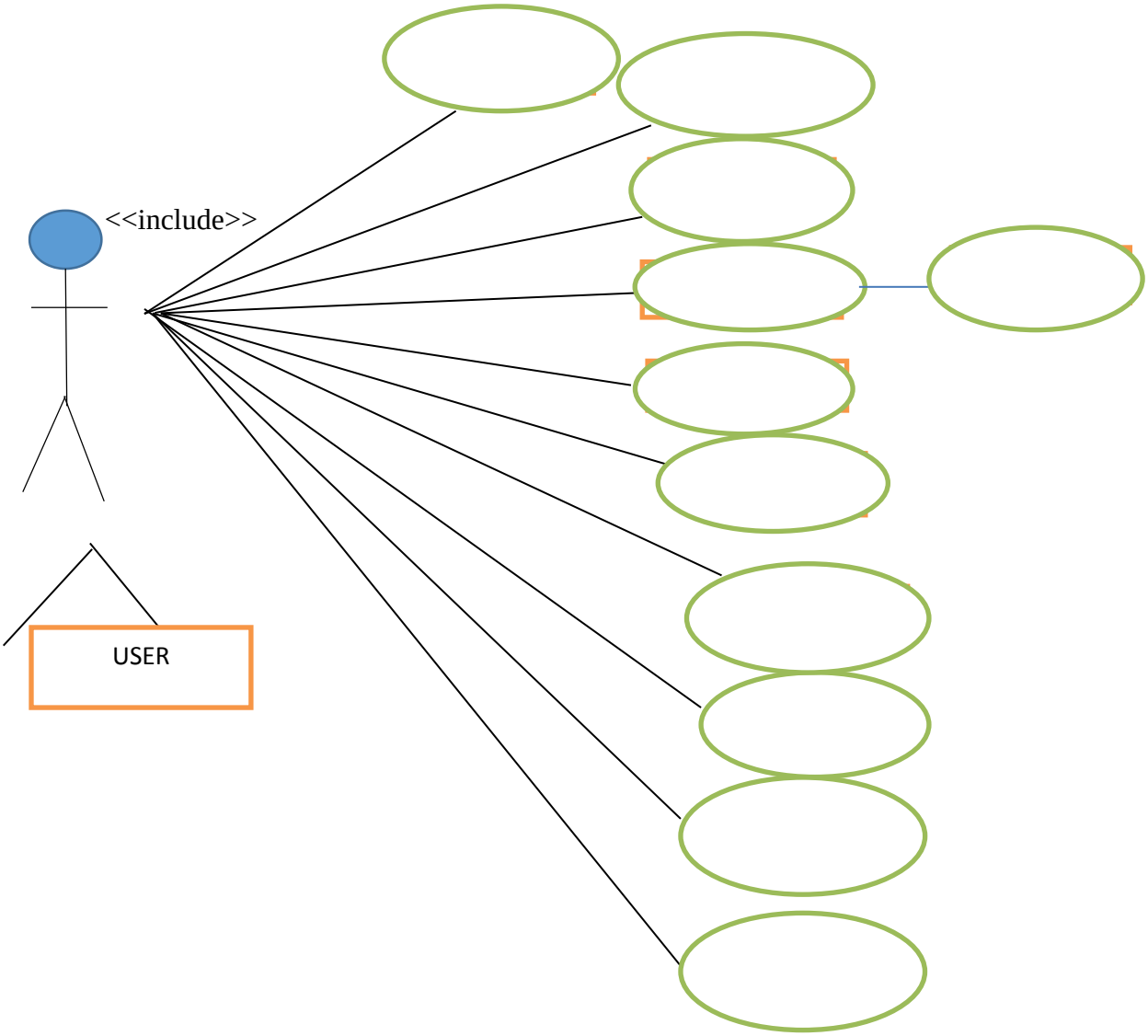

Fig 1: Customer Use Case Diagram

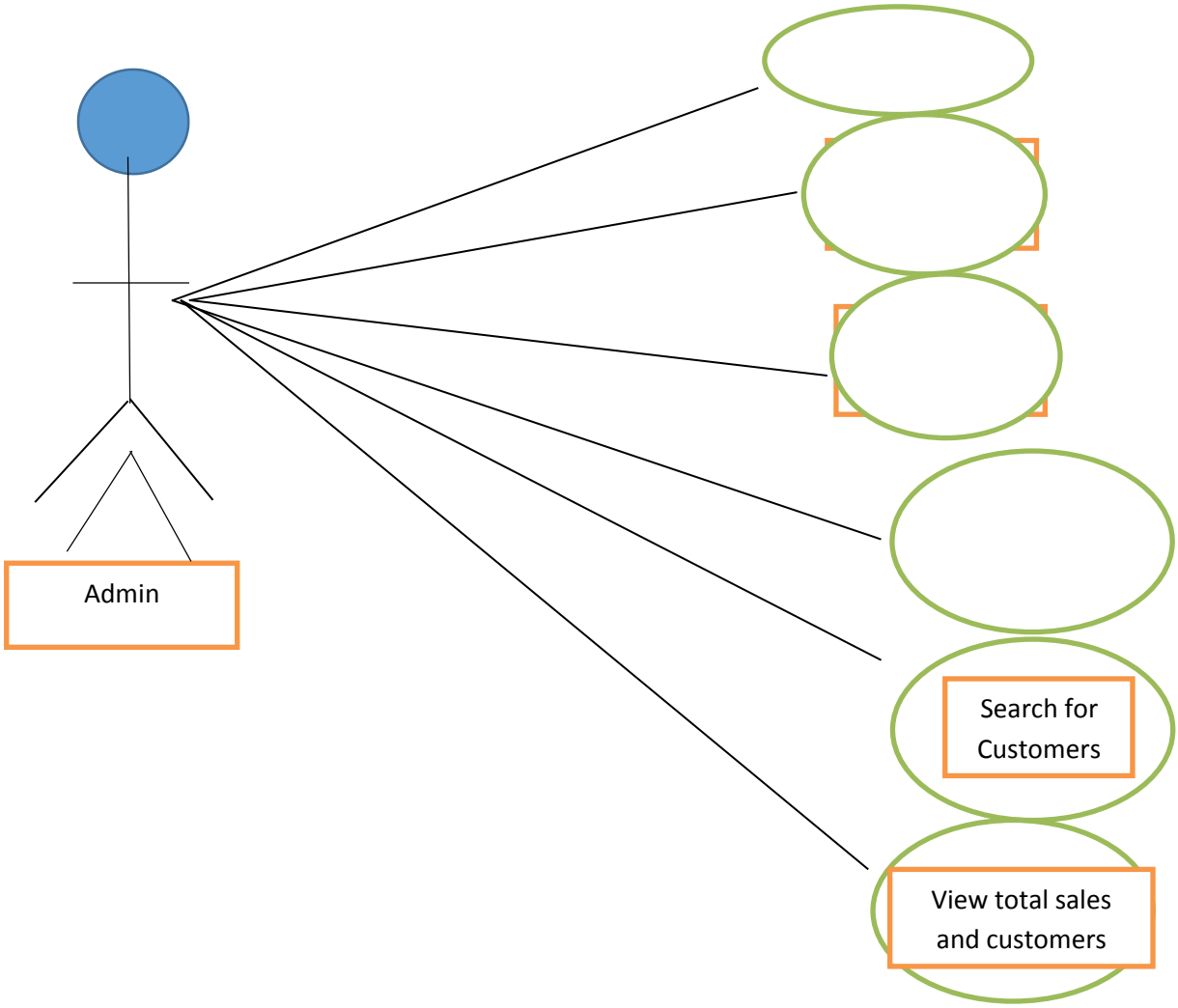

Fig 2: Admin Use Case Diagram

3.4.3 USE CASE DESCRIPTIONS

USE CASE NAME	REGISTER
ACTORS	Users
DESCRIPTION	The user gets access to the account creation page
PRE-CONDITION	Application has been launched
EVENT FLOW	1. Enter email and password 2. Enter Name and Phone number
POST-CONDITION	Successful Registration page information is displayed

Table 1

USECASENAME	Login
ACTORS	User/Administrator
DESCRIPTION	Theuser or the admin gets access into the system.
PRE-CONDITION	Application has been launched.
EVENTFLOW	1. Enter email 2. Enter password
POST-CONDITION	User's page is displayed foroperation to begin if entries are correct.

Table 2

USE CASE NAME	VIEW PROFILE
ACTORS	Users and Administrator
DESCRIPTION	Users are able to view the contents of their profile Administrator can view users' profiles
PRE-CONDITION	1. User has launched the application. 2. User is on his/her page
EVENT FLOW	1. Click on the My Account
POST-CONDITION	User information shows displaying what user entered at the time of registration

Table 3

USE CASE NAME	EDIT PROFILE
ACTORS	Users
DESCRIPTION	User is able to edit some of the info allowed for update.
PRE-CONDITION	User must have access to the user account
EVENT FLOW	1. Users should click on My account 2. Click on Edit Profile
POST-CONDITION	Page refreshes with messages showing successful update

Table 4

USE CASE NAME	FUND ACCOUNT
ACTORS	Users
DESCRIPTION	User can add money to their account balance
PRE-CONDITION	User must be logged in
EVENT FLOW	1. User Clicks on Cart 2. Enter Voucher and Press Enter
POST-CONDITION	Successful Registration page information is displayed

Table 5

USE CASE NAME	BROWSE BOOKS
ACTORS	Users
DESCRIPTION	The user is able to view books available for sale
PRE-CONDITION	Application has been launched User can be logged in or not
EVENT FLOW	1. Launch Application 2. Search for books
POST-CONDITION	Can read the gist of books and view price

Table 6

USE CASE NAME	ADD TO CART
ACTORS	Users
DESCRIPTION	Adds book to shopping basket for purchase
PRE-CONDITION	View book
EVENT FLOW	1. Click on Basket diagram
POST-CONDITION	Redirects users to cart automatically

Table 7

USE CASE NAME	VIEW CART
ACTORS	Users
DESCRIPTION	Takes user to shopping basket with total amount to pay
PRE-CONDITION	Should click on shopping basket below book
EVENT FLOW	Automated From Add to cart
POST-CONDITION	Shows users the total amount to pay for book(s)

Table 8

USE CASE NAME	CHECKOUT
ACTORS	Users
DESCRIPTION	User pays for cost of book(s)
PRE-CONDITION	User must be at the shopping cart page
EVENT FLOW	1. Click on Proceed to Cart 2. Click on Place Order
POST-CONDITION	Redirects user to another page displaying successful purchase or brings user back to checkout page if cost of item is more than account balance

Table 9

USE CASE NAME	DOWNLOAD
ACTORS	Users
DESCRIPTION	User is able to download purchased books
PRE-CONDITION	Should have bought a book(s)
EVENT FLOW	1. Click on My Account 2. Click on downloads 3. Download bought book(s)
POST-CONDITION	Download Book(s) to users' devices

Table 10

USE CASE NAME	SIGNOUT
ACTORS	Users/Administrator
DESCRIPTION	The users are able to logout of their account after they are done
PRE-CONDITION	1. User has launched application 2. User is on his/her page as admin or customer
EVENT FLOW	Click on logout
POST-CONDITION	Redirects user to index page

Table 11

USE CASE NAME	GENERATE VOUCHER
ACTORS	Administrator
DESCRIPTION	Admin generates voucher with amount and stores them
PRE-CONDITION	1. Admin has launched application 2. Admin must be in his/her account page
EVENT FLOW	Click on transaction Click generate with respect to amount Click on issue to save to database
POST-CONDITION	Gives a message upon success or denial of operation

Table 12

USE CASE NAME	SEARCH FOR BOOKS
ACTORS	Administrator
DESCRIPTION	Admin searches for book already uploaded
PRE-CONDITION	1. User has launched application 2. Must be logged in as admin
EVENT FLOW	1. Must be at admin dashboard 2. Type in the name of the book or ISBN in the search bar on the right hand side of admin
POST-CONDITION	Brings up information of the book

Table 13

USE CASE NAME	UPLOAD BOOKS
ACTORS	Administrator
DESCRIPTION	Books are uploaded for sale by admin with gist and prices
PRE-CONDITION	1. User has launched application 2. Must be logged in as admin
EVENT FLOW	1. Click on Add Product 2. Enter the required info demanded by the system and click on Add book
POST-CONDITION	Displays a message after successful upload

Table 14

USE CASE NAME	SEARCH FOR CUSTOMERS
ACTORS	Administrator
DESCRIPTION	Admin searches for users already registered
PRE-CONDITION	1. User has launched application 2. Must be logged in as admin
EVENT FLOW	1. Click on view customers 2. Type in the name of the user in the search bar on the right hand side of admin
POST-CONDITION	Displays User with searched credentials

Table 15

USE CASE NAME	TOTAL SALES AND CUSTOMERS
ACTORS	Administrator
DESCRIPTION	Admin can view total number of customers and sales made
PRE-CONDITION	1. User has launched application 2. Must be logged in as admin
EVENT FLOW	1. Must be at the admin dashboard
POST-CONDITION	Displays required information needed

Table 16

3.4.4 SEQUENCE DIAGRAMS

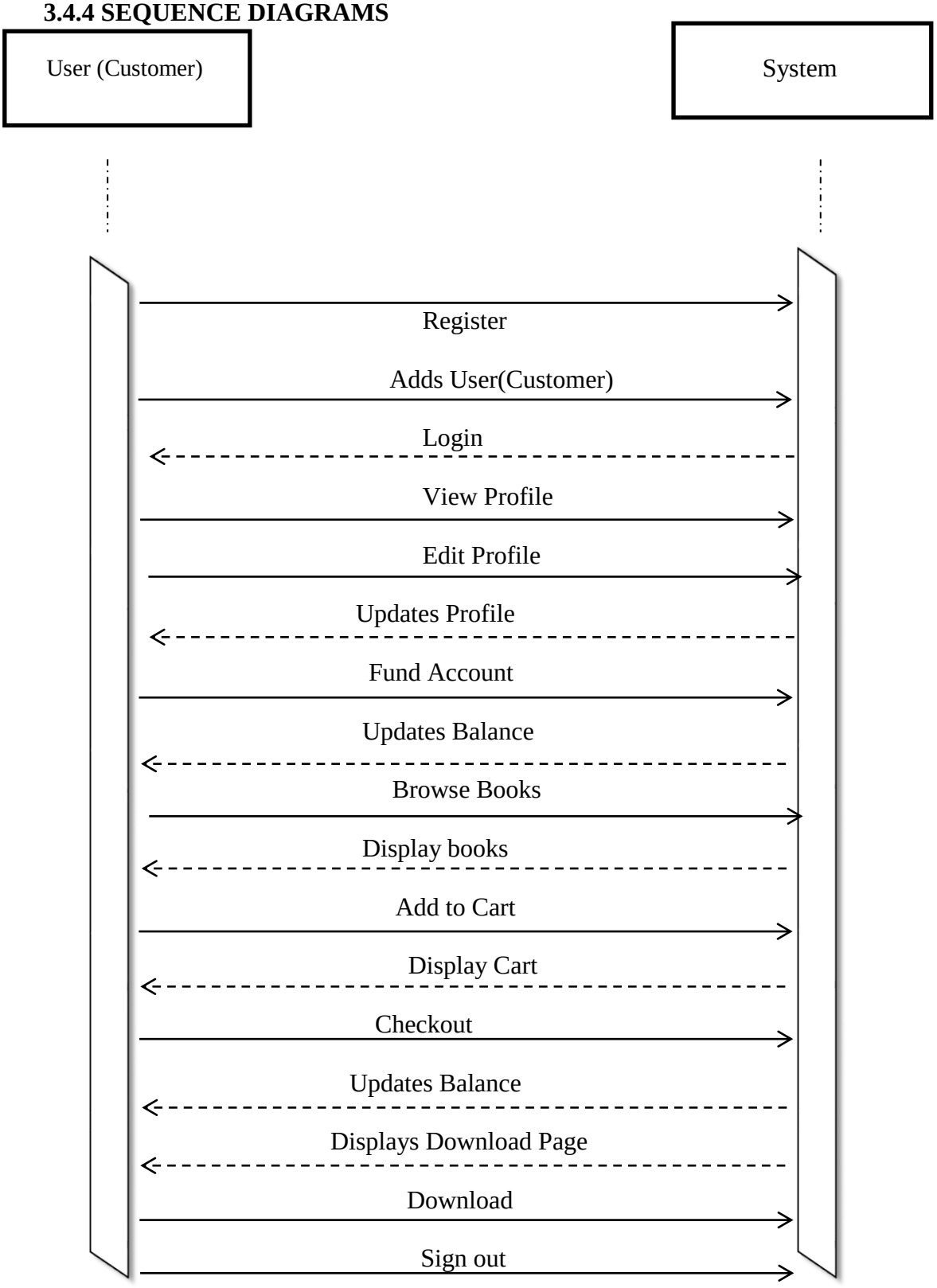

Fig 3: Customer Sequence Diagram

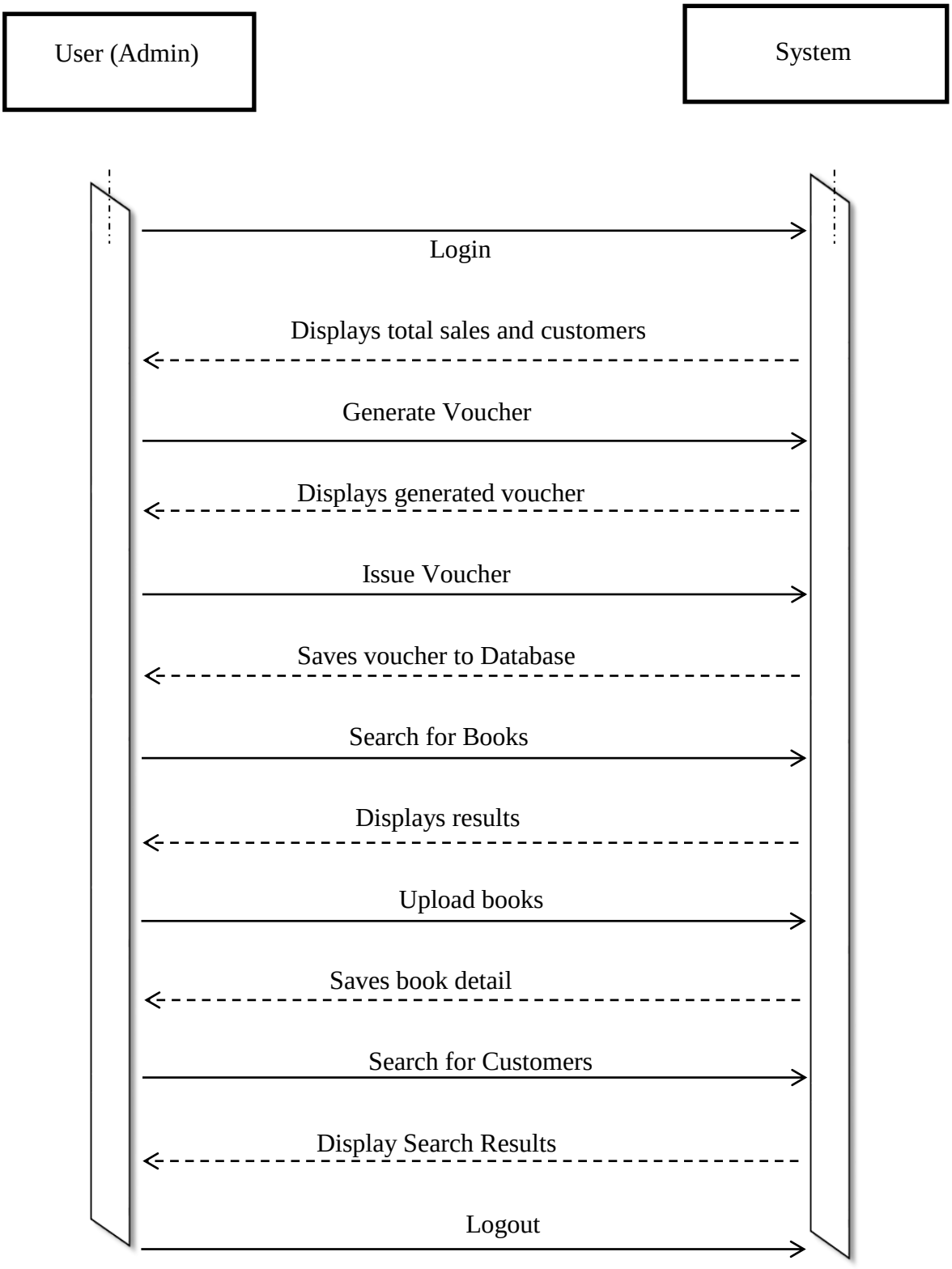

Fig 4: Administrator Sequence Diagram

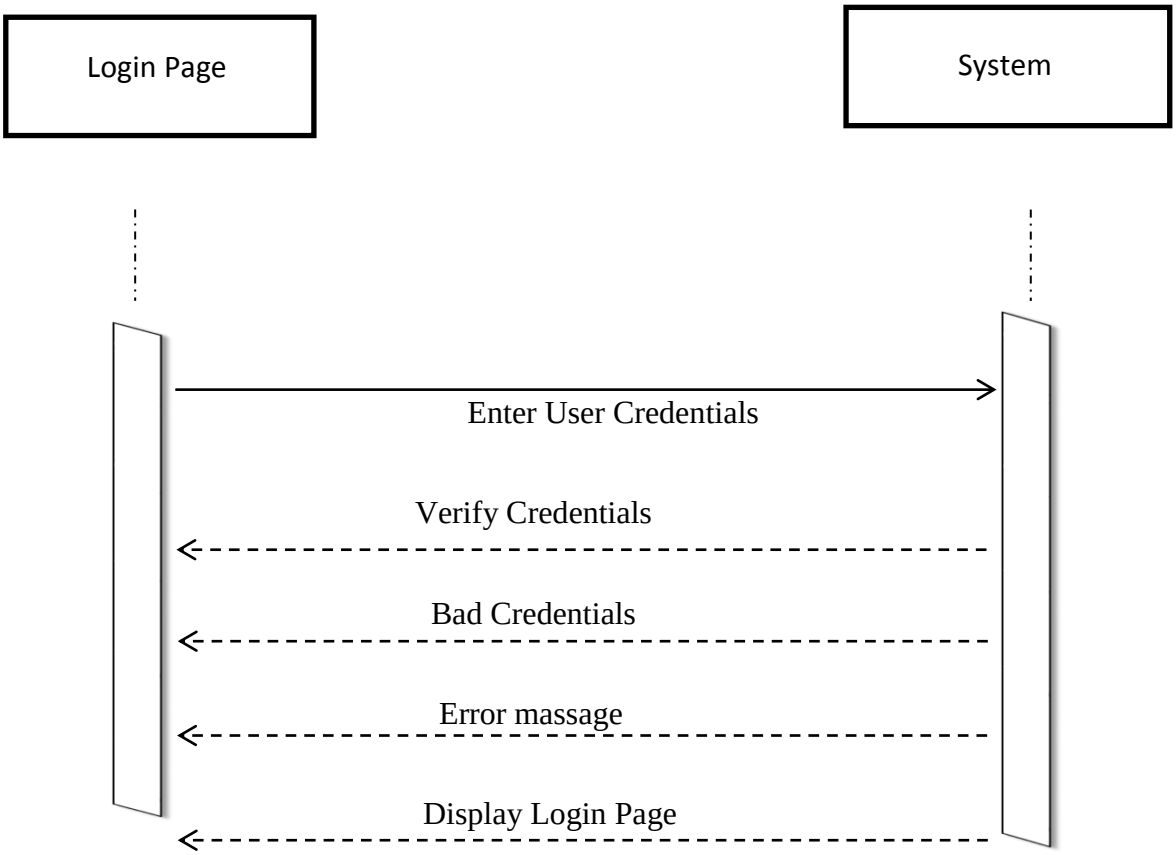

Fig 5: Login Sequence Diagram

3.4.5 ACTIVITY DIAGRAM

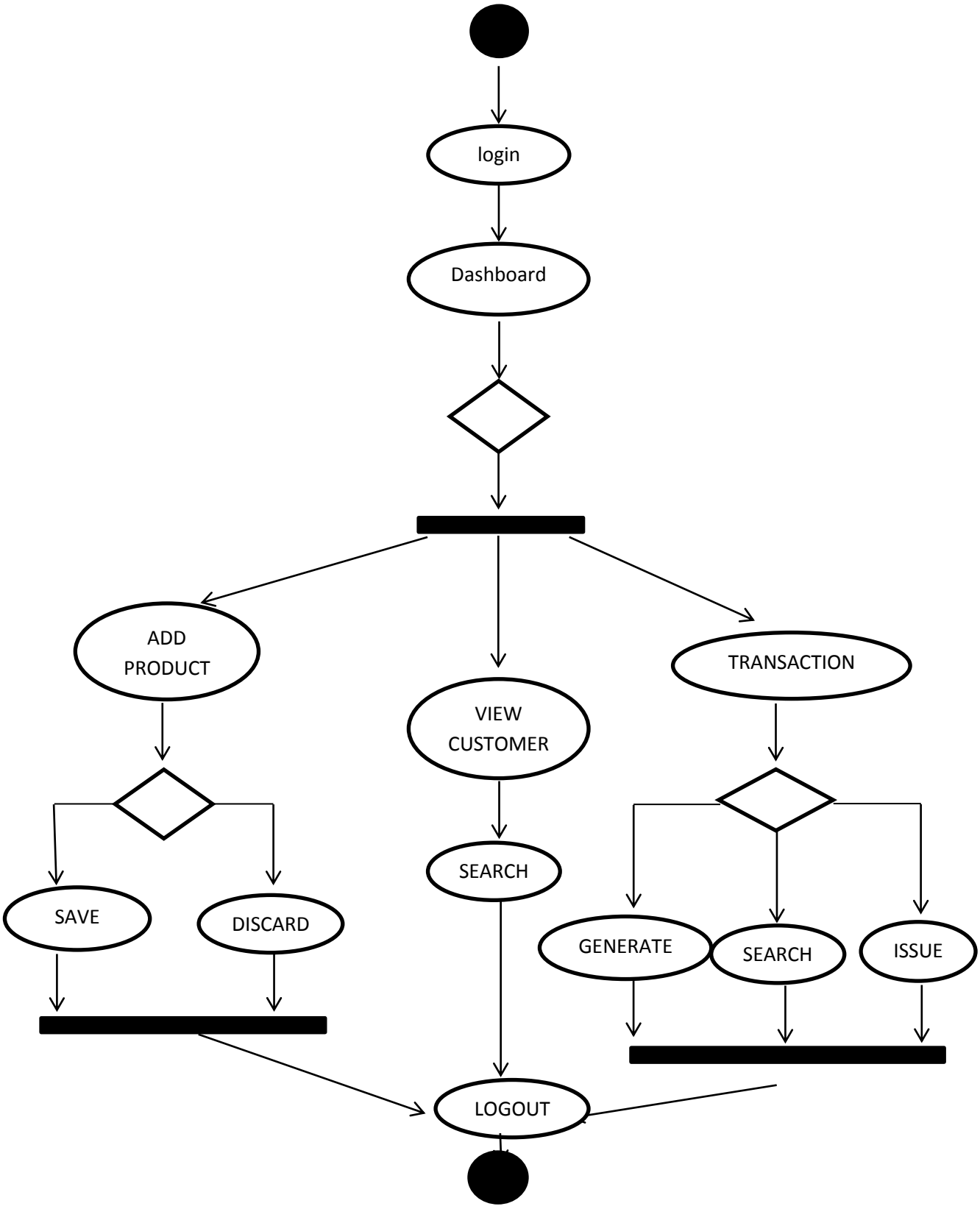

Fig 6: Administrator Sequence Diagram

3.4.6 CLASS DIAGRAMS

Admin
Login View Customers Transaction Dash board
Save() Discard() Search() Generate() Issue()

Table 17

Customer
Login My Account orders Downloads store
Download () Add to cart () Fund() Checkout ()

Table 18

CHAPTER FOUR

METHODOLOGY

4.1 PROJECT METHOD

There are several methodologies that could be used in developing the application. The ones that will be discussed are the incremental model, the water fall model and the spiral model.

4.1.1 INCREMENTAL METHOD

The model is divided into five phases and these phases will be done repeatedly until the expected systemis achieved. The phases include: Planning Requirements, Analysis and Design, Implementation and Deployment, Testing and Evaluation.

- **Planning Requirements:** Incremental Development usually has a shortlist of requirements that needs to be defined and then quickly converted into test/use cases. These requirements will be obtained through personal experience and interview of the potential users of the system.
  - **Analysis and Design:** Due to the smaller requirement set and shorter design cycle, test cases would be built quickly from the requirements so that the increment/ component can be delivered on time to our supervisor when complete. As projects progress and new increments are created the design phase is the time to assess impact and risk of new features, link existing test cases to requirements and create and improve the regression suite.
- **Implementation and Deployment:** With the Incremental methodology it is generally easier to test and debug than other methods of software development

because relatively smaller changes are made during ach increment. This allows for more targeted and rigorous testing of each element within the overall product. With the Incremental methodology, even after the first increment, the expectation is that a product is ready and can be delivered to our supervisor. This means that all requirements must be tested and passed. As mentioned in the design phase we can link test cases to Requirements to establish coverage; however, we can also use a simple approach of testing all test cases directly, or organizing our test cases in folders.

- **Testing**: After each increment, regression testing should be conducted. During this testing, faulty elements of the software can be quickly identified because few changes are made within increment. There are two types of testing that are performed and they are unit testing and system testing.

  Unit Testing is performed to verify that each program unit meets its specification while system testing is performed to ensure that the software requirements have been met.

- **Evaluation:** Based on supervisor's feedback, a plan will be developed for the next increments, and modifications are made accordingly. Often some of the features in the initial planning are removed from the scope of a project in the planning or analysis phase. In addition many bugs are found in the implementation and testing phase that were not initially fixed.

- **Repeat:** This process continues, with increments being delivered until the complete product is delivered.Thatis, until the projectis finally accepted by oursupervisor.

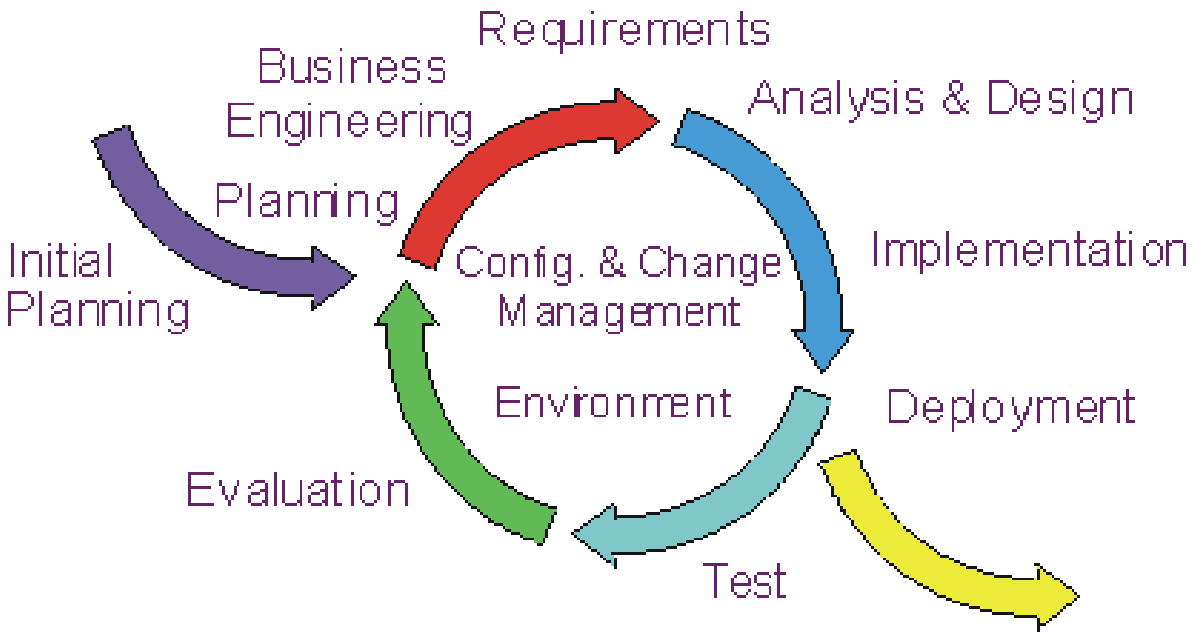

Figure 7: The incremental software development methodology (Software life–cycle). Incremental software development methods have been traced back to 1957. In 1974, a paper by E. A .Edmonds introduced an adaptive software development process. Concurrently and independently the same methods were developed and deployed by the New York Telephone Company's Systems Development Centre under the direction of Dan Gielan. In the early 1970s, Tom Gilb started publishing the concepts of Evolutionary Project Management (EVO), which has evolved into Competitive Engineering. During the mid to late 1970s, Gielan lectured extensively throughout the U.S. on this methodology, its practices and its benefits. (Reference: Wikipedia-Agile software Development)

4.1.2 WATERFALL MODEL

Generally, the water fall model Is a step-by-step design process, often used in software development processes, in which progress is seen as flowing steadily downwards (like a waterfall) through the phases of Specification, Analysis, Design, Construction, Testingthroughto Maintenance. The waterfall development model has its roots from the manufacturing and construction industries; highly structured physical environments in which after-the-fact changes are prohibitively costly, if not impossible. Since no formal software development methodologies existed at the time, this hardware-oriented model was simply adapted for software development.

The water fall model places emphasis on documentation (such as requirements documents and design documents) as well as sourcecode. Inless thoroughly designed and documented methodologies, knowledge is lost if team members leave before the project is completed and it may be difficult for a project to recover from the loss. If a fully working design document is present new team members or even entirely new teams should be able to familiarize themselves by reading the documents.

Advocates of Agile software development argue the waterfall model is a bad idea in practice—believing it impossible for any non-trivial project to finish a phase of a software product's life cycle perfectly before moving to the next phases and learning from them. Thus the waterfall model maintains that one should move to a phase only when it’s proceeding phase is reviewed and verified. This takes the fundamental process activities of specification, development, validation, and evolution and represents them as separate process phases such as requirements specification, software design, implementation, testing, and so on.

The principal stages of the waterfall model directly reflect the fundamental development activities:

1. **Requirements Analysis and Definition:** The system's services, constraints, and goals are established by consultation with system users. They are then defined in detail and serve as system specification
2. **System and Software Design:** The system's design process allocates the requirements to either hardware or software systems by establishing an overall system architecture. Software design involves identifying and describing the fundamental software system abstractions and their relationships.
3. **Implementation and Unit Testing:** During this stage, the software design is realized as a set of programs or program units. Unit testing involves verifying that each unit meets its specification.
4. **Integration and System Testing:** the individual program units or programs are integrated and tested as a complete system to ensure that the software requirements have been met. After testing, the software system is delivered to the customer.
5. **Operation and Maintenance:** Normally (although not necessarily), this is the longest life cycle phase. The system is installed and put into practical use. Maintenance involves correcting errors which were not discovered in earlier stages of the life cycle, improving the implementation of system units and enhancing the system's services as new requirements are discovered.

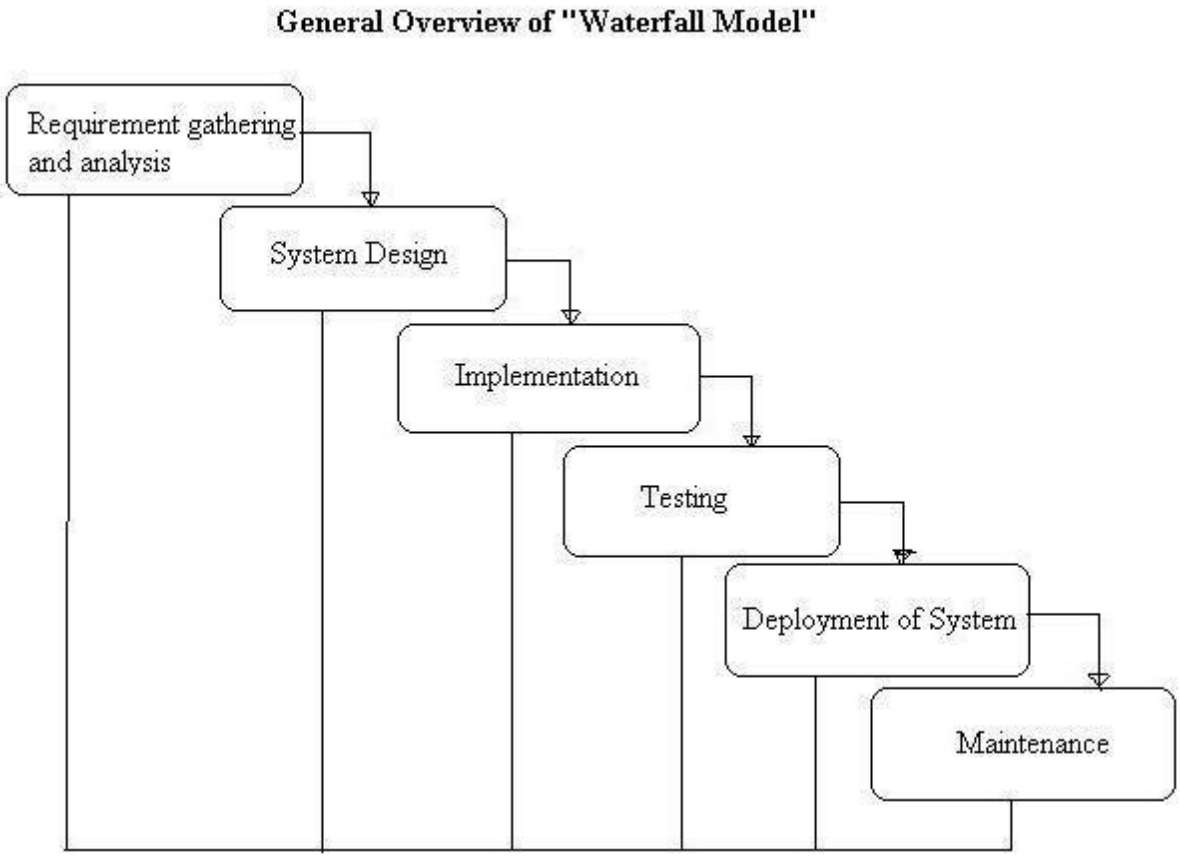

Fig 8: Waterfall Model

4.1.3 SPIRAL METHOD

A risk-driven software process framework (the spiral model) was proposed by Boehm (1988). This is shown in the figure below. Here, the software process is represented as a spiral, rather than a sequence of activities with some back tracking from one activity to another. Each loop in the spiral represents a phase of the software process. Thus, the innermost loop might be concerned with system feasibility, the next loop with requirements definition, the next loop with system design, andso on.

The spiral model combines change avoidance with change tolerance. It assumes that changes are result of project risks and includes explicit risk management activities to reduce these risks. Each loop in the spiral is split into four sectors:

Objective Setting: Specific objectives for that phase of the project are defined. Constraints on the process and the product are identified and a detailed management plan is drawn up. Project risks are identified. Alternative strategies, depending on these risks, may be planned.

Risk Assessment and Reduction: For each of the identified project risks, a detailed analysis is carried out. Steps are taken to reduce the risk. For example, if there is a risk that the requirements are inappropriate, a prototype system may be developed.

Development and Validation: After risk evaluation, a development model for the

System is chosen. For example, throw away prototyping may be the best development approach if user interface risks are dominant. If safety risks are the main consideration, development based on formal transformations may be the most appropriate process, and so on. If the main identified risk is sub-system integration, the waterfall model may be the best development model touse.

Planning: The project is reviewed and decision made whether to continue with a further loop of the spiral. If it is decided to continue, plans are drawn up for the next phase of the project.

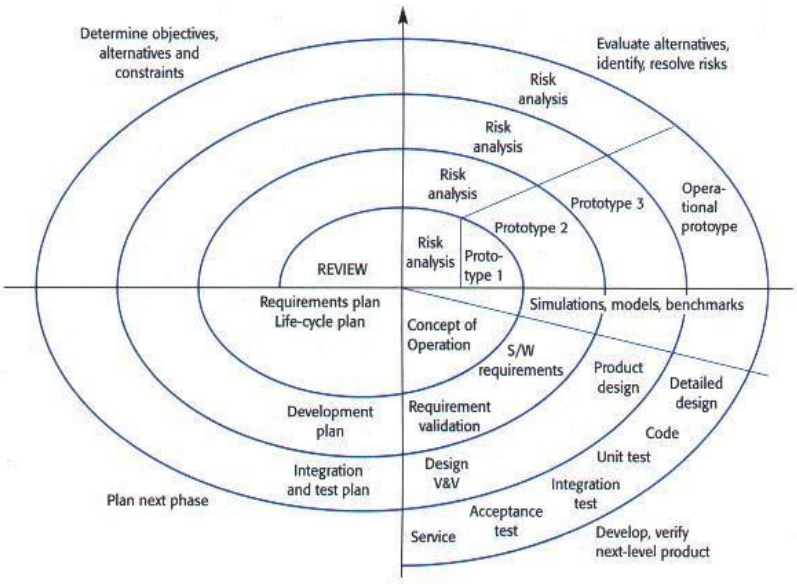

Fig 9: Spiral Model

The main difference between the spiral model and other software process models is its explicit recognition of risk. A cycle of the spiral begins by elaborating objectives such as performance and functionality. Alternative ways of achieving these objectives, and dealing with the constraints on each of them, are then enumerated. Each alternative is assessed against each objective and sources of project risk are identified. The next step is to resolve these risks by information-gathering activities such as more detailed analysis, prototyping, and simulation. Once risks have been assessed, some development is carried out, followed by a planning activity for the next phase of the process. Informally, risk simply means something that can go wrong. For example, if the intention is to u sea new programming language, a risk is that the available compilers are unreliable or do not produce sufficiently efficient object code. Risks lead to proposed software changes and project problems such as schedule and cost over run, so risk minimization is a very important project management activity.

4.2 PROJECT DESIGN

4.2.1 USER INTERFACE DESIGN CONSIDERATION

This is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. It could be seen as the application of systems theory to product development. Designing is the act of taking the marketing information and creating the model of the product to be manufactured. Systems design is therefore the process of defining and developing systems to satisfy specified requirements of theuser.A system can be designed logically or physically. The logical design of a system pertains to an abstract representation of the data flows, inputs and outputs of the system. This is often conducted viamodeling, usingan over-abstract (and sometimes graphical) model of the actual system. The physical design on the other hand relates to the actual input and output processes of the system. This is laid down in terms of how data is input into a system, howit is verified /authenticated, how it is processed, and how it is displayed as output.

This section comprises of two major forms of the project design i.e. the user interface design and the database design.

4.2.2 DESIGN CONSIDERATIONS

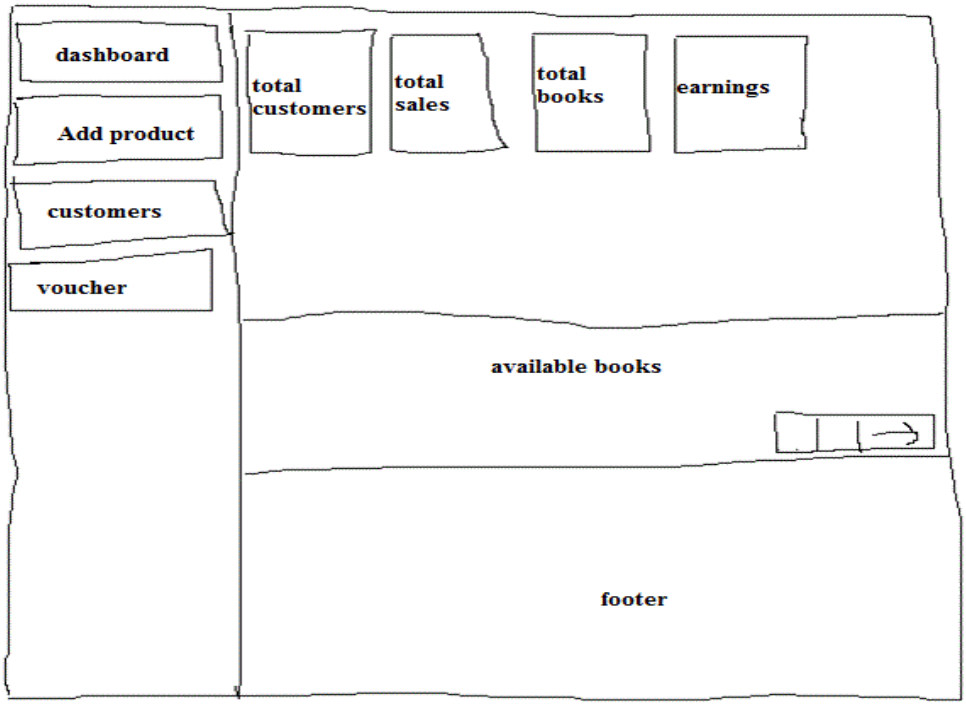

Fig 17: Administrator Design Consideration

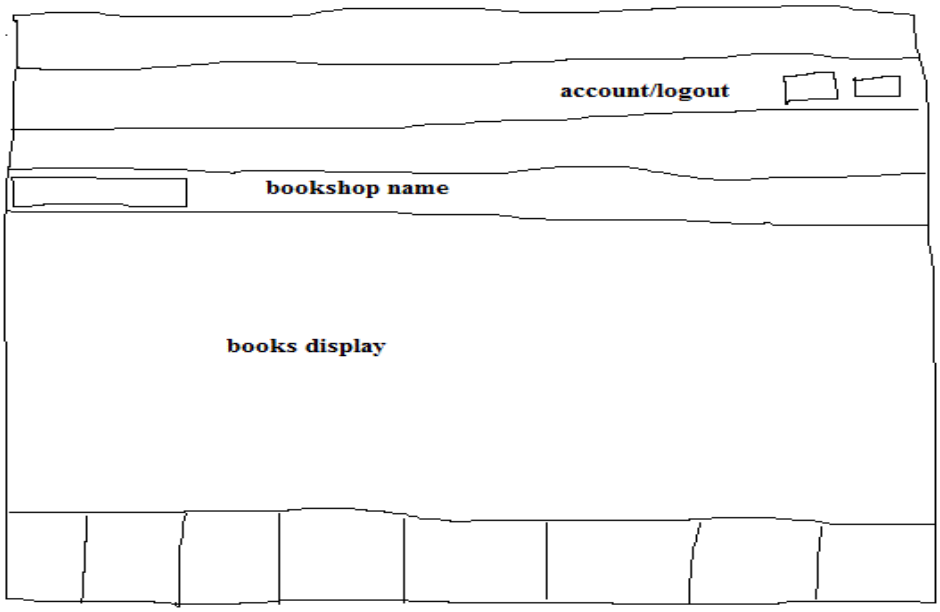

Fig 18: Customer Design Consideration

4.2.3 DATABASE DESIGN

A database is a collection of data which may be related. In a computerized environment, a database is a collection of logically related data with some inherent meaning. It represents some aspects of the real world called the Mini World. They are designed to meet the needs of multiple types of End- users. A database must be integrated and have a share able data as well a shave the following characteristics:

- The data must be perceived differently by different users.
- There must be a common approach to the retrieval, insertion and amendment of data
- Non-redundant data

The database approach to information system comes with the following advantages:

Contingency Redundancy

In the database approach, the views of different user groups are integrated during database design. The database designs to research logical data item in only one place in the database. This ensures consistency and saves storage space. By placing all the data together, one does not have to search multiple files to collect this data and as such controls redundancy.

Restricting Unauthorized Access

When multiple users share a large database, it is likely that most users will not be authorized to access all information in the database. Some users may only be permitted to access all information in the database. Some users may only be permitted to retrieve data, whereas others are allowed to retrieve and update. The database management system provides security and authorized subsystem, which the database administrator

uses to create an account and to specify account restrictions. The database management system then enforces these restrictions automatically.

Enforcement of Standards

Database administrator function is the important part of the database approach. This function has the authority for defining and enforcing data standards. It approves all data names, format and data usage throughout the system ensuring that they conform to the agreed standards.

Sharing of Data

A database is intended to be shared by all authorized users in thesystem. In the database approach, each functional subsystem is provided with its own view (for views) of the database. Each subsystem view (or user view)is a subset of the conceptual database model of the system.

Normalization

Normalization is a scientific method of breaking down complex table structure into a simple table structures by using certain defined rules. Using this method, you can reduce redundancy in a table and eliminate the problems of inconsistency and disk space usage. There is no loss of information. Below are some of the benefits of normalization:

- It enables faster sorting and index creation.
- Few NULLs, and makes the database compact.
- It helps to simplify the structure of tables (database).

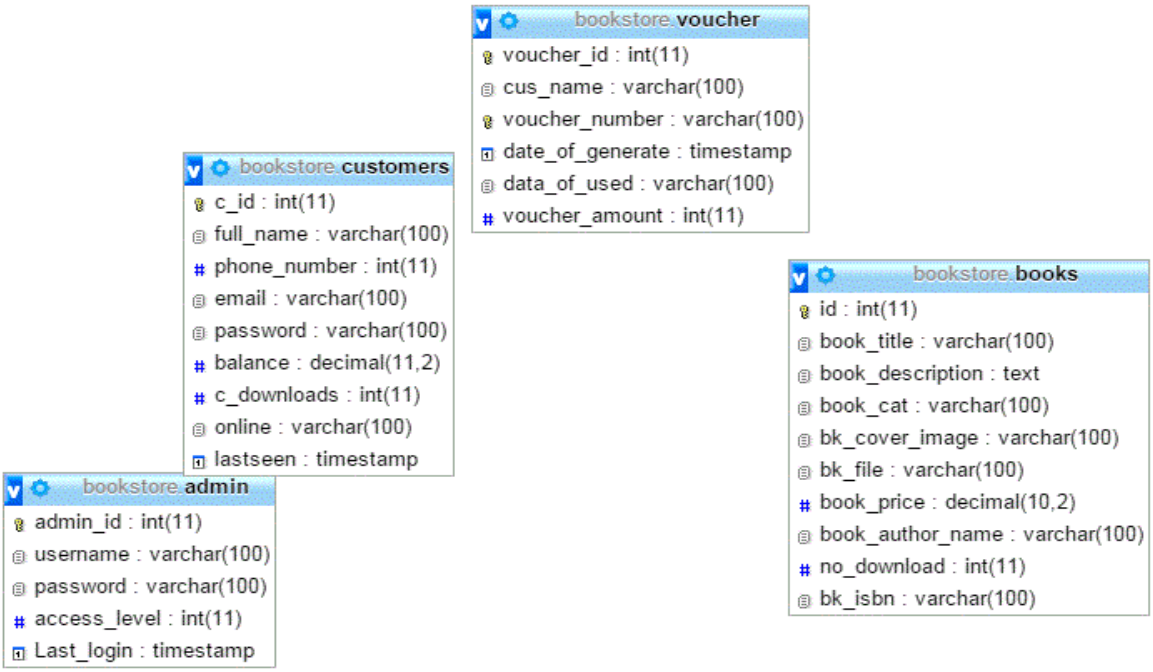

Fig 16: Database Design

4.2.4 LOGICAL DATABASE DESIGN

Logical database design is the process of constructing a model of the data used in an organization based on a specific data model, but independent of a particular DBMS and other physical considerations. Below are the steps used for designing **The Online Bookshop** logical database:

Step1.0 Create and check ER model

An entity-relationship diagram (ERD) is a data modeling technique that creates a graphical representation of the entities, and the relationships between entities, within an information system. Any ER diagram has an equivalent relational table, and any relational table has an equivalent ER diagram. ER diagramming is an invaluable aid to engineers in the design, optimization, and debugging of data base programs. The entity is a person, object, place or event for which data is collected. It is equivalent to a

database table. An entity can be defined by means of its properties, called attributes.In anentity-relationshipdiagramentitiesarerenderedas rectangles, andrelationshipsare portrayed as linesconnectingtherectangles. Theobjectiveistobuildan ERmodelof thedatarequirements ofthis systemtobesupported bythe database.

Step1.1

Identifyentities. Belowaretheentitiesfor **The Online Bookshop**

- Users
- Books
- Voucher

Step1.2

Identify relationships. The objective is to identify the important relationships that exist between the entities. The table below indicates the relationships existing between the above entities.

Entity	**Multiplicity**	**Relationship**	**Multiplicity**	**Entity**
Admin	1..1	Login	1..1	System
	1..*	Edits	0..*	uploads
	1..*	View	0..*	Profile
	1..*	Views	0..*	Books
	1..*	Adds	0..*	Books
	1..*	Views	0..*	Sales
Customer	1..1	Login	1..1	System
	1..*	Edits	1..1	Cart
	1..1	Views	1.11	Account
	1..1	Purchases	1..*	Books
	1..*	Downloads	1..*	Books

Table 19

Table 19: Entity Relationship Diagram for the Online Bookshop

Step1.3

Identify and associate attributes with entities or relationships. Our objective is to associate attributes with the appropriate entities or relationships.

Entity	**Attributes**
Books	Id, book_ title, book _description, book_ cat, bk_ cover_ image, bk_ file, book_ price, book_ author_ name, no_ download, bk_ isbn
Voucher	Voucher _id, cus_ name, voucher_ number, date_ of_ generate, date _of_ used, voucher_ amount
Users	C_ id, admin_ id, full_ name, phone_ number, email, username, password, balance, c_ downloads, online, last seen, last_ login, access_ level

Table 20

Step1.4

Determine attribute domains. Our objective is to determine domains for the attributes in the ER model. The table below shows the domains for the attribute in the various entities.

Entity	**Attribute**	**Description**	**Data type and length**	**Nulls**	**Multi-Valued**
Books	Id	Uniquelyidentifies a book	Integers	No	No
	Book_ title	Title of each book	100variable	No	No
	Book_ description	Talks a bit about the book and what it contains	Text	No	No
	Book_ cat	Groups a book into a particular category	100variable characters	No	No

	Bk_ cover_ image	An image of the book	100 variable characters	No	No
	Bk_ file	The pdf file of the book	100 Variable characters	No	No
	Book_ price	Give the price or cost of the book in the shop	Decimal (10,2)	No	No
	Book_ author _name	The Name of the writer of a particular book	100 variable characters	No	No
	No_ download	Counts the number of downloads of a book	Integers	No	No
	Bk_ isbn	Identifies a book for searching	100 variable characters	No	No
Voucher	Voucher_ id	Identifies a particular voucher	Integers	NO	No
	Cus _name	When used, it stores the name of the user	100 Variable characters	No	No
	Voucher _number	Valid number with a specific amount assigned to it	Integers	Yes	No
	Date_ of _generate	The date and time the voucher was created	Time stamp	No	No
	Date_ of _used	The date and time voucher was used by a customer	100variable characters	No	No
	Voucher_ amount	The amount of money assigned to a particular voucher number	Integers	No	No
Users	C_ id	Uniquely identifies a customer	Integers	No	No
	Admin_ id	Identifies and administrator	Integers	No	No
	Full_ name	The first and last name of the customer	100variable characters	No	No
	Phone_ number	The phone number of a customer	Integers	No	NO
	Email	Email of customers for communication and login	100 Variable characters	No	No

	Username	A form of identification used by the admin to login	100 variable characters	No	NO
	Password	A secret string of words used by a user for authentication	100 variable characters	No	No
	Balance	Amount of money in a customer's account	Decimal	No	No
	Last seen	Last time a customer signed into his/her account	Timestamp	No	No
	Last _login	Last time the admin logged into his account	Timestamp	No	No
	Access_ level	Determines the level of rights of a user	Integers	No	No

Table 21

Step1.5

Determine candidate, primary, and alternate key attributes. Our objective is to identify the candidate key(s) for each entity and, if there is more than one candidate key, to choose one to be the primary key, and to identify the others as alternate keys.

Entity	Attribute	Description	Data type and length	Keys	Nulls	Multi-Valued
Books	Id	Uniquely identifies a book	Integers	Primary Key	No	No
	Book_ title	Title of each book	100 variable characters		No	No
	Book_ description	Talks a bit about the book and what it contains	Text		No	No
	Book_ cat	Groups a book into a particular category	100 variable characters		No	No
	Bk_ cover_ image	An image of the book	100 variable characters		No	No

	Bk _file	The pdf file of the book	100 Variable characters		No	No
	Book _price	Give the price or cost of the book in the shop	Decimal (10,2)		No	No
	Book_ author_ name	The Name of the writer of a particular book	100 variable characters		No	No
	No_ download	Counts the number of downloads of a book	Integers		No	No
	Bk_ isbn	Identifies a book for searching	100 variable characters		No	No
Voucher	Voucher _id	Identifies a particular voucher	Integers	Primary Key	NO	No
	Cus_ name	When used, it stores the name of the user	100 Variable characters		No	No
	Voucher_ number	Valid number with a specific amount assigned to it	Integers		Yes	No
	Date_ of _generate	The date and time the voucher was created	Timestamp		No	No
	Date_ of_ used	The date and time voucher was used by a customer	100 variable characters		No	No
	Voucher_ amount	The amount of money assigned to a particular voucher	Integers		No	No
Users	C_ id	Uniquely identifies a customer	Integers	Primary Key	No	No
	Admin _id	Identifies and administrator	Integers	Primary Key	No	No
	Full _name	The first and last name of the customer	100 variable characters		No	No

	Phone _number	The phone number of a customer	Integers		No	NO
	Email	Email of customers for communication and login	100 Variable characters		No	No
	Username	A form of identification used by the admin to login	100 variable characters		No	NO
	Password	A secret string of words used by a user for authentication	100 variable characters		No	No
	Balance	Amount of money in a customer's account	Decimal		No	No
	Last seen	Last time a customer signed into his/her account	Timestamp		No	No
	Last_ login	Last time the admin logged into his account	Timestamp		No	No

Table 22

4.2.5 MODEL ADAPTED AND JUSTIFICATION

The approach we are using for the system development is the *incremental development*. This approach was chosen over the waterfall model and the other development methodologies because, incremental development is based on the idea of developing an initial implementation, exposing his to user comments and evolving it through several versions until an adequate system has been developed. Specification, development, and validation activities are interleaved rather than separate, with rapid feedback across activities. Incremental development has three important benefits, compared to the waterfall model:

The cost of accommodating changing customer requirements is reduced. The amount of analysis and documentation that has to be redone is much less than is required with the waterfall model.

It is easier to get customer feedback on the development work that has been done. Customers can comment on demonstrations of the software and see how much has been implemented. Customers find it difficult to judge progress from software design documents.

More rapid delivery and deployment of useful software to the customer is possible, even if all of the functionality has not been included. Customers are able to use and gain value from the software earlier than is possible with waterfall process.

CHAPTER 5

SYSTEM IMPLEMENTATION AND TESTING

5.1 IMPLEMENTATION OF THE SYSTEM

The Implementation Plan describes how the information system will be deployed, installed and transitioned into an operational system. The plan contains an overview of the system, a brief description of the major tasks involved in the implementation, the overall resources needed to support the implementation effort (such as hardware, software. facilities, materials, and personnel),and any site- specific implementation requirements.

5.1.1 OVERVIEW OF IMPLEMENTATION

In a general context, implementation is the carrying out, execution, or practice of aplan, a method, or any design for doing something. As such, Implementation is the action that must follow any preliminary thinking in order for something to actually happen. In an information technology context, it encompasses all the processes involved in getting new software or hardware operating properly in its environment, including installation, configuration, and running, testing and making necessary changes. Implementation is the process of realizing the design as a program and it's the stage of software development which involves the process of converting a system specification into an executable system. It often involves the processes of software design and programming. The word deployment is sometimes used to mean the same thing.

5.1.2WHAT IS SYSTEMS IMPLEMENTATION?

Systems implementation refers to the fourth phase of the systems development lifecycle, in which the information system is programmed, tested, Installed andsupported. It is the construction of the new system and the delivery of that system into production (that is, the day-to-day operation of the system).It defines how the information system should be built (i.e., physical system design). System implementation ensures that:

- The information system is operational and used.
- The information system meets quality standard (i.e., quality assurance).

The systems implementation stage also involves educating users on how to utilize the new system. It also includes putting the new system to use and ensuring that it meets all the functional requirements. The process of changing the system's support duties includes evolving from a system development to a support system and operations maintenance, with the ownership of the new system shifting from the Development team to the users. In a nut shell, the phase of implementation entails;

- The various hardware and software components of the system are put in place. In this case, the software is installed on the devices to be used.
- Customization of the software to suit user's local functional requirements
- Also, migration of the old system to the new system takes place at the implementation phase.
- Lastly, the system as a whole is put through a series of tests before it passes through for approval and then put into operation.

5.1.3 SYSTEM OVERVIEW

Nwoma Bookshop is a web application with the basic function to make searching and purchasing of books more effective, feasible and electronic. The system will definitely cater for the lapses in the existing system and act as the main system for the physical bookshop. It will provide accurate results from the data base system to the admin to know the number of users (customers) and how sales are going.

5.1.4MAJOR TASKSINVOLVEDINIMPLEMENTATION

System will first be tested locally to verify if every functionality works perfectly before hosting the system on a server online. To start using the system locally, install any server application on your PC so that the system will be hosted locally.

Type http://localhost/bookshop/htmlas the URL and press enter. One can start using the system even without registration but would have to be registered to make purchases.

After verification, the system can then be moved to an online server where with the URL given after hosting, people around the globe can have access to the contents of the page.

5.1.5 Resources that are needed to support the implementation

- Hardware (Minimum Capabilities)
- A laptop or any working PC with 2GB of RAM
- A processor speed of 1GHz
- A Smartphone, tablet or an Ipad (3” or above)

Network

- Must have internet access

Operating System

- Windows, Linux, Mac OS, Android, etc

Browser

- Mozilla Firefox, Google Chrome, Internet Explorer, Safari, etc

5.2 SYSTEM TESTING

System testing is the process of performing a variety of tests on a system to explore functionality or to identify problems. System testing of software or hardware is testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. It falls within the scope of black box testing, and therefore requires no knowledge of the inner design of the code or logic. It is a more limited type of testing; it seeks to detect defects both within the "inter-assemblages "and also within the system as a whole. System testing is usually required before and after a system is put in place.

A seriesof systematic procedures are referred to while testing is being performed. These procedures tell the tester how the system should perform and where common mistakes may be found. Testers usually try to "break the system" by entering data that may cause the system to malfunction or return incorrect information.

The testing process has two distinct goals:

- To demonstrate to the developer and the customer that the software meets its requirements. For custom software, this means that there should be at least one test for every requirement in the requirements document. For generic software products,

it means that there should be tests for all of the system features, plus combinations of these features, that will be incorporated in the product release.

- To discover situations in which the behavior of the software is incorrect, undesirable, or does not conform to its specification. These are a consequence of software defects. Defect testing is concerned with rooting out undesirable system behavior such as system crashes, unwanted interactions with other systems, incorrect computations, and data corruption. The first goal leads to validation testing, where you expect the system to perform correctly using a given set of test cases that reflect the systems expected use. These condo goal leads to defect testing, where the test cases are designed to exposed efects. The test cases in defect testing can be deliberately obscure and need not reflect how the system is normally used. Testing of the system was undertaken in two stages; Unit Testing and System testing.

5.2.1 UNIT TESTING

System testing is the process of performing a variety of tests on a system to explore functionality or to identify problems. System testing of software or hardware is testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. It falls within the scope of black box testing, and therefore requires no knowledge of the inner design of the code or logic. It is a more limited type of testing; it seeks to detect defects both within the "inter-assemblages" and also within the system as a whole. System testing is usually required before and after a system is put in place.

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5.2.2ACCPETANCETESTING

Acceptance testing is a term used in agile software development methodologies, particularly extreme programming, referring to the functional testing of a user story by the software development team during the implementation phase.

The customer specifies scenarios to test when a user story has been correctly implemented. A story can have one or many acceptance tests, whatever it takes to ensure the functionality works. Acceptance tests are black-box system tests. Each acceptance test represents some expected result from the system. Customers are responsible for verifying the correctness of the acceptance tests and reviewing test scores to decide which failed tests are of highest priority. Acceptance tests are also used as regression tests prior to a production release. A user story is not considered complete until it has passed its acceptance tests. This means that new acceptance tests must be created for each iteration or the development team will report zero progress.

The following screenshots of the system were taken during testing:

Admin Dashboard:

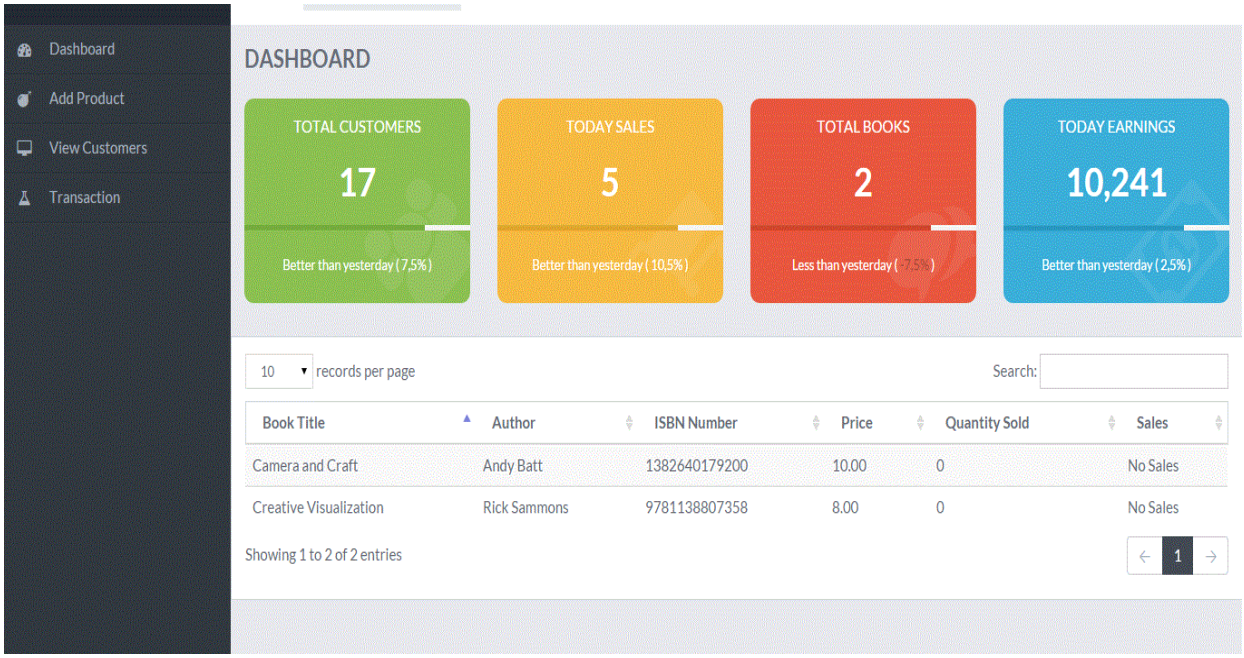

Fig 10: Admin Dashboard

Search Customer Page:

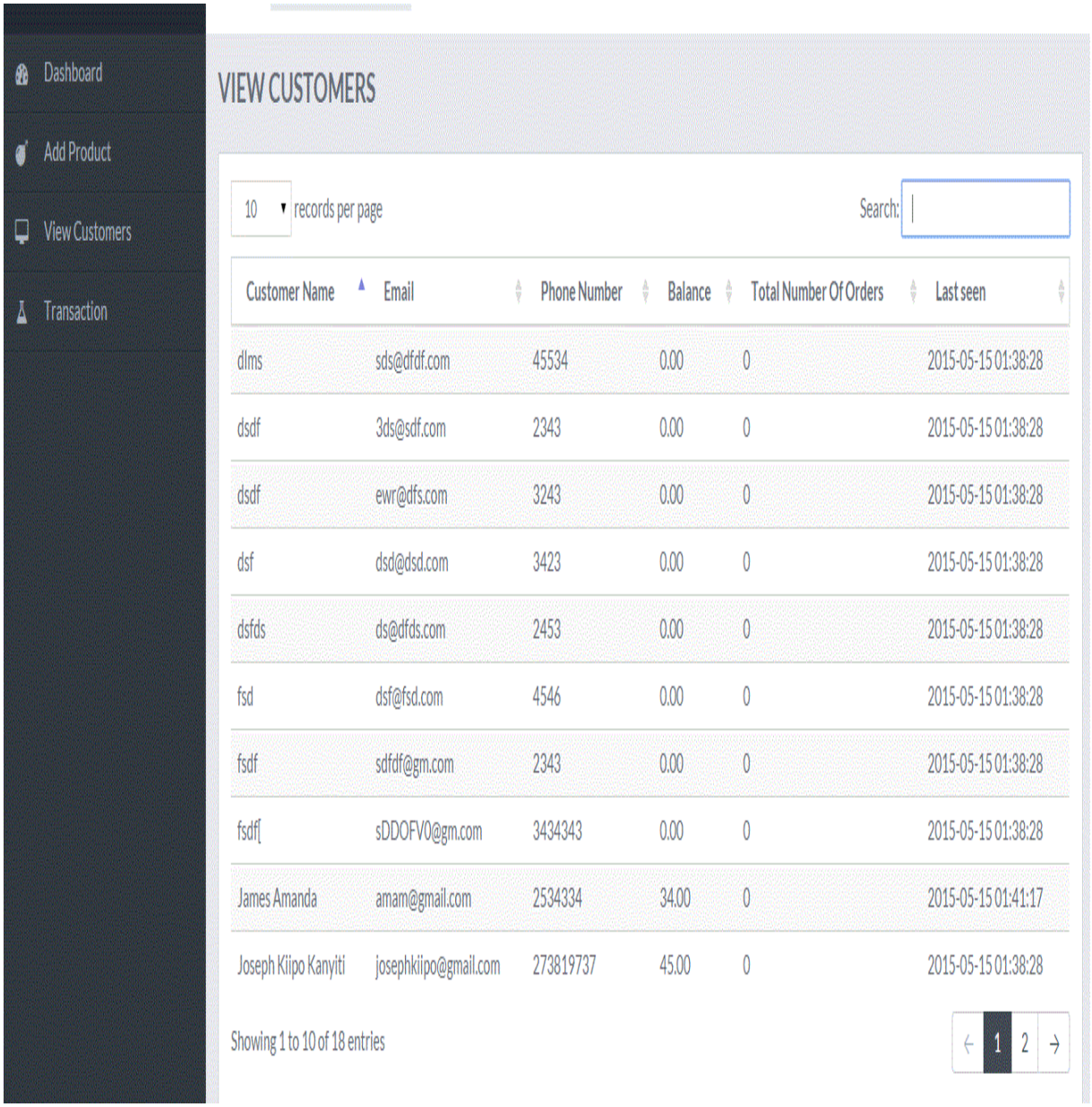

Fig 10: Search Customer

Voucher Generation Page:

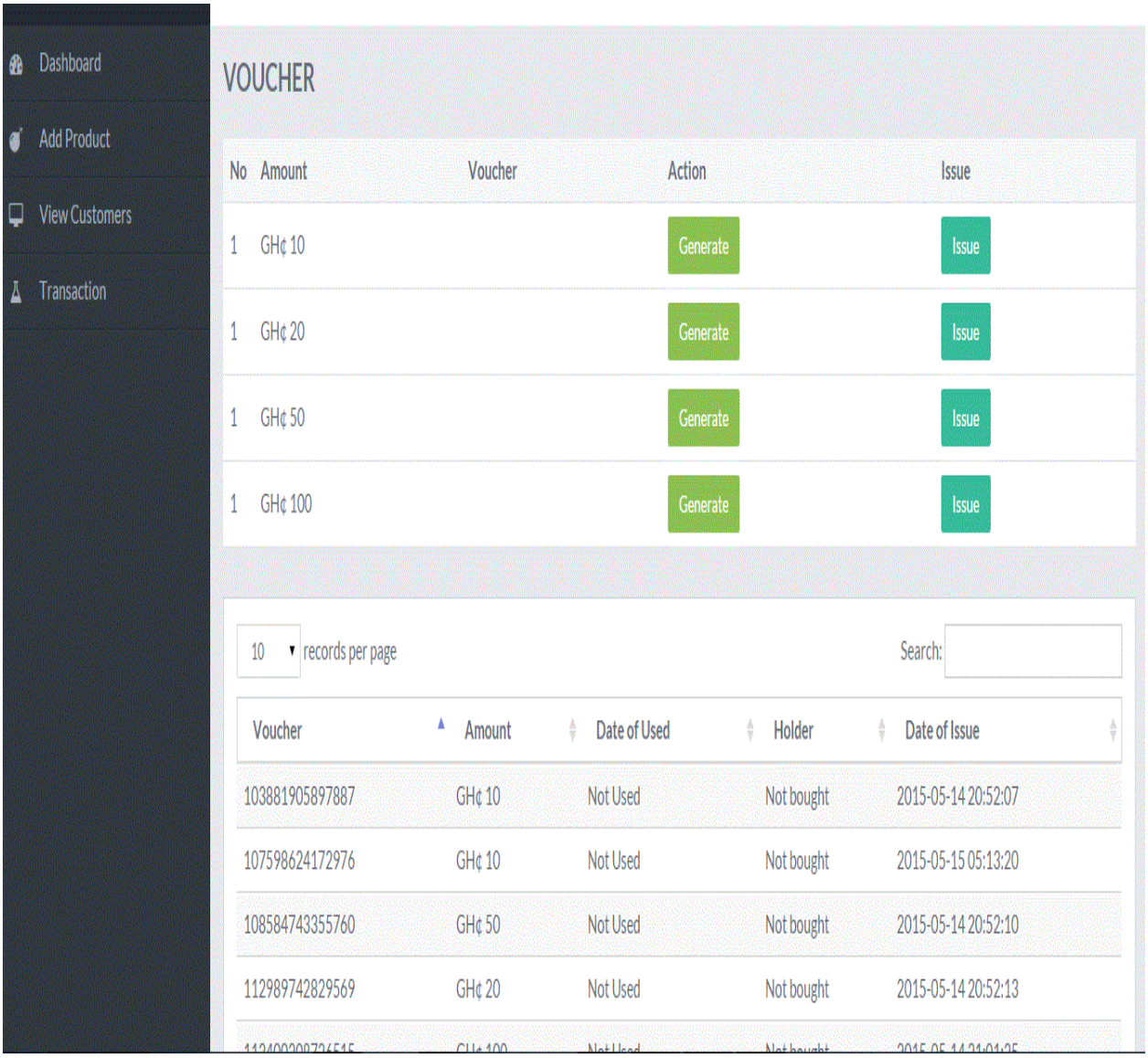

Fig 11: Voucher Generation

Add Product Page:

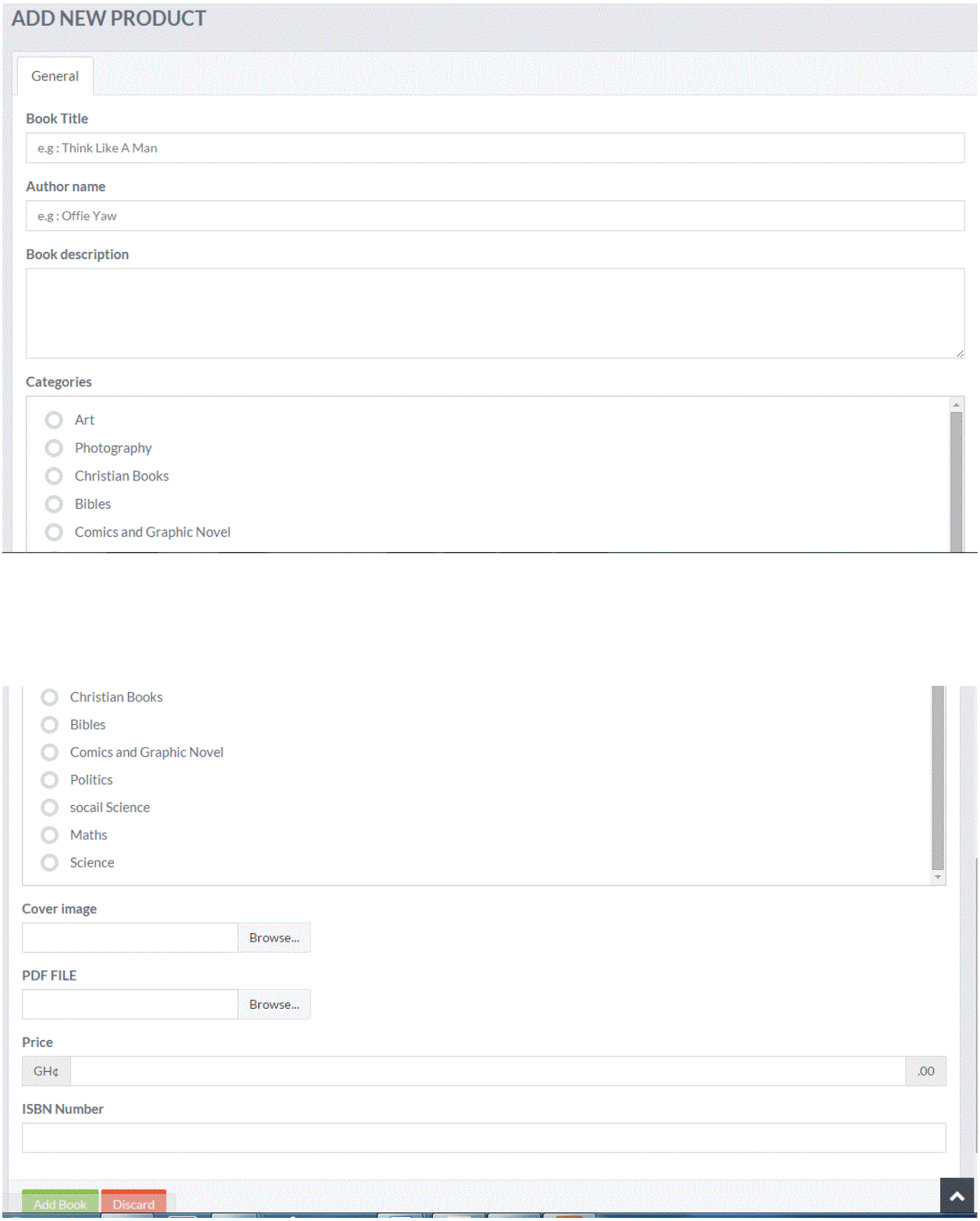

Fig 12: Add Products

Customer Login and Registration:

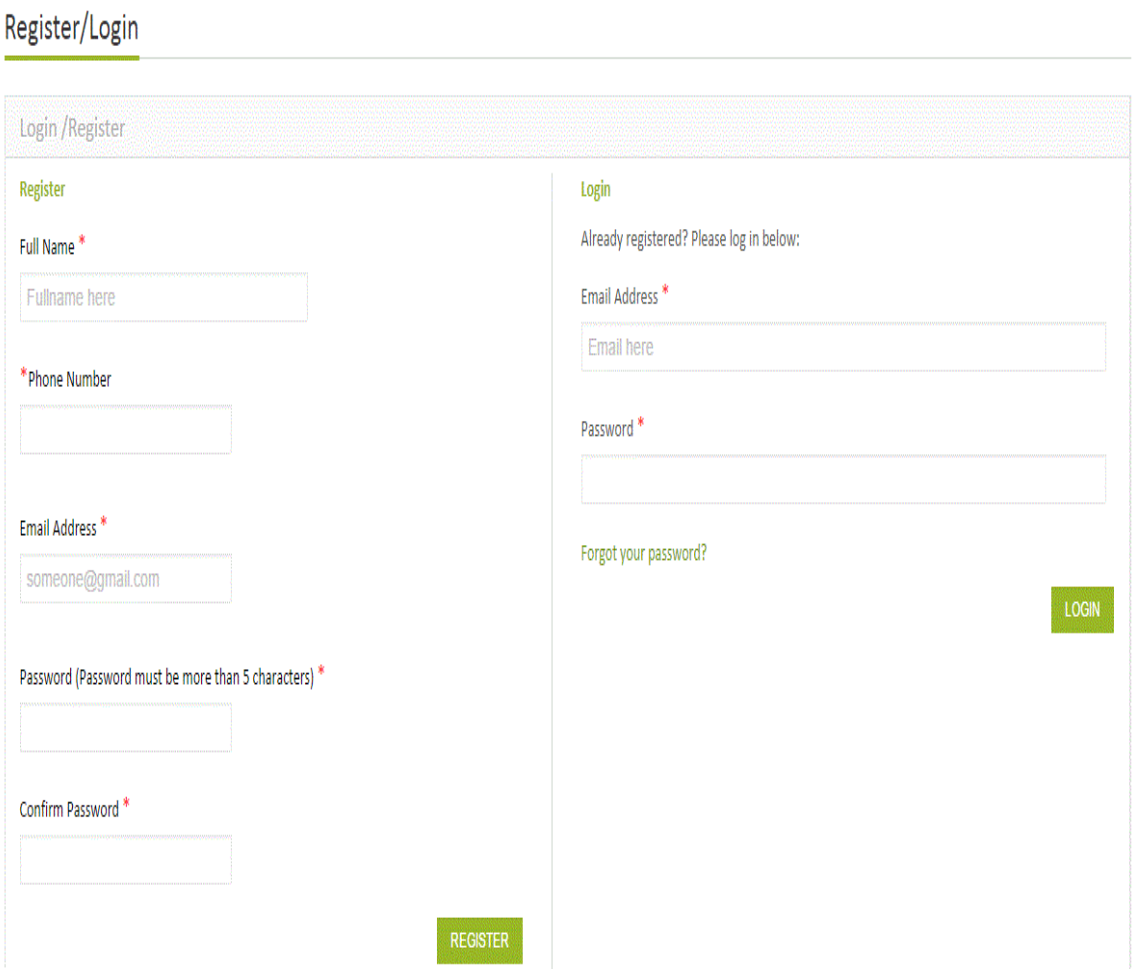

Fig 14: Login and Registration

Book Display Page:

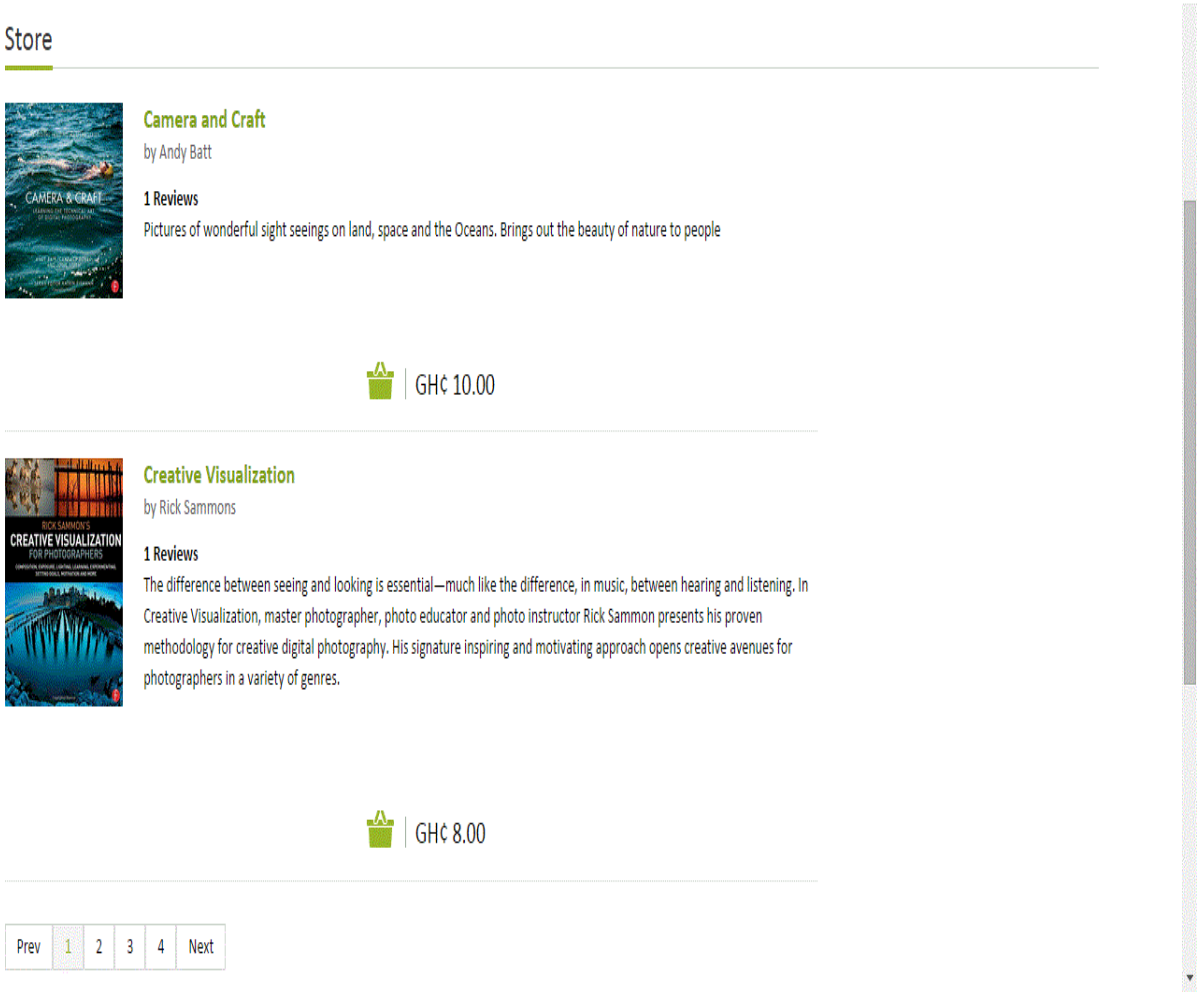

Fig 15: Product Display

CHAPTER SIX

6.0 CONCLUSION

This web application NWOMA-BOOKSHOP is for providing an uploading system, purchasing, download and delivery for the shop owner and customers. It is supposed to be used by the Shop owner and customers both far and near.

It is an internet enabled application to be used by both account and non-account holders (customers) for easy purchasing and download of books.

6.1 RECOMMENDATION

In the near future, it is recommended that the system be improved and expand the payment system to include most common mobile money transfers like Tigo cash, Airtel Money and MTN Mobile Money. Also for those outside of the country, PayPal system should be added to help minimize unauthorized money transfers (fraud).

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