HOSPITAL MANAGEMENT SYSTEM

By

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A Thesis Presented To The Facultly Of Computer Science And Information Technology University Of Malaya In Fulfillment Of The Requirement For The Degree

BACHELOR OF
INFORMATION TECHNOLOGY
(MANAGEMENT)
UNIVERSITY OF MALAYA
2002 / 2003

ABSTRACT

Internet has often been referred to as the "Information Superhighway". The concept of being able to access information quickly and easily led to the vision of the Internet. With the advancement of information technology and increasing number of users getting connected to the net, various techniques are being employed on the world wide web. It provides sustaining facility accessible to hundreds of million of people worldwide.

The medical community is moving toward an environment where automated patient medical records, and electronically interconnected healthcare facilities, are becoming prevalent. The primary reason is that the electronic record, coupled with the electronic networking of hospitals, can provide healthcare organizations with more efficient, seamless services, resulting in higher quality care and reduced healthcare costs. A major tenet of such automation, and indeed of healthcare reform as a whole, is the ability to share patient information.

With this in mind, the Hospital Management System intends to provide a similar service to its users and thus creating an information hub that stores and retrieves information pertaining to the patient.

The Hospital Management System will focus on patient related situations while resolving the drawbacks of the conventional methods of retrieving user information through loads of paper and manual record.

ACKNOWLEDGEMENT

Firstly I would like to gratefully acknowledge the support and assistance given by my supervisor, Assoc Prof Dr. P Sellapan. Thanks for giving me an insight of the system and assisting me in my queries about the system.

I also owe my deepest gratitude to my moderator, Puan Siti Hafiza for all the comments and feedback given during the VIVA of this project. The suggestions and comments given were very much appreciated.

I would also like to thank the Directors of University Malay Medical Center and Hospital Fatima for approving to view the system that is currently being implemented in the hospital. Their help and support are much appreciated.

I wish to sincerely acknowledge my friends especially my partner Kavitha, who is also currently developing part of the Hospital Management System with me, my friends and those who have provided helpful insights and suggestions for this project. Their help was exemplary.

Finally, thanks once again to all the people who have directly or indirectly assisted me during the completion of this project.

MARY ANNE SOOSAY
SEPTEMBER 2002

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1.0 Introduction

A variety of environmental forces have shaped the delivery of healthcare services and brought about variations in the development of hospital systems. Prominent among these factors has been the shift in the industry from an emphasis on providing hospital services to an emphasis on furnishing health care services.

Traditional ways of carrying out hospital tasks involve huge amounts of paper documents, resulting in a lot of overhead and inefficiency. The need for a more efficient system resulted in the development of the Hospital Management System. The Hospital Management System consists of:

i.   Patient Management System

ii.   Patient Billing System

iii.   Accounts Module

iv.   Appointment Module

v.   Medical Certificate Module

vi.   Pharmacy Module

The 6 subsystems are integrated into a complete system and runs on an integrated database.

The portion that we developed is the Patient Billing System and the Accounts Module, which is a subsystem of the Hospital Management System that would include security management, inpatient and outpatient billing management and the charges and receivables management.

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The focus of my thesis would be the Patient Billing System and the Accounts Module, which is a subsystem in the Hospital Management System that would include security management, inpatient and outpatient billing management and the charges and receivable management.

1.1   Project Overview

At present day, the use of the computerized Hospital Management System is still limited to large hospitals. With most of the system being administrative oriented and billings are usually done separately, these hospitals are currently being lagged behind by the revolution of technology.

The Hospital Management System streamlines the administrative functions related to patients for a variety of activities (admission, patient care and etc.) It includes the registration of patient demographic data, admissions, discharge, transfer data and billing transactians for inpatients and visiting outpatients.

1.11 Patient Billing System

The Patient Billing System module streamlines all the functions from discharge and transfer to the final transaction of the hospital bills.
It is clear that selected departments will automatically be notified of all the following activities.

The ADT located under the Patient Management System is one of the functions that interact with the Patient Billing System. It generates the transactions which was chosen to be rendered to the patients and later is displayed in the Charges Computation located under the Patient Billing System.

1.12 Accounts Module

The Accounts module on the other hand keeps the records of the transactions, which involves inpatients and outpatients.. This module is also responsible in tracking the recalim and extra payment charges of the patient.

1.2 Objective

One of the most important objectives of a patient management system is to establish the communication links between wards and functional departments for inpatients and outpatients. Together with that, below are listed a few objectives of the system

i.   To become a paperless, efficient and effective hospital

ii.   Improving the current procedure (functions) based system to a system that is oriented to a user's point of view.

iii.   To connect and manage distributed information resources.

iv.   To guarantee high availability of the system, where the reliability and confidentiality of the system is high and the respond time is fast.

v.   Provide a user – friendly graphical user interface to the users.

1.3 Scope

The system will be developed according to the following scopes:

i.   The Hospital Management System will focus on the patient related administration functions like the Patient Admission, Patient Location, Medical History and finally the Patient Billing Module.

ii.   The system will include 4 modules namely
   a) The Patient Admission Module
   b) The Patient Location Module
   c) The Medical Expenditure Module
   d) The Patient Billing Module

iii.   Password will be provided to authorize access for the healthcare administrator to update the patient information.

iv.   User Friendly Interactive Graphical User Interface will be designed to provide the user with an easy method of handling the system.

1.4 Expected Outcome.

This system is designed to help improve the rendering of healthcare services to the patients. Besides that, the medical staffs would have a more systematic way of handling the billing and the payment system.

Patients on the other hand will be aware of what they are actually being accounted for during their stay at the hospital.

1.5 Project Schedule

Key Activity	Mar	Apr	May	Jun	July	Aug	Sept
Preliminary Research	▄						
Requirement Acquisition		▄					
Requirement Analysis	▄						
Requirement Definition	▄						
Literature Review	▄						
System Design		▄					
System Coding				▄			
System Testing					▄		
Documentation						▄	
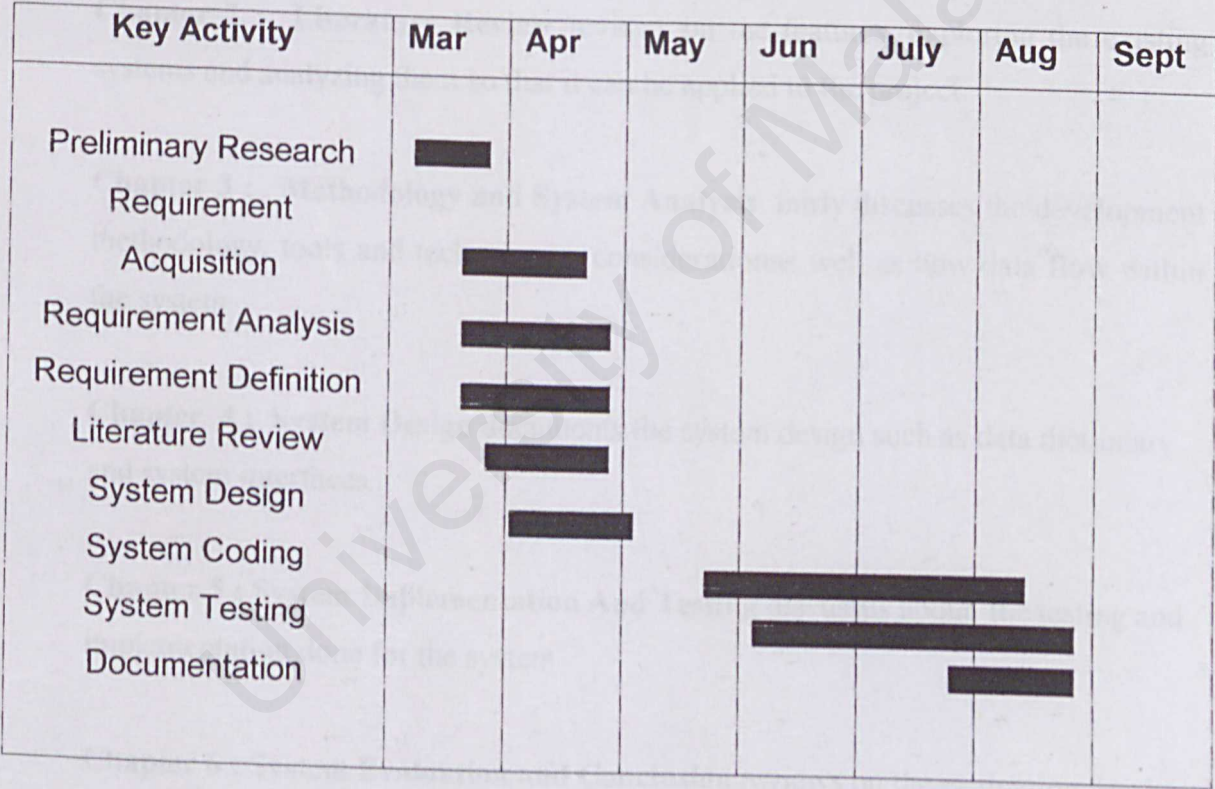
Figure 1.1   Project Schedule from March 2002 – September 2002

1.6 Chapter Summary

The purpose of this report is to document all the essential information gathered and used to develop this system. This report is mainly divided into 4 chapters. A brief synopsis of each chapter is as follows :

Chapter 1: Introduction serves as an introduction to the entire project. It overviews the project objectives, significance, scope, overview of the system, methodology, expected outcome and the project schedule.

Chapter 2 : Literature Review reviews on the features, exploring the existing systems and analyzing them so that it can be applied to the project

Chapter 3 : Methodology and System Analysis fairly discusses the development methodology, tools and technologies considerationas well as how data flow within the system.

Chapter 4 : System Design documents the system design such as data dictionary and system interfaces.

Chapter 5 : System Implementation And Testing discussus about the testing and implementation done for the system

Chapter 6 : System Evaluation and Conclusion reviews on the evaluation for the system and the final conclusion.

2.0 Literature Review

2.1 Introduction

Hospital Managers are beginning to realize that hospitals are relying more and more on their IS and that the IS development group challenges the issue not only to produce better system but also to be more responsive to user needs. Nowadays we can observe that application software does not keep pace with the constantly changing needs of healthcare environment or with dynamic evolving technology.

Attempts to improve the flow of applications have only resulted in marginal improvements. As software developments techniques and design techniques are becoming excessively

2.2 Findings And Techniques Used In development

This is an important stage in the system development. At this stage, analyses and synthesis of the action will be carried out to ease the understanding of the system. In the process of developing the functional module of the Hospital Management System, features and operations that the manual and current administration of a few hospitals in the country has been carried out. This step helps in understand the flow of management and to get a better view of how the flow of work actually takes place.

In order to develop an efficient and systematic system, it is very important to work and study the current existing information systems at these local hospitals and search to re-engineer the systems so that it could perform multi tasks and in turn can troubleshoot the administration thus providing the users with lesser data access. Also, it is useful to efficiently deliver the knowledge of the strength and limitations of current so that the best tools may be chosen to develop the proposed system.

2.0 Literature Review

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Attempts to improve the flow of applications have only resulted in marginal improvements. As software developments lag behind in technology advances, analysis and design techniques are becoming extremely important.

2.2 Findings And Techniques Used In Developing The System

This is an important stage in the systems development. At this stage, analysis and synthesis of the system will be carried out to ensure the understanding of the system. In the process of developing the Billing Module of the Hospital Management System, research and interviews with the medical and systems administrators of a few hospitals in the peninsular was carried out. This was done to understand the flow of management and to get a better view of how the flow of work actually takes place.

In order to develop an efficient and systematic system, it is very important to learn and study the current existing information systems at these local hospitals and modify it to enhance the systems so that it could perform multi tasks and to ease the workload of the administrator, thus providing the users with faster data access. Also, it is meant to sufficiently deliver the knowledge of the strength and limitations of several development tools so that the best tools may be chosen to develop the proposed system.
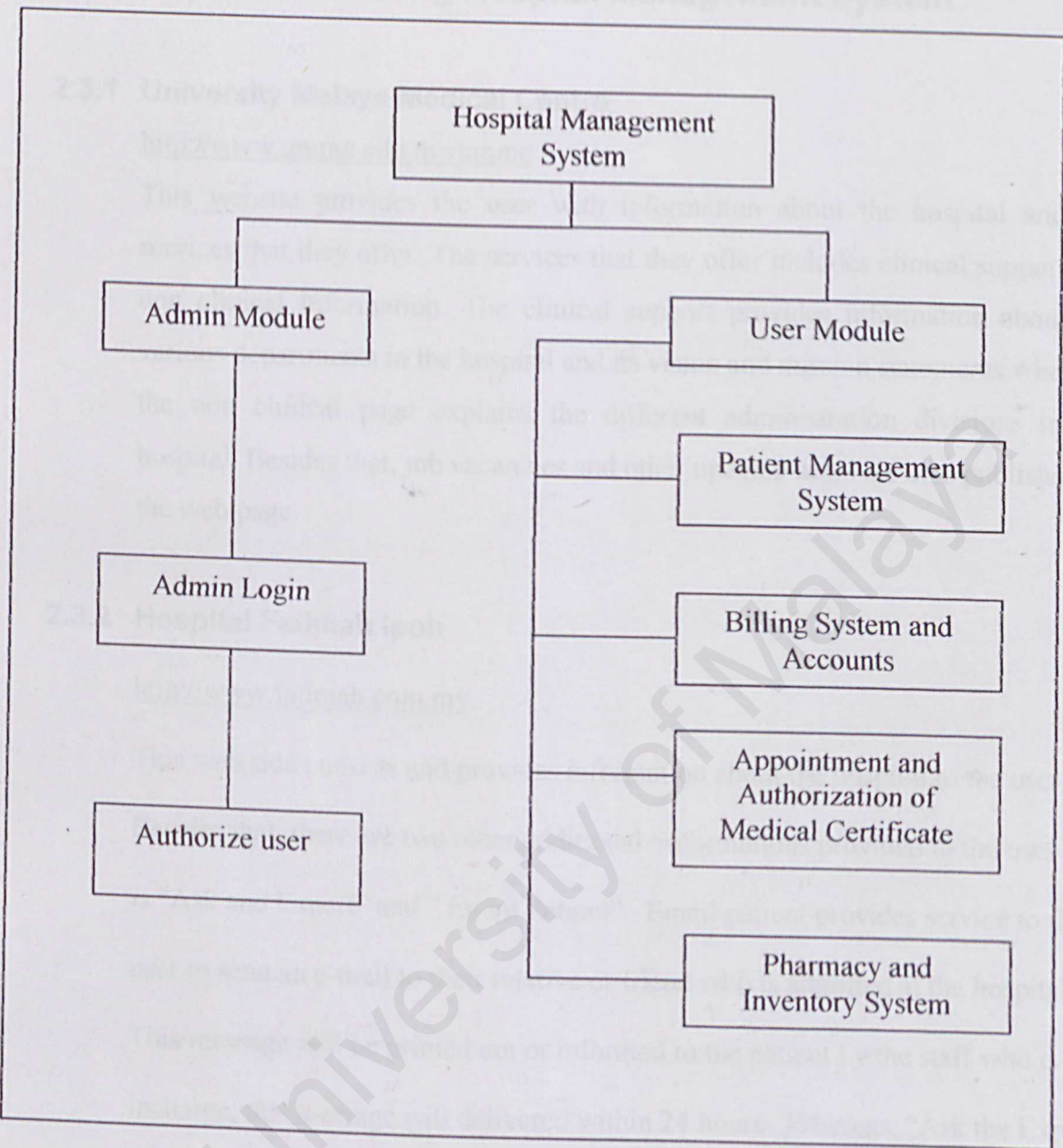
Figure 2.1: Conceptual Diagram Of Proposed System.

The figure above depicts the conceptual diagram of the proposed system. On the left is the server side whereas on the right is the client side. Form the diagram above, the client side depicts the modules of the Hospital Management System.

2.3 Analysis On Existing Hospital Management System

2.3.1 University Malaya Medical Centre

http://www.ummc.edu.my/ummc

This website provides the user with information about the hospital and the services that they offer. The services that they offer includes clinical support and non clinical information. The clinical support provides information about the various departments in the hospital and its vision and mission statements whereas, the non clinical page explains the different administration divisions in the hospital. Besides that, job vacancies and other updated news are also published on the web page.

2.3.2 Hospital Fatimah Ipoh

http://www.fatimah.com.my

This web side consists and provides information about the hospital to the user.

Besides that, there are two other additional informations provided to the user that is "Ask and Expert" and " Email Patient". Email patient provides service to the user to send an e-mail to their relative or friend who is admitted at the hospital.

This message will be printed out or informed to the patient by the staff who is incharge, this message will delivered within 24 hours. Whereas, "Ask the Expert" ia a questions and answers (Q &A) session where a patient can ask the clinical consultant about any disease they wish to know about.

2.3.3   Malacca Hospital

http://www.melaka.gov.my/southen/default.html

This web site also provides the user with information about the hospital. It

consists of the information about the facilities, beds category (ward class) and

other information that the user wishes to know about the hospital.

2.3.4   Hospital Selayang

http://www.selayanghospital.gov.my

This web site provides information to the user. This web site was design

and constructed for a TOTAL HOSPITAL INFORMATION SYSTEM (T.H.I.S)

environment with ultimate aim of paper-less and film-less hospital operation. It is

the first hospital in Malaysia and the world to operate with THIS to cover all

aspect of its operation. In order to meet the objective of the state of the art facility,

a highly quality effective organization and management has to be ensured for the

success of this hospital. THIS covers all aspects of its operation that consist 4

main Module

- Patient Management System

- Clinical System

- Clinical Support System

- Administrate Hospital System

As a summary, patients' medical records, guidelines and clinical protocols

are instantly available and can be assessed in one integrated workstation at any

place and at any time in the hospital, provided that the user has proper and rightful

authority to access the information.

Being an electronic hospital that has taken the initiative to implement THIS,

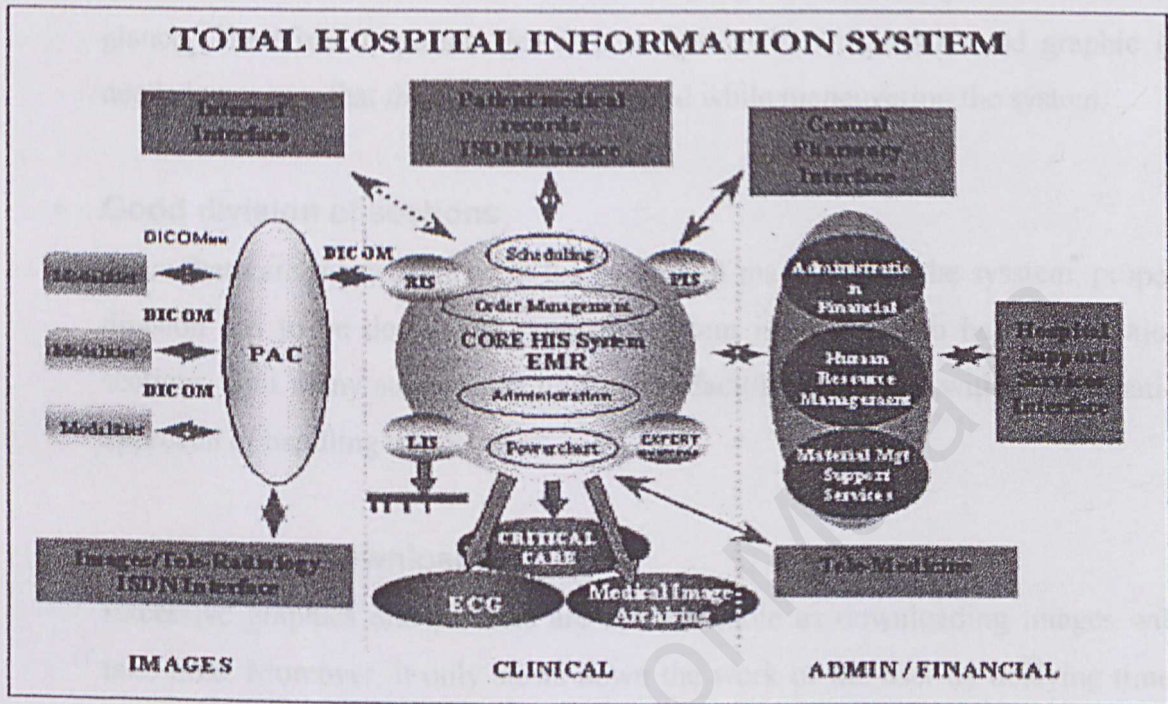Selayang Hospital has become a showcase to the rest of the world.

THIS Modules

Figure 2.2 THIS Module

2.4 Synthesis Of The Existing Systems

Based on the observation and evaluation made on the existing systems, many plus points and weaknesses were discovered. At the time of writing, there are no existing billings systems of the hospital being done over the Internet where by a patient can pay and settle their bills. Most of the web sites surfed was only meant to provide information about the hospitals. The distinct difference was noted on the website of Fatima Hospital in Ipoh (fatima.com) where they had an "e-mail a patient" module which enables the users to send an email to the patient at the hospital. However, the information and knowledge gained during the analyzing of these systems will be taken into consideration while developing this system. Therefore, this system will set out its ultimate goal to provide and deliver value added services for patients to pay their bills.

Overall, this proposed system is expected to have these features :

- **Good interface design**

  The interface design is so vital as users will judge whatever they see at their first glance. Therefore, important features such as colour, font size and graphic is needed to ensure that the user is not confused while maneuvering the system.

- **Good division of sections**

  Since there are many sections in the process of maneuvering the sysstem, proper division has to be done. The proposed system is expected to have few major sections with many subsections under it to facilitate the user with a systematic approach of handling the system.

- **Easy and fast downloading**

  Excessive graphics and pictures are not advisable as downloading images will take time. Moreover, it only slows down the work of the user by delaying time. Therefore, the system being developed will only consist of relevant graphics.

2.5 Project Domain

The focus of my thesis revolves around the billing process of patient. This domain is scattered mostly in forms involving the patient`s prescriptions and charges and is captured altogether in the final billing module. This shows an integration of the system whereby the billing module is actually dependent on the patient management system modules in order to generate its functions fully. There fore, creating an ease of flow that enables the billing staff to simply retrieve the information pertaining to the patient`s charges rather than keying it in manually. In other words, there is no redundancy of information being passed around. It is infact a one-input technique that eases the workload of the person in charge.

2.6 Summary Of Literature.

Most of the websites surfed were merely providing information about the services and information to the users. No websites were found which allows the user to update their information neither to reschedule their appointments. In other words, these websites were merely an information website rather than a service based website.

The main reason as to why these websites were only meant to be "read only" is because of the fear that the users may not knowingly change the information that is in the database. The management system of the hospital is usually found in the intranet that only allows authorize users to use them.

3.0   Methodology

The main purpose of this part is to give enough confidence to the readers or supervisors on the feasibility of the project. The quality of the proposed tools is referring to the practicality of chosen tools, effectiveness and appropriateness in solving the problems. Effective development of a project depends on through planning. Thus, a plan must be drawn up to guide the development towards the project goals. This is done buy conducting a few methods of finding information about the proposed system. The research and analysis is further explained below.

3.0.1 Research

The research and findings for the proposed system started throughout semester. Research needs to be done to find the feasibility of the project according to the users need. Many methods have been used to gather sufficient resources about the system so as to keep the right track in developing the system. The methods used are namely:

• Via Internet

Most of the information gathered and obtained here is based on the power of Internet where information can be found through browsing with the use of search engine, Google. A list of all resources used in this project through the Internet can be found in the Reference page.

• Visit to the 7th South East Asian Healthcare Exhibition Show 2002

This healthcare conference was an eye-opener as it showed many different types of systems used in the hospitals which were developed using many different programming languages. Discussions was conducted with the personnel in charge to get a better view of the whole system.

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3.0.1 Research

The research and findings for the proposed system progressed throughout 2 semesters. Research method is a critical part to determine the requirements of the project according to the users need. Many methods and ways were used to gather sufficient resources about the system so as to be on the right track in developing the system. The methods used are namely:

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Most of the information required and obtained here is based on the power of Internet where information can be found through browsing with the use of search engine, Google. A list of all resources found in this project through the Internet can be found in the Reference page.

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- **Discussion with lecturers and peers.**

This method has been very useful in deciding and determining the core requirements of this project. Discussion with peers has given ideas on how this project will be developed.

- **Visits to the hospital**

This method was most benefiting as we had an actual look at the system implemented at the hospital. Discussion was conducted with the administrative staff to gain a better insight of the system that was being implemented in the hospital.

- **FSKTM's Document Room**

Through this method, examples of past thesis were reviewed as a guideline for this project.

3.1 Systems Analysis

System Analysis is an important phase in a software development life cycle. During the analysis phase, information needs and system performance criteria are defined by engaging in a variety of information-gathering activities, and developing alternative solutions.

Basically, the purpose of system analysis are to acquire knowledge on how the current available systems work, researching on how this system can be developed using current or maybe the latest emerging technologies. The most important of all is to gain an overall understanding of the system data flow and system process.

3.1.1 System Development Phases

System development generally takes the form of a life cycle. All system goes through the same generic phases in their lifetime. The phases are

- System analysis and requirements specification
- System design
- Implementation
    - Coding
    - Testing
    - Documentation
    - Conversion
    - Evaluation

3.1.2 Software Life Cycle Model

The software engineering process consists of a set of steps that encompasses methods, tools and procedures. These steps are referred to as software engineering paradigm or software life cycle models. A paradigm for software engineering is chosen based on the nature of the project and applications, the methods and tools to be used, and the controls and deliverables that are required.

The reason for modeling a process

- To form a common understanding of the activities, resources and constraints involve in a system development.
- Help to find inconsistencies, redundancies, and omission in the process and in its constituent parts.
- To reflect the goals of the development.

3.2 Developmement Model For HMS - The Waterfall Model

In developing the Hospital Management System, the model chosen is the waterfall model incorporated with the evolutionary prototyping model to achieve better result.
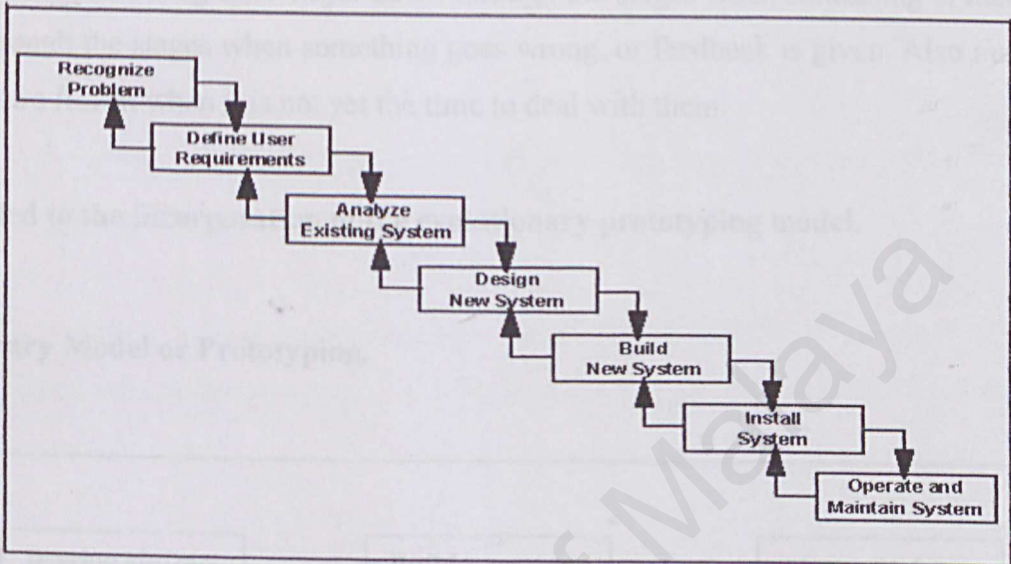
The waterfall model was the first structured approach to systems development. The waterfall model is just a time-ordered list of activities to be performed to obtain an IT system.

3.2.1 Justification in choosing Waterfall Model

- This model was chosen over the proposed V Model due to the fact that all the requirements are well documented thus creating a systematic development process.

- There is a linear flow among stages which allows analysis of requirements done thoroughly before moving to the next stage in order to have a set of predefined guidelines.

- It is very straightforward and simple to use enabling ease of management for a small system like this project.

- Thorough reviews are made after each stages which enables some output so that the quality of the project is often taken into consideration.

Finally it has to be noted that the software development process is not as linear as it seems. When errors in later stages are found, they are often fed back to a previous stage and the development is set back to that stage again. This feed back makes for a waterfall with information flowing both ways: down through the stages when something is made, and up through the stages when something goes wrong, or feedback is given. Also many processes are frozen when it is not yet the time to deal with them.

This has led to the incorporation of the evolutionary prototyping model.

Evolutionary Model or Prototyping.
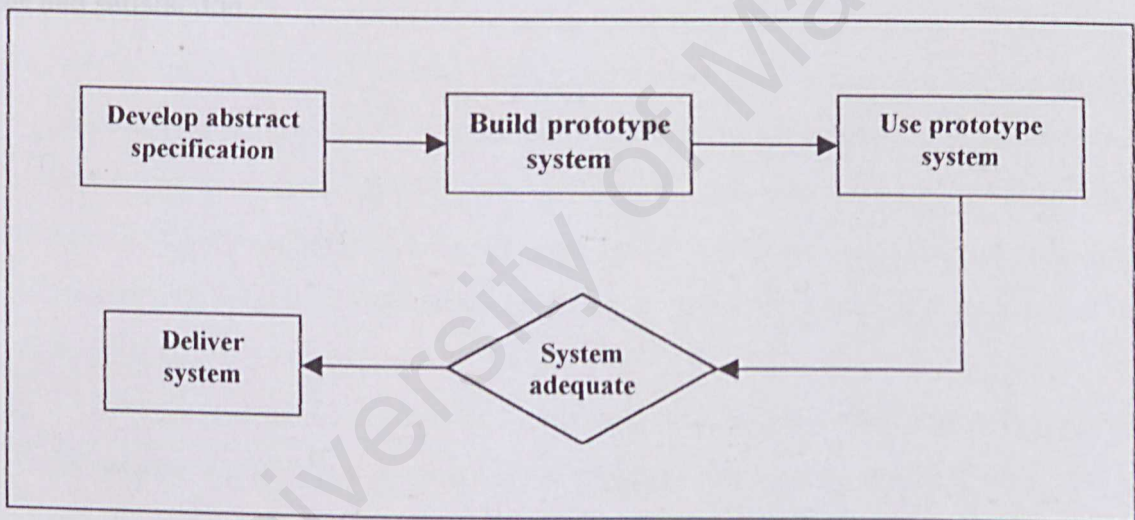
Figure 3.2: Evolutionary Prototyping Model

Like in exploratory programming the idea is to create a program as quickly as possible. This program is known as the throwaway prototype. This prototype is used to give the software engineer a way to find out what the exact requirements are. Then a second program is written using the waterfall model. Evolutionary prototyping consists of many such steps and is the same as exploratory programming. In the evolutionary model a program is build once and the program is gradually improved, and thus it is increment driven; unlike the Waterfall model which is document driven.

3.2.2 Justification in choosing the Evolutionary Prototyping Model

- Users can see and evaluate real system fast thus engages users involvement
- With the combination of this model feedback can be obtained to rectify any problems in the early stages.
- Testing time and development cost is reduced due to the fact that reviews are given in all stages according to the users needs.

As this system will be a users centered system thus it is only appropriate for the users to give comments and suggestions during reviews so that this system will cater to the users needs and satisfaction.

3.3 Analysis on existing development tools

3.3.1 Client / Server computing

A decade ago, everyone was excited about a new technology that was going to revolutionize the way business is conducted in corporation. It would provide a new paradigm for information processing that would facilitate collaboration and information sharing in vast numbers of system and organization. It has developed as the computer industry moved from a centralized shared logic-based system to a network of workstations and servers.

This new technology was the client-server computing. The client/server computing involves splitting an application into tasks and putting each task on the platform where it can be handled most efficiently. The key notation of breaking up the problem is to provide designated layers and functionality that can be written and deployed across multiple machines in an optimized manner. This usually results in putting the processing for presentation to the user/client machine and the data management and storage on the server. Depending on the application and software used, all data processing may occur on the client or is split between the client and the server.

The server is connected to the client through a network. The server software accepts data from the client and then return with results to the client. The client manipulates the data and presents the results to the user. In the usual client/server model, one server is activated and awaits client's requests. Typically multiple client programs share the services of a common server program. Both client programs and server programs are often part of a larger program or application.

3.3.2   Web Server

A web server is a computer software program running on a computer connected to the internet that serves web pages upon request. The term 'web server' is also used sometimes to refer to the computer on which the computer is running. A web browser is a software program that acts as an interface between the users and the inner workings of the internet, specifically the WWW. The browser not only sends messages to web servers to retrieve the requested pages but also renders the HTML code once it arrives. That is, the browser interprets the code and displays the results on the screen . Some examples of web servers are Microsoft Internet Information Server 4.0 for Windows NT, Netscape Enterprise Server and Microsoft Personal Web Server for Windows 98.

- **Microsoft Internet Information Server**

Microsoft Internet Information Server 4.0 is a comprehensive solution that will surely help Windows NT take a bite out of the Unix-dominated Web server pie. With perks for both small and large Web sites, IIS 4.0 comes with powerful extras, including Active Server Pages for building dynamic web pages, Crystal Reports for custom reporting, Microsoft FrontPage 97 for site management, Index Server for advance searching and NetShow for on demand multimedia.

IIS's tight integration with Windows NT is immediately apparent. IIS uses Windows NT's User Manager to maintain users and groups, saving you the trouble of maintaining the multiple sets of network and Web site users. IIS also utilizes Window's NT's Event Viewer and Performance Monitor to view such items as bytes sent per second and current CGI requests.

IIS is also an extremely capable performer all around, one that would suit any Web site's needs. IIS comes with three default services: WWW, FTP, and gopher. Its internet Service Manager (ISM) application controls these services on this or any other IIS server on the network. ISM runs from the Windows NT Server or from a Windows 98 Workstation.

- ## Personal Web Server

Personal Web Server is Microsoft's slimmed – down web server, which provides a basis on which to develop corporate networked applications. It does include support for ASP, script debugging, and many other important features found in IIS. PWS is a great entry level Web Server that makes it easy to publish personal homepages, serve small Web Sites, and share documents through a local intranet.

3.3.3 Database Server

Database Server is a computer and software application that uses the client/server technology to distribute the processing of data in the database between the server and client computers. Two key features of a server database become important because of the client access to data are providing a single point of access to the data in the database dividing processing and manipulation between the client and server systems. By using reliable database management systems, the consistency and accuracy of data can be assured. Among some of the popular database server in the market are Microsoft SQL Server, Microsoft Access and Oracle.

- ## Microsoft SQL Server 7.0

Microsoft SQL Server version 7.0 is a defining release for Microsoft's databse products, building on the solid foundation established by SQL Server 6.5. As the best database for Microsoft Windows NT Server, SQL Server is the relational database management system (RDBMS) of choice of a broad spectrum of corporate customers and independent software vendors (ISVs) that are building business applications. Customer needs and requirements have driven significant product innovations in ease of use, scalability and reliability, and data warehousing.

Data warehouses serve the needs of an enterprise; in contrast, data marts serve specific business units or functions. It helps the user to better understand the information and have a new way to gain insights, see patterns and trends and make a better business decision. SQL Server 7.0 provides an excellent platform for data warehousing and data marts such as scalability, terabyte-size database support, integrated online analytical processing (OLAP) services and has high performance utilities.

- **Microsoft Access**

Since its first introduction in 1992, Microsoft Access has become a leader in the desktop database category among a wide variety of users. Experienced database users were impressed that such a powerful desktop database could be so easy to use. Access's popularity among end users by increasing the scalability of Access 2000 with stronger integration to enterprise level databases. Whether users are creating a database to manage contacts and customers or creating a tracking system for inventory, Access provides an easy way for all levels of desktop users to find, manage and share data.

Whether users are creating a stand alone desktop database for personal use, departmental use or for an entire organization, Access offers an easy-to-use database for managing and sharing data. Access 2000 brings not only the traditional broad range of easy data management tools but also adds increased integration with the web for easier sharing of data across a variety of platforms and users levels and additional ease of use enhancements to assist with personal productivity.

Regardless of the back-end data source selected, end users will still have the same easy –to –use experience of the most popular desktop database client.

3.3.4 Web Programming Technology

- **ASP**

    Active Server Pages is an open, compile – free application environment in which you can combine HTML, scripts and reusable ActiveX server components to create dynamic web-sites. ASP is designed to be used together with HTML to create dynamic pages. In fact ASP actually creates HTML code. Active server pages are executed on the server. This means that any client(browser) can be used to view the pages provided that the web server must be capable of running ASP.

    The primary difference between ASP and the new generation technologies mentioned is that ASP must be executed on the web server, while the pages generated by other technologies are interpreted by the browser. The advantages that ASP enjoys over CGI and Perl are those of simplicity and speed.

    The idea behind ASP is that the demand on browsers will be decreased by getting the server to do some of the work instead.

    Some of the other advantages of using are :

- It minimizes network traffic by limiting the need for the browser and server to talk to each other.

- Makes for quicker loading time since, in the end the task done is only to download a HTML page.

- Allows programs to be runned in languages that does not reside on the client's machine.

- Provides improved security measures, since you can code things which can never be viewed from the browsers.

- ## Microsoft Visual Interdev 6.0

Microsoft Visual Interdev is a comprehensive, web based application development tool. It provides an intergrated environment that brings together various technologies to work towards a common goal of buliding a robust and dynamic application for the web. Visual Interdev enables the developer to build applications that are dynamic through the use of client and server side scripting. Irt supports the use of VBScript and JavaScript. Visual Interdev's database intergrationis also vital to any application. It provides a rich and robust set of visual data tool to immediately enhance productivity. Visual Interdev supports the major ODBC – compliant databases, both on the desktop and the server.

3.3.5 Scripting Language

Scripting language are designed for designed for different tasks than systems programming languages. Scripting programming languages are designed for gluing: they assume the existence of a set of powerful components and are intended primarily for connecting components together. Some of the common scripting language are JavaScript and VBScript.

* **VBScript**

VBScript is a subset of Microsoft Visual Basic and is upwardly compatible with Visual Basic for Application (VBA). The ability to provide scripting, automation, and customization capabilities for web browsers are a major feature of VBScript.

VBScript brings active scripting to a wide variety of environments, including Web client scripting in Microsoft Internet Explorer 3.0 and web server scripting in Microsoft Internet Information Server version 3.0. VBScript talks to host applications using ActiveX Scripting. With ActiveX Scripting, browsers and other host applications do not require special integration code for each scripting component.

Although VBScript is just text and can be written with a simple text editor, a graphical design tool for VBScript is available. This visual layout tool is called ActiveX Control Pad. ActiveX Control Pad allows us to combine HTML codes, ActiveX controls, HTML layouts, and VBScript or JavaScript . ActiveX Control Pad work in conjuction with the HTML Layout control.

Compatibility with existing browsers is another rissue for VBScript. Although the Internet Explorer supports both VBScript and JavaScript, VBScript is not currently supported by the Netscape browser. In the future, we may see support from Netscape and others, but for now, interactive web sites that use VBScripts are limited to platforms running the Internet Explorer.

- ## Java Script

Perhaps the best known scripting language prior to the introduction of VBScript was JavaScript. JavaScript is used to create interactive web applications supported by the Netscape browser. JavaScript offers many of the same advantages as VBScript . It is simple to use, lightwight and dynamic. Developers can easily embed code functionality for interactive applications inside a web page.

The most noticeable difference between JavaScript and VBScript is the syntax. The syntax for JavaScript is similar to the syntax of the C++ programming language. Since VBScript is a subset of Visual Basic for Applications,VBScript follows the Visual Basic for Application syntax.

The Internet Explorer 3.0 supports JavaScript directly through a scripting engine in the file jscript.dll In fact, we can use both VBScript and JavaScript in a single webpage.HTML form elements,interact with the browser and automate with any ActiveX component.

3.3.6 Application Platform.

- ## Microsoft Windows NT Server.

Microsoft Winfdows NT Server is a 32-bit, high performance, network operating system that is designed to be easy to use, robust and extensible. It includes Internet (andintranet) functionality and communication services for today`s business computing environments, while supporting interoperability with multiple platforms.

The wide variety of services supported by Microsoft Windows NT Server provides a Foundation for distributed applications y supporting the development and implementation of these applications. Many of these Windows NT services are tied together with the Component Object Model (COM). COM is Microsoft's Component based communication standard that allows us to build flexible, extensible and dynamic distributed applications.

Benefits Of Microsoft Windows NT Server

- Designed to help developers build and deploy business applications faster than ever before.
- The Option Pack integrates new web transaction,scripting, component and message queuing services directly into Windows NT Server 4.0.
- Enables multiple websites on a single machine, innovate Web publishing features, customizable tools, and new wizard technologies that helps to make it the best platform to publish and share information securely over corporte intranets and th Internet.

- ### Microsoft Windows 98

  The Microsoft Windows 98 operating system is the upgrade to Windows that makes the computer works better and play better. It works better by making it simple to access the internet and by providing better system performance along with easier system diagnostics and maintenance. With Windows 98, our systems plays better as well as with support for the latest graphical sounds and multimedia technologies, the ability to easily add and remove peropheral devices with support for Universal Serial Bus(USB). Windows 98 2nd edition is an update to Windows 98 that enhances the leading consumer operating system with the latest Internet, home –networking and hardware technologies.

Benefits Of Windows 98

- Improved ease of use and Internet Access
- Improved performance and reliability because it reduces the time it takes to launch applications
- Enables a new generation of hardware and entertainment.

- **Linux**

Linux is developed under the GNU General Public License and its source code is freely available to everyone. This however doesn't mean that Linux and its assorted distributions are free. Companies and developers may charge a fee for it as long as the source code remains available. Linux may be used for a wide variety of purposes including networking, software development and as an end user platform. Linux is often considered an excellent, low-cost alternative to other more expensive operating systems.

Benefits of using Linux

- Linux is complete operating system that is stable as the crash of an application is lease likely to bring down the operating system under Linux.
- It is Alos Reliable as its servers are often up for hundreds of days compared with the regular reboots required with a Windows system
- Come with a complete development environment, including C, C++, Fortran compilers, toolkits such as Qt and scripting languages such as Perl. Awk and sed.
- Excellent networking facilities because it allows the sharing of CPUs, modems and all of which is not included or available with Windows 95.
- Easily upgradeable.
- Supports multiple processors and truly multi-tasking.

3.4   Consideration on Development Technologies.

After reviewing and considering the requirement needed for the system, possible development tolls are analyzed. Listed below are the chosen tools for the proposed systems.

- Microsoft Windows 98 2nd Edition as the application platform
- Personal Web Server (PWS) as the web server
- SQL 7.0 as the database management system.

On the server side scripting, a mixed of VB Script and JavaScript will be used to write ASP based on the suitability on performing certain functions in ASP architecture. ASP technology is applied because of its ability to customize web ages to the specific needs of the individual user.

On the Client side scripting, JavaScript will be used in order to support a wider range of type of web browsers.

As for website testing, Internet Explorer 5.0 will be used to test the web site as it is the only browser that displays error messages when ASP scripting generate errors.

Microsoft Visual Basic 6.0 will be used to interact with the Microsoft SQL Server 7.0.

3.5   System Requirement

System requirement points out what the proposed systems intends to do and it is devided into two types of requiremtns. The first is the functional requirement that defines the system's functions and service and the second requirement is the non-functional requirement which explains the constraint places on the system and its development process.

Listed below are the functional requirements involved in the proposed system.

3.5.1 Functional Requirement

Login Function

All users who wants to start using the system will have to perform this login function by selecting their user group, entering their user name and password. Users will be grouped into different user group depending on the functional task they will be managing. For example, the nurse will only be able to update the inpatient bill at the end of the day, and only physicians can edit or view the medical information of a patient.

User Authentication and Authorization

For administrative module, users authentication and authorization are very important in order to provide access control against the system. Access controls restrict use of computer system resources to authorized users, limit the actions authorized users can take with these resources and ensure that users obtain authentic computer system resources.

Add New Patient's Record

Users who are authorized (database administrator or data entry staffs) can perform this action and add a record into the database. This is an important function in the system because almost all the sub module connects to this module. The system will also generate a patient registration ID for the use of the tracking the patient's activities.

Retrieval, Updating and Deletion Of Patients Record.

The proposed system is expected to have the capabilities to retrieve and update as well as delete the patient's record when the updating and prescribing of drugs and medical examinations are performed. This actions can only be performed by the authorized group of users.

Error Handling

The proposed system shall be able to detect and protect the patient's information in the database against unauthorized personals or erroneous data entry into the database. Error messages will be displayed for the users.

Print Report Function

Authorized user can print the patient's bill according to the right function.

In the following pages are listed the functions and advantages of each modules and sub modules in the proposed system.

Module 1: Patient Billing System
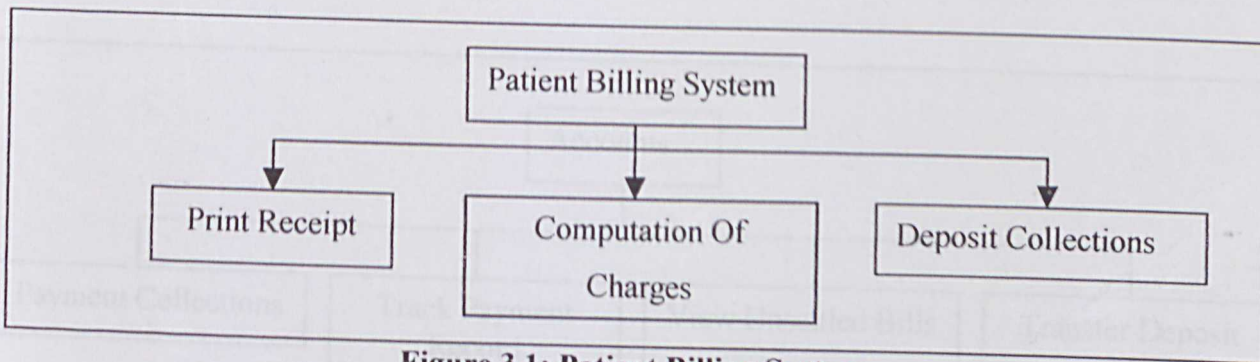
Figure 3.1: Patient Billing System

Sub Module:

1. Deposit Collections
   - Collects a certain amount of deposit from the patients that acts like a prepaid function whereby all the accumulated charges will be deducted from.
   - Reclaims and extra charges will be dealt with in the accounts module.

2. Computation Of Charges.
   - Computes the charges of medication, lab tests, and other miscellaneous expenses subjected to the patient.
   - This module shows the breakdown of charges so that the patient can know what they are really accounted for.

3. Print Receipt
   - Prints out the receipt for the patient so that they will be able to reclaim or make extra payment to the accounts department. The receipt functions as a prove of the payments made to the hospital.
   - In the receipt is stated whether the patient has to reclaim or repay the extra charges.
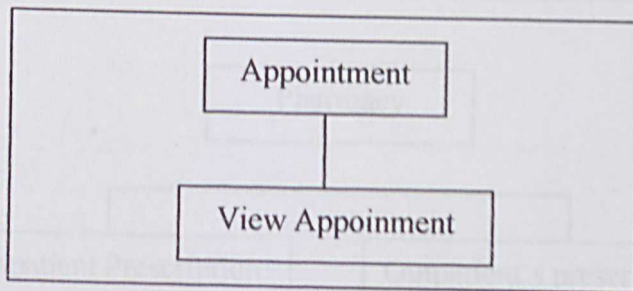
Advantage:

✓ Keeps the financial records of the patient in a proper and easy retrievable manner especially when dealing with sensitive issues like the financing factor.

Module 2: Accounts System
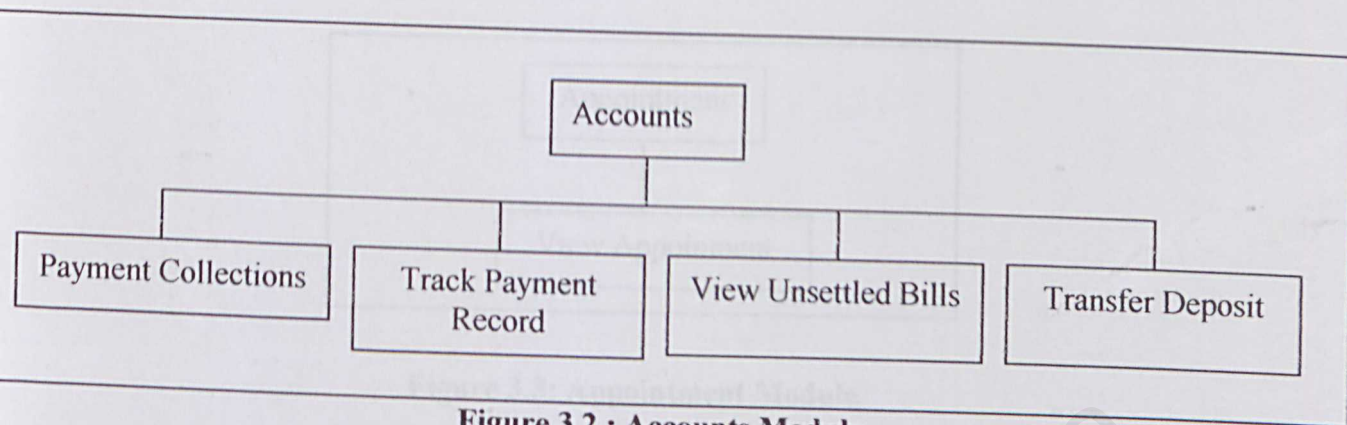
Figure 3.2 : Accounts Module

Sub Module:

1. Payment Collections.
    *   Updates the database and notes down that the patient has settled their bills .
2. Track Payment Record.
    *   Tracks a particular patients payment record.
    *   A pop – up message will indicate if the patient has or has not settled his bills.
3. View Unsettled Bills
    *   Functions as a search engine that displays all unsettled bills for any period of time.
    *   This function may enable the accounts staff to alert the patients to settle their bills by sending them a notice from the hospital.
4. Transfer Credit
    *   Enables the patient to transfer his previous credit made to the hospital upon his earlier visit. This credit is which was dued to be reclaimed by the patient will automatically be considered as a deposit upon the patient`s request.

Advantage:

✓ This module streamlines the functions of updating the database and keeping up to date with dealing with the financial concerns of the patients. Besides that, it also helps to track "run –away cases" whereby the patient has left the hospital without settling his bills.

Module 3: Appointment

Figure 3.3: Appointment Module

Sub Module:

1. View Appointment

- Enables the user to view the appoinments of the patients by date and and by the department.
- Links with the medical summary module in the Patient Management System Module.

Advantage

✓ Physicians may be able to remind themselves of the amount of apppoinments they have for the day.

Module 4: Pharmacy
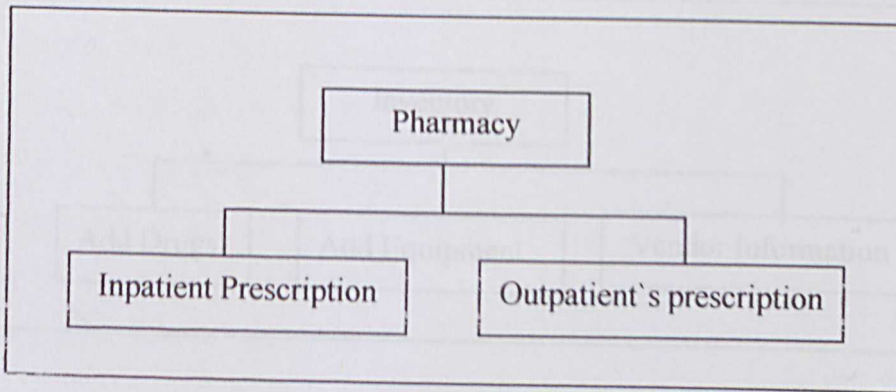
Figure 3.4 : Pharmacy Module

Sub Module:

1. Inpatient Prescription

   • Enables the pharmacist or the dispenser to prepare the drugs to be administered to the inpatients according to the doctors prescription.

2. Outpatient's Prescription

   • Enables the pharmacist to prescribe the drugs to the patients according to the doctors prescription.

Advantages

✓ Avoids the administring of wrong drugs to the patients due to the fact that it is difficult to read the manual handwriting of the doctors.

Module 5: Medical Certificate.

Sub Module:

1. View MC

   • The staff uses this module to print the medical certificate administered to the patient by the doctor. Besides that, this module lists down the amount of medical certificate given to a particular patient.

Advantage :

✓ Keeps track of the amount of MC's given out in a day

Module 6: Inventory
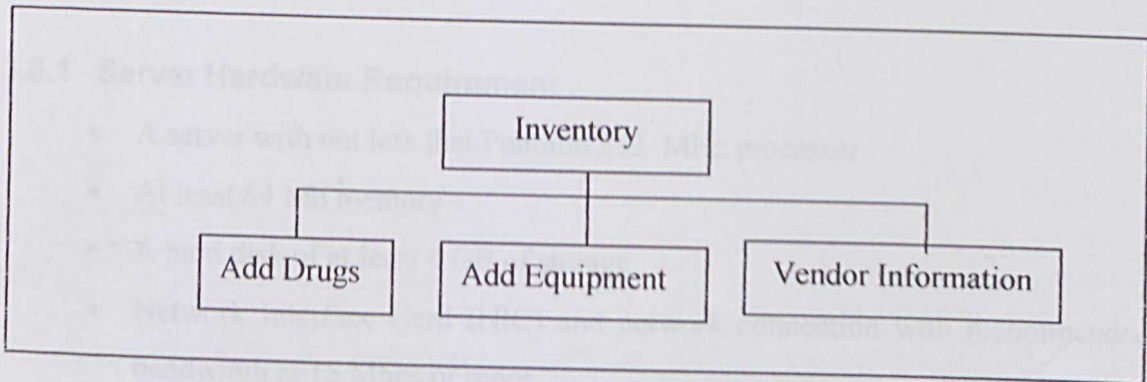
Figure 3.5 : Inventory Module

Sub Module

1. Add Drugs and Add Equipments
   - This module enables the stockkeeper to add new drugs and equipments purchased by the hospital. It would also enable the user to keep an accout of the amout of stock available before he should reorder the items.
2. Vendor Information
   - Stores the information about the vendors and their information to be used in the process of repurchasing the stock.

Advantages:

✓ Promotes easy management of inventories in the hospital

3.6   Requirement Specification

3.6.1   Server Hardware Requirement

- A server with not less that Pentium 233 MHz processor
- At least 64 Mb memory
- A hard disk of at least 4 GB of storage
- Network Interface Card (NIC) and network connection with recommended bandwidth at 15 Mbps or more.
- Other standard computer peripherals.

3.6.2   Server Software Requirement

- Windows NT Server 4.0 - Network Operating System
- Personal Web Server – Web Server service
- Active Server Pages (ASP) – Server scripting engine
- Microsoft SQL Server 7.0 – Database repository
- Microsoft Internet Explorer 5.0 – Precondition for ASP installation.

3.6.3   Client Hardware Requirement

- A Pentium 3 with 750 Mhz processor
- At least a 64 MB RAM
- Network Connection through existing network configuration or modem.

3.6.4   Client Software Requirement

- Microsoft Windows 98 2nd edition
- Microsoft Internet Explorer 5.0

4.0   System Design

System design is the phase in which requirements analysed and produced in the system analysis phase are translated and converted into a representation characteristics of the proposed system. The design process involves developing several models of the system at different level of abstraction. As a design is composed, errors and omissions in earlier stages are discovered. Generally, this phase will be focusing on architectural design, functional design, database design and the interface design.

4.1   Architectural Design

Large systems can be decomposed into sub-systems that provide some related set of services. The initial design process of identifying these sub-systems and establishing a framework for sub-system control and communication is called architectural design. It usually comes before the detailed system specification.

The first phase of the architectural design is usually concerned with developing a system into a set of interacting sub-systems. The proposed Hospital Management System is decomposed into a number of principal subsystems where a subsystem is an independent software unit. At the most abstract level, an architectural design is depicted in a block diagram to represent an overview of the system structure and to describe the interaction between the sub-systems.

The Hospital Management System consisting of 5 main modules are as depicted on the next page.

CHAPTER 4
SYSTEM DESIGN

4.0   System Design

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The Hospital Management System consisting of 7 main modules are as depicted on the next pages.
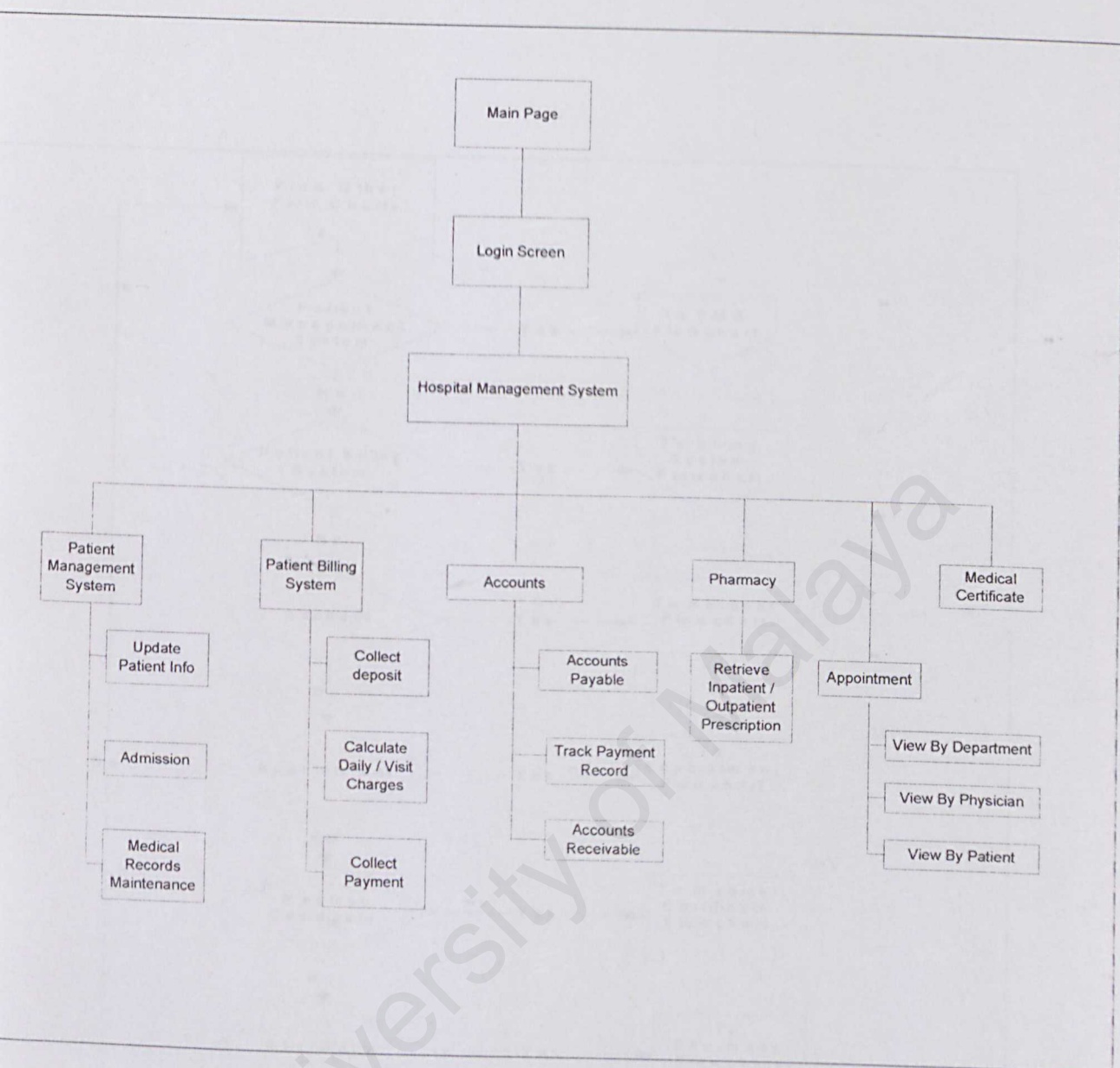
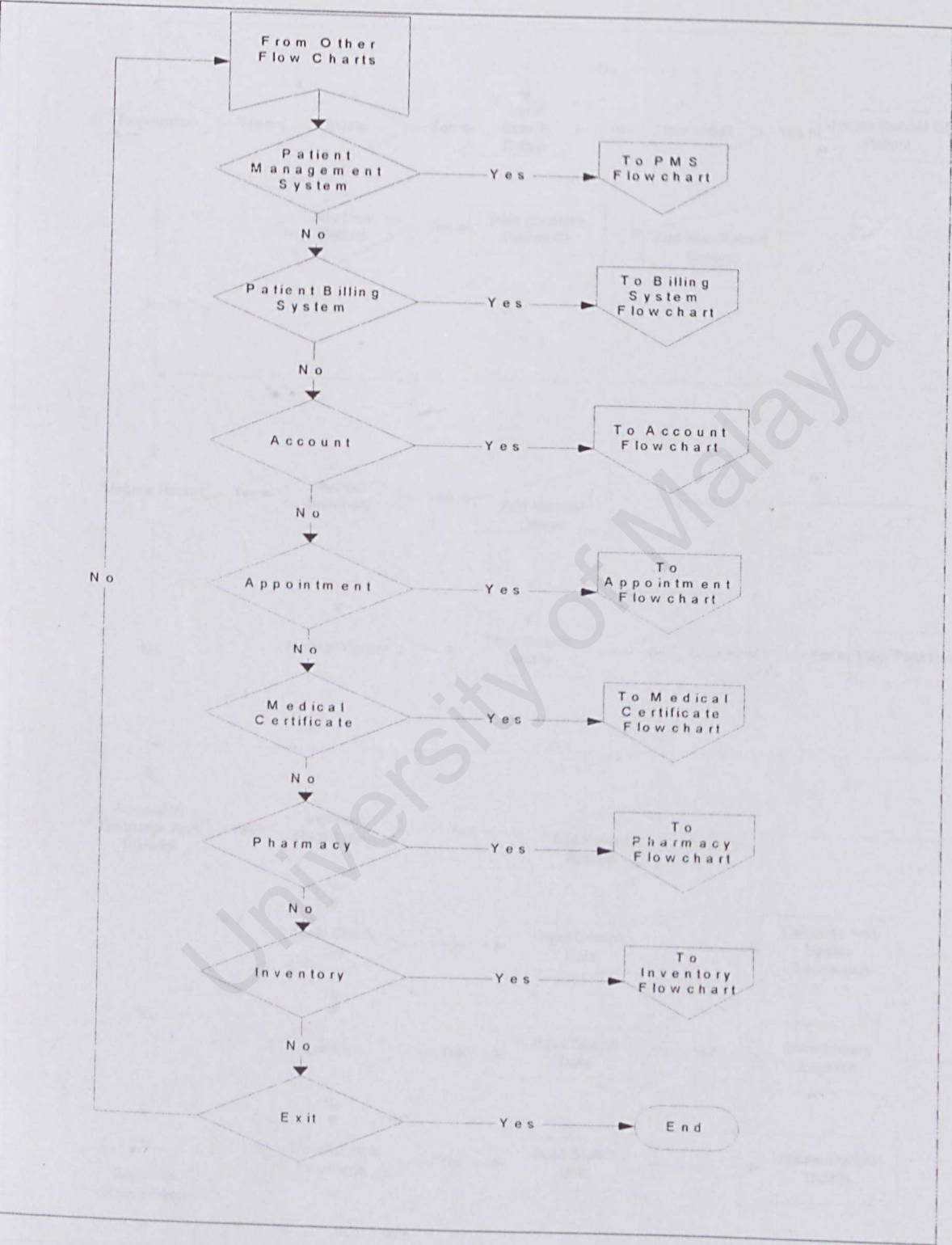Figure 4.1   Structure of the Hospital Management System

Figure 4.2   Main Screen Flow of the Hospital Management System
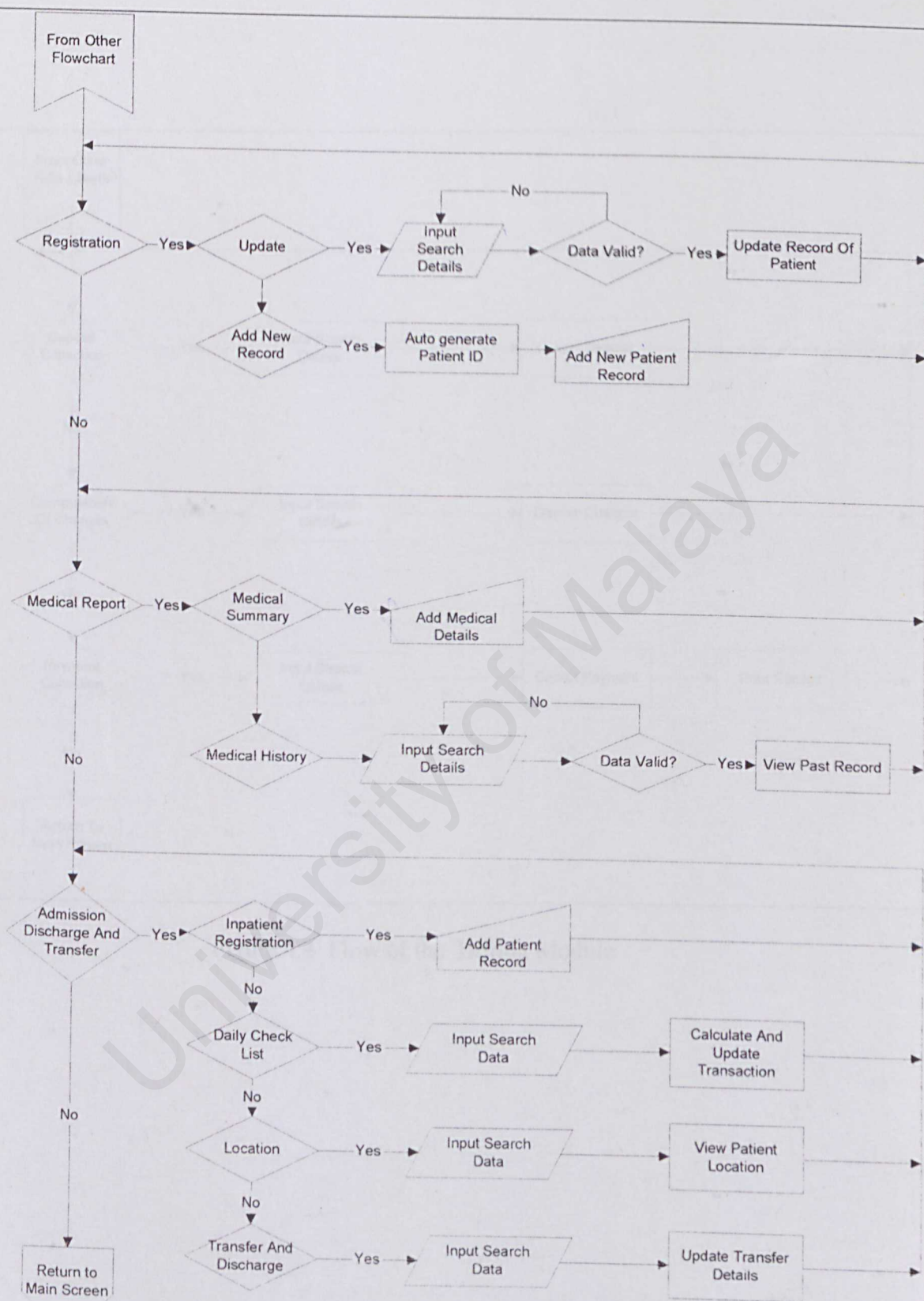
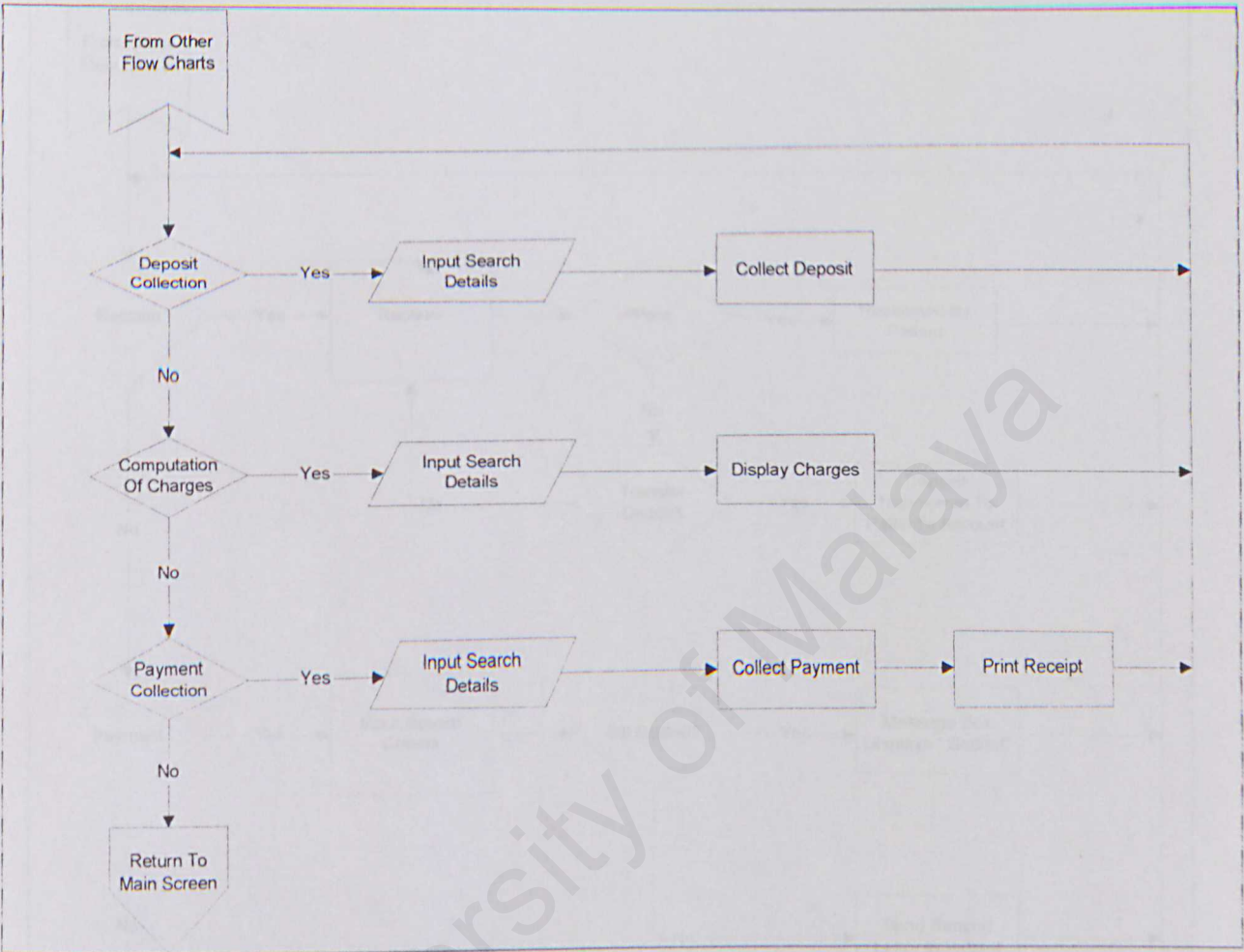Figure 4.3 Flow Of The Patient Management System

Figure 4.4 Flow of the Billing Module
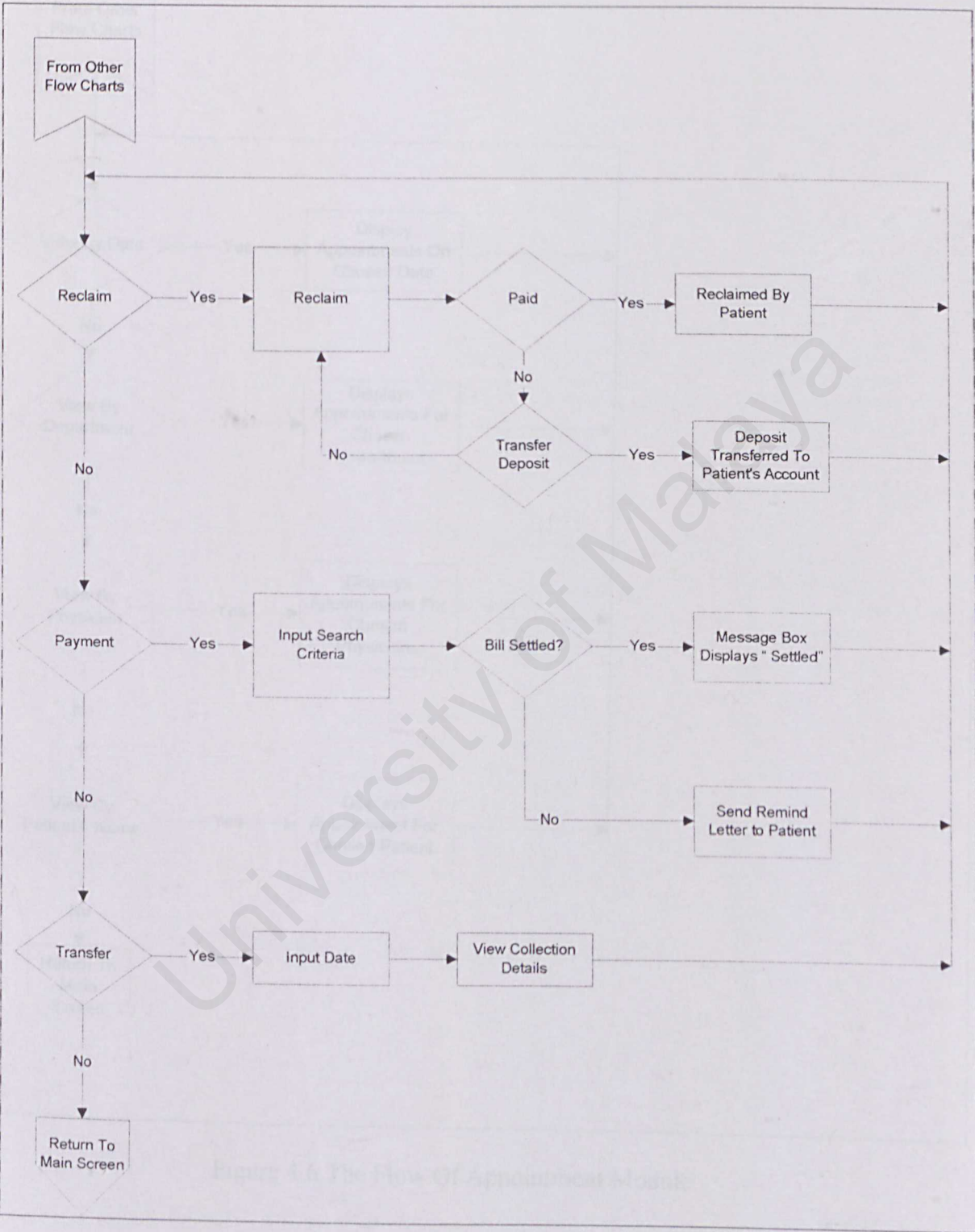
Figure 4.5   The Flow Of The Accounts Module
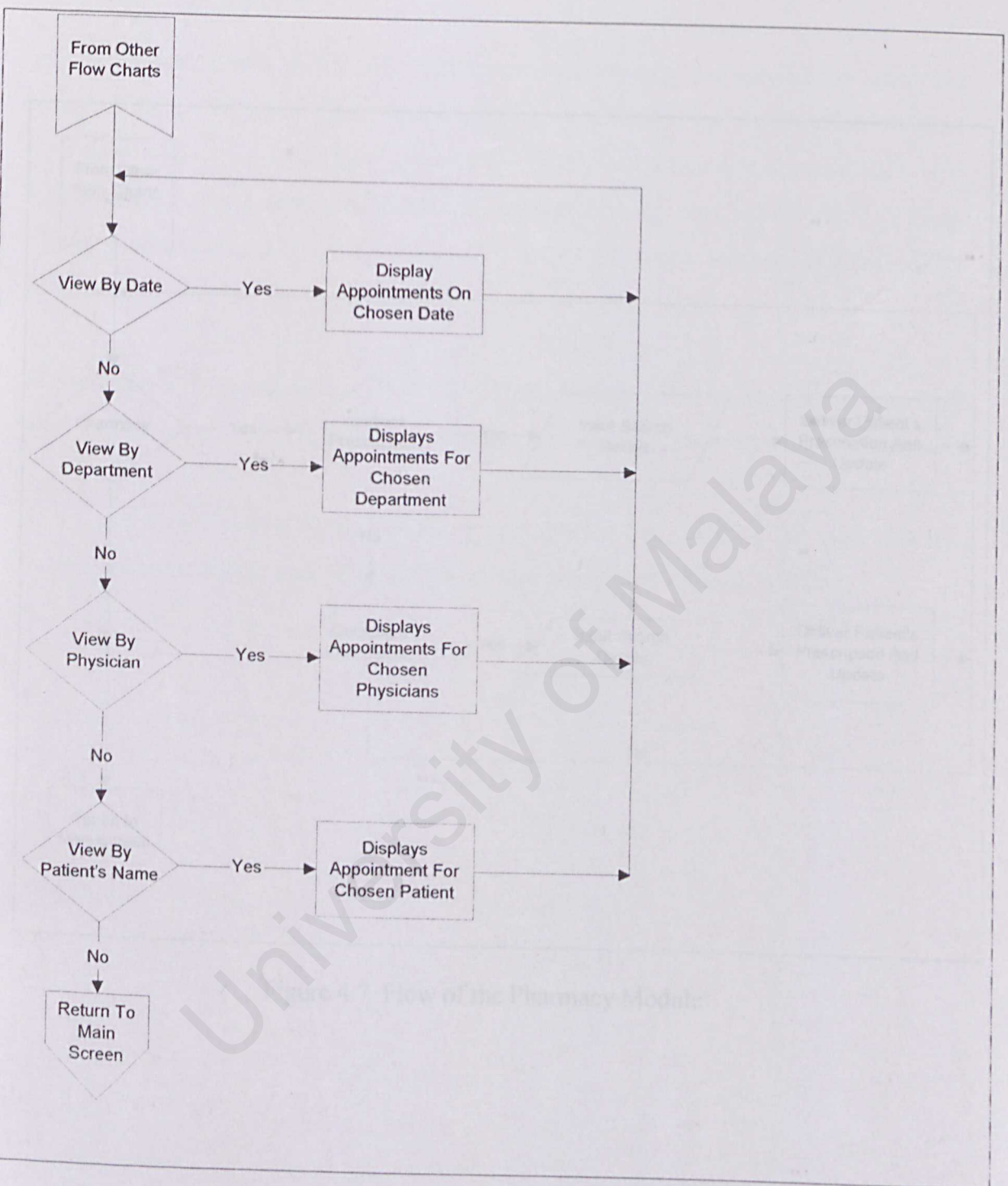
Figure 4.6 The Flow Of Appointment Module

Figure 4.7 Flow of the Pharmacy Module

4.2 Functional Design

Functional design of the proposed system will be depicted graphically using the data flow diagram diagram. Data Flow Diagrams are diagrams that show the flow of data from one source to another. They describe the flow of information and processes of the system, showing how these processes link together through data stores and how these processes relate to the users. They are used to record the system analysis as a part of the design documentation.

At their lowest level of detail, DFD's are often included in a programmers' working specification when the systems analysis is complete and the system is being programmed.

Below are listed the Data Flow Diagram of the process that involves the users and the focused modules which is the Patient Billing System and the Accounts Moudule.
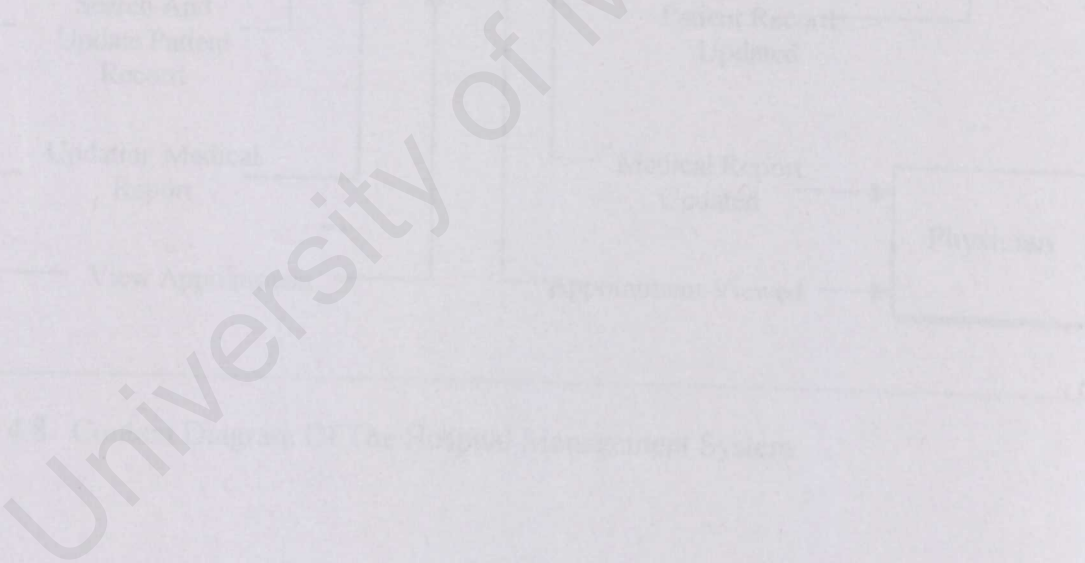
Figure 4.8   Context Diagram Of The Hospital Management System

4.2 Database Design

The Hospital Management System uses the relational database model in its database implementation. The database is developed using Microsoft SQL Server 7.0. The databases are shared among all the department thus it has to be designed carefully so that no conflict occurs when inserting and retrival is done during real time process. The attributes of the database is listed as below.

Database Name	hos_man_sys
Data Source Name (DSN)	system.dsn
Type	Microsoft SQL Server relational database
Usage	Keeps the record of the system

4.21 Database Structure of The Hospital Management System

Table 4.1: tbl_registration

Field Name	Data Type	Length	Description
Patient_Id	Varchar	50	Unique patient ID assigned to each patient
Patient_Name	Varchar	255	Person's Name
Nric_Old	Varchar	50	Old identification number
Nric_New	Varchar	50	New identification number
Gender	Char	10	Gender
Race	Varchar	50	Person's race
Religion	Varchar	50	Person's religion
Date_Of_Birth	Datetime	8	Person's birthday
Age	Int	4	Person's age
Occupation	Varchar	50	Person's occupation
Nationality	Varchar	50	Nationality
Marital_Status	Varchar	50	Marital status
P_Address1	Varchar	50	Person's address (street)
P_Address2	Varchar	50	Person's address (town)
Post_Code	Varchar	50	Postcode
City	Varchar	50	City
State	Varchar	50	State
Country	Varchar	50	Country
Off_Address1	Varchar	50	Person's office address
Off_Address2	Varchar	50	Person's office address
Telephone	Varchar	50	Person's contact number
Handphone	Varchar	50	Person's personal contact number
Guardian_Name	Varchar	255	Next Of Kin's name
Guardian_Address1	Varchar	50	Next Of Kin's address
Guardian_Address2	Varchar	50	Next Of Kin's address
Telephone_Guardian	Varchar	50	Next Of Kin's contact number
Staff_Id	Varchar	50	Staff ID
Date_Stamp	Datetime	8	Date when data was input
Time_Stamp	Datetime	8	Time when data was input
Staff_IdU	Varchar	50	Staff ID of person who modified data
Date_StampU	Datetime	8	Date when data was modified
Time_StampU	Datetime	8	Time when data was modified

Table 4.2 : tbl_medical_history

Field Name	Data Type	Length	Description
Patient_Id	Varchar	50	Unique patient ID assigned to each patient
Patient_Name	Varchar	255	Person's Name
Nric_Old	Varchar	50	Old identification number
Nric_New	Varchar	50	New identification number
Pulse	Char	10	Pulse rate
Temperature	Char	10	Current body temperature
Systol	Char	10	Heart's systol count
Diastol	Char	10	Heart's diastol count
Date_Stamp	Datetime	8	Date when data was input
Time_Stamp	Datetime	8	Time when data was input
Department	Varchar	50	Department
Physician	Varchar	50	Physician Name
Status	Varchar	50	Status of patient (inpatient/outpatient)
Description	Text	16	Health condition of patient
Notes	Text	16	Extra information on patient's health
Allergy	Text	16	Patient's allergy to take note

Table 4.3 : tbl_mc

Field Name	Data Type	Length	Description
Patient_Name	Varchar	255	Person's Name
Nric	Varchar	50	Nric of patient (old/new)
Date1	Datetime	8	Date of visit
Date2	Datetime	8	Extended date of medical leave
Days	Int	4	Number of days given
Company	Varchar	255	Patien's Employee

Table 4.4: tbl_appointment

Field Name	Data Type	Length	Description
Patient_Name	Varchar	255	Person's Name
Nric	Varchar	50	Nric of patient (old/new)
Date_Visit	Datetime	8	Current date of visit
Time_Visit	Datetime	8	Current time of visit
Physician	Varchar	50	Physician Name
New_Date	Datetime	8	Future date of visit
New_Time	Datetime	8	Future time of visit

Table 4.5 : tbl_outpatientprescription

Field Name	Data Type	Length	Description
Nric	Varchar	50	Nric of patient (old/new)
Date_Visit	Date_Time	8	Current date of visit
Item_Code	Varchar	50	Code of medicine
Medicine	Varchar	50	Medicine name
Dose	Varchar	50	Dosage
Days	Varchar	50	Amount of days
Remarks	Varchar	50	Remarks by physician
Staff_Id	Varchar	8	Staff ID of pharmacist
Date_stamp	Datetime	8	Date when prescription was distributed
Time_Stamp	Datetime	8	Time when prescription was distributed

Table 4.6 :tbl_outpatientlab

Field Name	Data Type	Length	Description
Nric	Varchar	50	Nric of patient (old/new)
Date_Visit	Date_Time	8	Date of patient's visit
Item_Code	Varchar	50	Lab Code
Lab_Test	Varchar	50	Lab test name
Price	Varchar	50	Price of the lab test
Physician	Varchar	50	Physician Name
Staff_Id	Varchar	50	Staff ID of Lab staff
Date_Stamp	Datetime	8	Date when patient went for the test
Time_Stamp	Datetime	8	Time when patient went for the test

Table 4.7: tbl_inpatientinfo

Fields Name	Data Type	Length	Description
Patient_Id	Varchar	50	Unique patient ID assigned to each patient
Patient_name	Varchar	255	Person's Name
Nric_New	Varchar	50	Old identification number
Nric_Old	Varchar	50	New identification number
Date_Admit	Datetime	8	Admission date
Time_Admit	Datetime	8	Admission Time
Department	Varchar	50	Department
Physician	Varchar	50	Physician Incharge Name
Ward_Location	Varchar	50	Ward Number
Status	Varchar	50	Status of Inpatient (Discharged/ Admitted)
No_Record	Varchar	50	Record Number
Staff_Id	Varchar	50	Staff Id of nurse

Table 4.8 : tbl_inpatientprescription

Field Name	Data Type	Length	Description
Nric	Varchar	50	Nric of patient (old/new)
Date_Admit	Date_Time	8	Admission Date
Location	Varchar	50	Department
Item_Code	Varchar	50	Medicinal item code
Medicine	Varchar	50	Name of medicine
Dose	Varchar	50	Dosage
Days	Varchar	50	Amount of days
Remarks	Varchar	50	Remarks on patient condition
Staff_Id	Varchar	8	Staff id of nurse
Date_stamp	Datetime	8	Date when data was input
Time_Stamp	Datetime	8	Time when data was input

Table 4.9 : tbl_inpatientlab

Field Name	Data Type	Length	Description
Nric	Varchar	50	Nric of patient (old/new)
Date_Admit	Date_Time	8	Date of admission
Location	Varchar	50	Department
Item_Code	Varchar	50	Lab test code
Lab_Test	Varchar	50	Name of lab test
Price	Varchar	50	Price of lab test
Physician	Varchar	50	Physician name
Date	Datetime	8	Date of lab test appointment
Time	Datetime	8	Time of lab test appointment
Staff_Id	Varchar	50	Staff Id of Lab staff
Date_Stamp	Datetime	8	Date of lab test taken
Time_Stamp	Datetime	8	Time when lab test was completed

Table 4.10 : tbl_inpatientservice

Field Name	Data Type	Length	Description
Nric	Varchar	50	Nric of patient (old/new)
Date_Admit	Date_Time	8	Date of Admission
Location	Varchar	50	Department
Item_Code	Varchar	50	Code of item given
Item_Name	Varchar	50	Item name
Price	Varchar	50	Price of item
Staff_Id	Varchar	50	Staff Id of Nurse
Date_Stamp	Datetime	8	Date of item given
Time_Stamp	Datetime	8	Time of item given

Table 4.11 : tbl_adt

Fields Name	Data Type	Length	Description
Patient_Id	Varchar	50	Unique patient ID assigned to each patient
Patient_name	Varchar	255	Person's Name
Nric	Varchar	50	Patient's Nric (Old/New)
Date_Admit	Datetime	8	Date of Admission
Location	Varchar	50	Department
Reason	Varchar	50	Reason of being discharged
Date_Discharge	Datetime	8	Date of discharged
Time_Discharge	Datetime	8	Time of discharged
Transfer	Varchar	50	Transferred
Ward_Transfer	Varchar	50	Ward transferred to
Department	Varchar	50	Original department of patient
Department_Transfer	Varchar	50	New department transferred to
Transfer_Hospital	Varchar	255	New hospital transferred to
Date_Transfer	Datetime	8	Date of transfer
Staff_Id	Varchar	50	Staff Id pf Nurse
Time_Stamp	Datetime	8	Time of discharged
Date_Stamp	Datetime	8	Date of discharged

Table 4.12 : tbl_deposit

Field Name	Data Type	Length	Description
Nric	Varchar	50	Nric of patient (old/new)
Department	Date_Time	8	Department of patient
Status	Varchar	50	Status of patient
Transfer_Deposit	Varchar	50	Balance amount being transferred
Transfer_Date	Varchar	50	Tranfered transaction date
Deposit_Paid	Varchar	50	Deposit top up
Total_Deposit	Varchar	50	Total credit in patient account
Staff_Id	Varchar	8	Staff ID of accounts staff
Date_stamp	Datetime	8	Date of transaction made
Time_Stamp	Datetime	8	Tiem of transaction made

Table 4.13 : tbl_computationout

Field Name	Data Type	Length	Description
Nric	Varchar	50	Nric of patient (old/new)
Date	Datetime	8	Date
Consultation	Money	8	Consultation fees
Deposit	Money	8	Patient deposit
Medication_Charge	Money	8	Total of medication bills
Lab_charge	Money	8	Total of lab charges
Total_charge	Money	8	Overall total charges
Balance	Money	8	Balance amount
Payable	Money	8	Extra charges to be paid
Reclaim	Money	8	Excess amount of deposit
Staff_Id	Varchar	50	Billing Staff Id
Date_Time	Datetime	8	Date of transaction made
Time_Stamp	Datetime	8	Time of transaction made

Table 4.14: tbl_reclaim

Fields Name	Data Type	Length	Description
Patient_Id	Varchar	50	Unique patient ID assigned to each patient
Patient_Name	Varchar	255	Person's Name
Nric	Varchar	50	Nric of patient (old/new)
Department	Varchar	50	Department
Date_Reclaim	Datetime	8	Date of reclaim made
Deposit	Money	8	Total deposit made
Total_Charge	Money	8	Total charges accounted for
Balance	Money	8	Balance cash in hand
Reclaim	Money	8	Reclaim amount
Status	Varchar	50	Transferred deposit/ Reclaimed

Table 4.15 : tbl_computation

Field Name	Data Type	Length	Description
Patient_Id	Varchar	50	Unique patient ID assigned to each patient
Patient_Name	Varchar	255	Person's Name
Nric	Varchar	50	Nric of patient (old/new)
Department	Varchar	50	Department
Ward	Varchar	50	Ward Number
Deposit	Money	8	Total deposit of patient
Medication	Money	8	Medication charges
Diagnostic_Lab	Money	8	Lab charges
Miscellneous	Money	8	Miscellaneous charges
Operation	Money	8	Operation charges (if any)
Ward_Investigation	Money	8	Other charges
Total	Money	8	Total charges
Balance	Money	8	Balance deposit
Payable	Money	8	Excess cash needed to be paid
Price	Money	8	Price of ward
Food	Money	8	Food price
Total_Charge	Money	8	Total bill
Final_Charge	Money	8	Final total of the charges
Staff_Id	Varchar	50	Staff ID
Date_Stamp	Datetime	50	Current Date
Time_Stamp	Datetime	50	Current Time

Table 4.16 : tbl_transferdeposit

Fields Name	Data Type	Length	Description
Patient_Id	Varchar	50	Unique patient ID assigned to each patient
Patient_Name	Varchar	255	Person's Name
Nric	Varchar	50	Nric of patient (old/new)
Date_Transfer	Datetime	8	Date deposit was ransfered
Total_Transfer	Money	8	Total amount transferred
Staff_Id	Varchar	50	Account staff id
Time_Stamp	Datetime	8	Time of transaction completed.

4.3   User Interface Design

The user interface design is so vital as users will judge whatever they see at their first glance. Therefore, important features such as colours, font size, and graphic, need to be paid attention to. Graphics and icon usage as a way of exposing relationships, which are not obvious from the raw icons, serve functions similar to these of words and may replace them in many menus, since their meaning can be easily grasped than words.

Below are a few interface design templates for the administrative and customer subsystem.
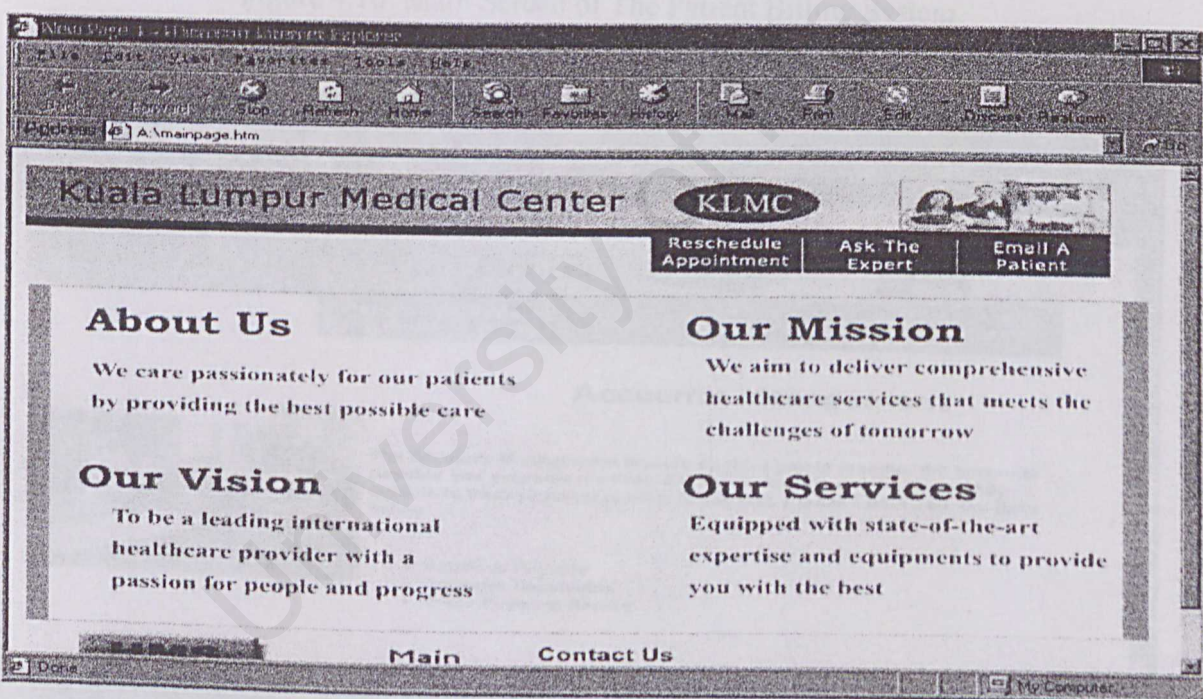
Figure 4.9   Main Screen of the Hospital Management System
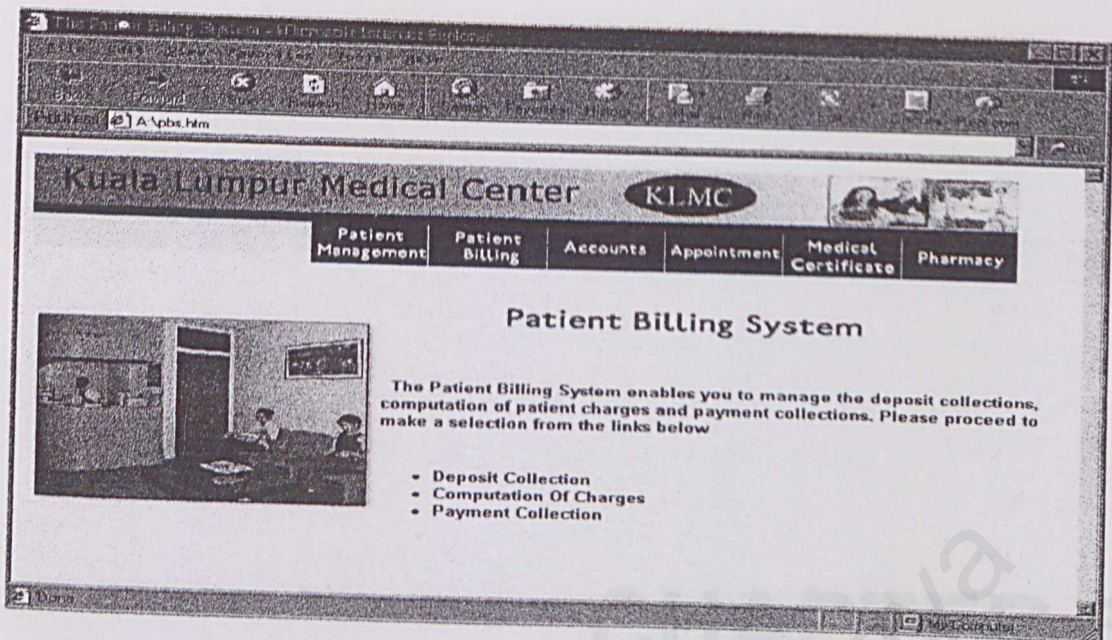
Figure 4.10 Main Screen of The Patient Billing System.
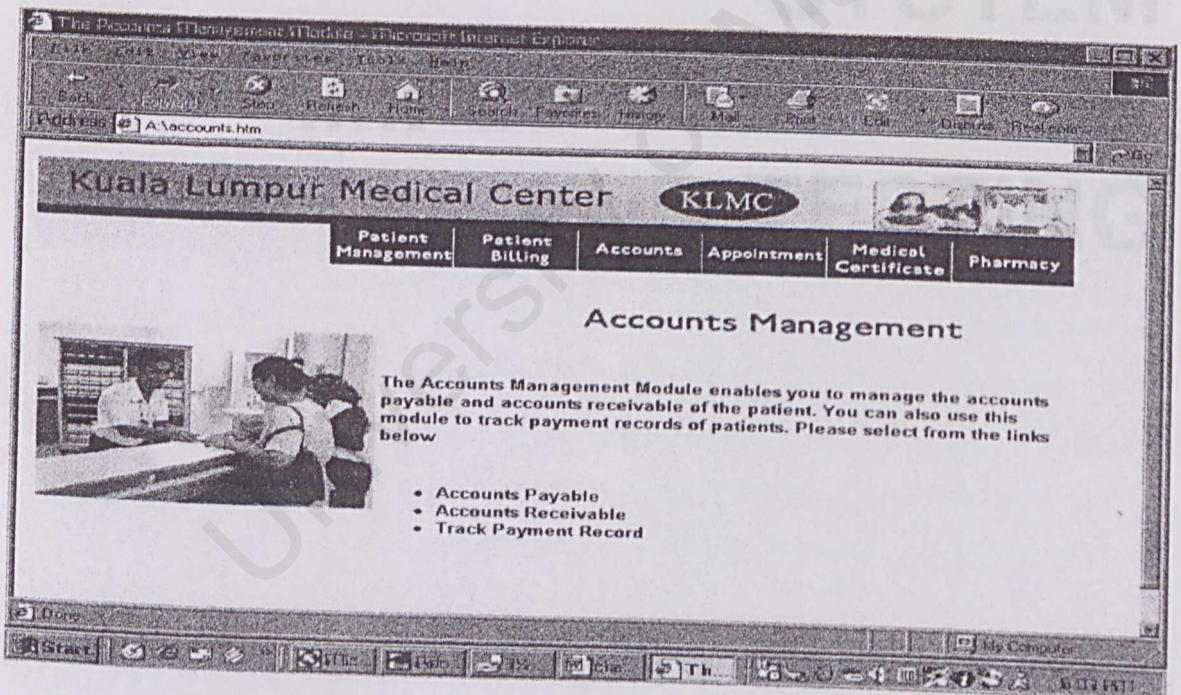
Figure 4.11   Main Screen of Accounts Module.

5.0 : System Implementation And Testing

The process of ensuring that the information system is operational and then allowing users to take over its operation for use and evaluation is called implementation. There are a few approaches to implementation that should be considered as a changeover to the new system.

One of the approaches used in implementing the Hospital Management System is by evaluating or formulating performance statements by which to evaluate the system does this. Evaluation comes from users, management and the analyst itself.

5.1 Setting Up The Environment

Before you can read the data in the database, you must establish a connection. This can be accomplished with a variety of methods and statements (DSN, OLE-DB data link, or a connection string). A short coding is provided below.

5.1.1 To create a System / User Data Source Name

To connect data using ODBC, a Data Source Name (DSN) is used. DSN is a method of establishing data connections. There are 3 types of DSNs which are user DSN, system DSN and file DSN. A system DSN is available to all users on the current machine. It is best for connections when working for use with ASP/ADO. It is also the fastest type. System DSN because the connection information is stored in Windows Registry. A system DSN tends to be about one-third of fast less so than a User DSN.

5.1.2 Create Databases with virtual store tools.

The developers who are used to working with Access databases may be disappointed with the tools that are available for any SQL server. MS Access provides the user an interface for designing and working with databases. However, the tools provided with MS SQL server have a more text-based look and feel. For example, there is no wizard or straightforward for table/field/query definition and relationships.

CHAPTER 5
SYSTEM IMPLEMENTATION AND TESTING

5.0 : System Implementation And Testing

The process of assuring that the information system is operational and then allowing users to take over its operation for use and evaluation is called implementation. There are a few approaches to implementation that should be considered as a changeover to the new system.

One of the approached used in implementing the Hospital Management System is by evaluating it. Formulating performance measures on which to evaluate the system does this. Evaluation comes from users, management and the analyst itself.

5.1 Setting Up The Environment

Before we can use the data in the database, we must be able to establish a connection. This can be accomplished with a variety of methods, including ODBC data source names (DNS), OLE DB data links, and so called DSN-less connection, where enough coding is provided to connect to the database.

5.11 To create a System / User Data Source Name (DSN)

To connect data using ODBC, an ODBC data source name (DSN) is used. DSN is a method of standardizing database connectivity . There are 3 types of DSN which are user DSN, System DSN and File DSN. A system DSN is available to all users on the current machine, including NT services, making it ideal for use with ASP/ADO. Its also the fastest type of DSN because the connection information is stored in Windows Registry. A System DSN tends to be more convenient but less secure than a User DSN.

5.12 Create Database with visual data tools.

For developers who are used to working with Access databases may be dissappointed with the tools that were available for Ms SQL server. MS Access provides the user an interface for designing and working with databases.However, the tools provided with MS SQL server have a more text-based look and feel. For example, there is no database diagramming for tasks such as query definition and relationships.

Fortunately, the Visual Data Tools provided in Visual InterDev, removes those user interface constrainst. Using Visual Data Tools, developers can from within Visual Interdev, visually create SQL statements for querying or updating the database, view or edit data returned by a query , and even create parameterized queries, which requires some values provided for each execution of the query.

5.13 Accessing Databases Programmatically.

Visual Interdev is an interesting point in its development. With the move to Active Data Object 2.0, Web developers finally have a data access library that's as powerful and simple to use. The ADO object model defines the base objects you work with to perform specific actions especially to access the data. The base objects, such as Connection, Recordset and Command, can be created independently of one another and are related in a hierarchical sense.

1. Using the Connection Object

An ADO Connection object represents a unique session with a data source. One of its key properties, connection string, is used to specify the DSN, username and password required and other information, necessary to establish a connection to the database with authentication. This is used in the HMS project. A simple DSN connection is created and using the Open method, a connection to the datasourceis done by providing the login name, and password as shown below.

```
<%
Set oConn = Server.CreateObject(ÄDODB.Connection")
Oconn.ConnectionString=DSN=system;UID=hms;PWD=hms
Oconn.Open
.....
Oconn.Close
%>
```

2. Using the Recordset Object

The following is a two server-based ADO Object: a Connection object (oConn) and a Recordset object (oRs). The recordset uses oConn for its data connection and then execcutes the Open Method, passing the plain text SQL query as the only parameter.

The nice thing about the Recordset object, however, is that you can create one connection independently of a Connection object. Because of its speed, it`s an ideal recordset to use on public websites because you typically have to display read-only data.

```
<%
Set oConn = Server.CreateObject(ÄDODB.Connection")
Oconn.ConnectionString=DSN=system;UID=hms;PWD=hms
Oconn.Open

Set oRs=Server.CreateObject("ADODB.Recordset")
Sql="SELECT*FROM tbl_registration WHERE Patient_ID = '" &strUSerName&'";"
oRs.Open Sql,Oconn
…
oRs.Close
Oconn.Close
%>
```

3. Using the Command Object

The ADO Command Object can be used to define command that we intend to excecute against a datasource. The following is a Command Object.

```
<%
Set cn=Server.CreateObject(ÄDODB.Connection")
Set  rs=Server.CreateObject(ÄDODB.Recordset")
Set cm=Server.CreateObject(ÄDODB.Command")

rs.Open "DSN=system;UID=hms;PWD=hms
Set rs.ActiveConnection=cn

rs.Open cm
…..
rs.close
cn.Close
%>
```

5.2   System Testing

System testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding. Rules that can serve well as testing objectives are

- Testing is a process of executing a program with the intent of finding an error.
- A good test case is one that has high probability of finding an undiscovered error.
- A successful test is one that uncovers a yet undiscovered error.

A software module is exposed to testing both during the development phase and during the test and integration phase. During the development phase, each function or procedure that is part of the module is independently developed and thoroughly tested until the entire module is complete. The major difference between testing a module during its development phase and testing it during the test and integration phase is that during the development phase, errors are fixed as the6y are found. While during the test and integration phase, failure if any are recorded and the failed module is returned to the development team along with an explanation of failure. The Hospital Management System has undergone 3 stages of testing before it was considered as a complete system. They are unit, integration and system testing.

5.21 Unit Testing

Historically, quality software relied on testing each functions, module or class (in Object oriented programming). This practice called unit testing which is effective is extremely time consuming and labor intensive. Using the detail design description as guidance, important control parts are tested to uncover errors within the boundary of the module. This relative complexity of tests and errors detected as a result limited by the constrained scope established for unit testing. Unit testing is also referred to as module testing and is usually performed by the software developer. For this package, unit testing was done during the implementation phase, in Visual Interdev itself. After the functionality of each module was developed, reviewed and verified, test cases were designed. The module was tested to ensure that it operates correctly.

5.22 Integration Testing

Testing a specific feature together with the other newly developed features is known as integration testing. Testing the interface of components explores how components interact with each other.

Previously captured unit test scripts can be combined to create a variety of integration test cases, with minimum effort. For instance, units test scripts that tested on a Back function can be schedule with Previous function to create an integration test on the entire system. Incremental integration approach was applied during the development of this package. The Hospital Management System was constructed and tested in Visual Interdev where errors were easier to isolate and corrected. Errors will be corrected before proceeding to the next integration.

5.23 Function testing

Each function can be associated with those system components that accomplish it. For some functions, the part may comprise the entire system. Logically it should be easier to find the cause of a problem in a small set of component than in larger set. Effective function tests have a high probability of detecting a fault.

The Hospital Management System uses some guidelines for function testing listed below.

- Have a high probability of detecting a fault
- Know the expected action and output
- Test both valid and invalid input
- Never modify system just to make testing easier

5.24 Performance Testing

When the system performs the functions required by the requirements, it turns to the way in which those functions are performed. Thus functional testing addresses the function requirements and performance testing addresses the nonfunctional requirements. System performance is measured against the performance objectives set by the user as expressed in the nonfunctional requirements. In the Hospital Management System, performance testing examines how well the speed and response to the user commands, calculations of transactions and accessibility of the data.

5.25 Acceptance Testing

When the function and performance testing are completed, the system is convinced and meets all requirements specified during the initial stages of the software development. The next step is to ask the user. The user leads testing and defines the cases to be tested. The purpose of acceptance testing is to enable the user to determine if the system built really matches their needs and expectation. Thus acceptance test are written, conducted and evaluated by the users, with assistance form the developer only when the user requires an answer to a technical question.

5.3   Maintenance

As the Hospital Management System has not been used by any user thus there are no steps taken to pursue this cause. If they were to be, then maintenance of this package will involve the updating of each module where the content is concern

5.4 Conclusion

All the necessary details of implementation and testing strategies for this system have been included here for better understanding of the system flow. This system was developed according to the analysis done so that all the requirements are met and caters to the users needs.

6.0   System Evaluation

6.1   Project Problems and Solutions

There is always a notion that any software can solve problems, but in reality it is not always the case. Throughout the development of the Hospital Management System, several problems were encountered. Below is the list of problems along with the approaches and solutions taken to overcome them.

6.11   Problems and solutions encountered during the research and analysis phase.

CHAPTER 6
SYSTEM EVALUATION

Problems:

1. The major problem faced during project research was in determining the scope of the system in the project to be completed within the practical limits.
2. Choosing the appropriate development methodologies and methodology.
3. Finding facts and methods of processes with regards to the design of the project either logically or physically and correctly.

Solutions:

1. Thorough analysis was done to find out the best solution in developing the system. A feasibility study was also drawn in order to design the system and understand the details.
2. Reading from relevant materials i.e. books, journals articles and try to understand facts.
3. Referring to the previous projects that were done in the Document Room of FSKTM.
4. Interviews and consultation with lecturers and guidance.

6.0 System Evaluation

6.1 Project Problems and Solutions

There is always a notion that any software can solve problems, but in reality it is not always the case. Throughout the development of the Hospital Management System, several problems were encountered. Below is the list of problems along with the approaches and solutions taken, to overcome them.

6.11 Problems and solutions encountered during the research and analysis phase.

Problems:

1. The major problem faced during project research on studies and analysis is choosing the right scope of the system so that it could be completed within the given time frame.
2. Choosing the appropriate development life cycle model and methodology.
3. Finding facts and methods of application with regards to the design of the project either logically or physically and technically.

Solutions:

1. Thorough analysis was done to find out the best solution in developing the system. A logic frameline was also drawn in order to design the sytem and understand its scope.
2. Reading up on relevant materials i.e. books, journals and etc and try to understand them.
3. Referring to the previous projects that were done in the Document Room of FSKTM.
4. Supervisor and course mates' advices and guidance.

6.12   Problems and solutions encountered during project implementation and testing phase.

Problems:

1. Learning to use the ASP Language with VBScript and JavaScript, Macromedia Flash 5 and other software such as Adobe Photoshop. Choosing the appropriate images and icons for the interface.

2. Integrating the subsystems altogether to get the correct flow.

3. Testing the entire system on another computer.

4. Function 'Response.Redirect' does not function as expected.

Solutions:

1. Viewing samples from various books to understand how to use the ASP technology and also tring out using the trial and error method. Viewing other projects done previously and reviewing the codes to better understand how it works.

2. Testing of the system by other users to detect the flaw in the system.

3. When testing is done on another computer, some of the features or links cannot be presented properly. Therefore step such as testing it on other computers a couple of times were carried out.

4. A link was inserted into the pages to make it easier for the user to browse on to the next page.

6.2 System Strengths

Although this system was not designed to its ultimate capacity, it nevertheless has some extent of strenghts in it.

➢ The system comes with a level of security which is able to track users who enters the system as it only allows authorized users to enter the system and its modules. Users of the system is required to login using a special password that is given by the administrator when he is conformed as an employee of the hospital.

➢ Public users especially patients of the hospital will be able to reschedule their appointments online and be confirmed by the administrator. This way, users are not left to assume that their appointments are confirmed by just selecting the times and date on the screen provided. Moreover, this maximizes the time of consultation of the physician.

➢ User friendliness of the system that is developed based on GUI. The user interfaces are simple in order for the user to get use to the entire system in a short time and thus gaining confidence in the system.

➢ Each web page is designed to be lightweight. These pages load in a reasonable time to ensure users need not wait too long to view the pages. Heavy graphics were avoided.

➢ In HMS, error messages are immediately displayed when the user enters a wrong command or datatype. This allows users to identify their errors immediately and thus enabling them to continue using the system effectively.

➢ The system is easy to exit at anytime and each input and changes is recorded with its time and date stamp

6.3 System Limitations

Despite the strengths mentioned previously, there are limitations to the system which could not be developed due to time constraint and lack of resources.

➢ The system does not include the method of payment such as either cheque, credit card, cash or insurance.

➢ When deleting a record, a backup is not done for deleted records.

➢ All transactions can oly be made in Ringgit Malaysia and not any other currencies.

➢ The format of the medical record is not confirmed as it was due to the private and confidential issue of displaying these records for public view.

6.4 Future Enhancements

As the HMS was developed using the Waterfall model approach, this it still leaves place for improvements and future enhancements.

➢ Encryption and decryption of password. Passwords should be encrypted before storing into the database and decrypted during the password retrieval process.

➢ System should be able to generate a standard medical report for the user.

➢ The system should be able to display results of lab test to patients online.

➢ The system should be able to accept credit card and insurance payments by patients.

6.5 Suggestions

Below is a list of suggestions on how to improve this course.

1. Have more equipped laboratories and computers for final year students who are taking this course because currently there is only one laboratory, which is fully functional for this purpose.
2. Equip all the computers with CD writer.
3. Have more resources i.e. books or journal in the Document Room and enable borrowing.
4. Enable those who are currently taking this courser to view the working system submitted by previous students as a guideline.

Conclusion

The HMS has been successful in obtaining its primary objective which was to produce a system which would minimize paper usage and ease the workload of the staffs handling patient related issues. The process of designing the workflow of the system has helped me to think logically and to be a more organized person. As I was in charged of the billing module proposed under the HMS title, I was also exposed to being articulate and to take into account important and sensitive issues dealing with the whole process so as to cover a wider scope of billing modules.

Many difficulties and confusions were encountered especially in the design and implementing processes. Analyzing and learning the ASP scripts was a tough hurdle as the programming language was new and was required to be studied in a short period of time. But with much diligence and hard work, it finally paid off.

However, some minor drawbacks still exist in the system as discussed in the system limitation section. These features were intended to be embedded in the system itself for future enhancement.

Developing this system is a challenging task especially when concerning the flow of the sub modules because it has to be understandable to the user's point of view. Therefore, careful steps have been taken to achieve the desired requirements.

Throughout this project a lot of experience has been gained, new knowledge has been acquired and most importantly, there has been an improvement in project management. Having up to date knowledge and information becomes important in keeping abreast with the fast and ever changing field sin the information technology era. This project enables the implementation of the management approach to be applied in the development of this system.

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USER MANUAL

Hospital Management System ver 1.0

done by

Kavitha Ravierthran & Mary Anac loraw
WEK 040042 & WEK 990077

Things to be done to run HMS.

1. Copy the folder "hospital_new" from the CD to your
   "c:\inetpub\wwwroot" folder.

2. Set the default home directory to IIS server as
   "c:\inetpub\wwwroot\hospital_new".

3. Set the default document to "codehome.asp".

4. Create a database by the name "hos_final.mdf" .Restore the backup
   of SQL from the folder "hospital_new\SQL_database" in the CD

5. Create a system dsn by the name "system", having the userid "system" and
   the password "admin" that is connected to the SQL Server and set the default database
   to "hos_final".

6. Now you can run the website by the address "http://localhost".

7. Admin module is present in the folder "hospital_new\website\Module" in the CD.
   Run "presentation.exe".

USER MANUAL

USER MANUAL

Hospital Management System ver 1.0

done by

Kavitha Karbal Singh & Mary Anne Soosay
WET 990072 & WET 990077

Things to be done to run HMS :

1. Copy the folder "hospital_new" from the CD to your
   "c:\inetpub\wwwroot" folder.

2. Set the default home directory of IIS server to
   "c:\inetpub\wwwroot\hospital_new\".

3. Set the default document to "mainpage.htm"

4. Create a database by the name "hos_man_sys". Restore the backup
   of SQL from the folder "hospital_new\SQL-Module" in the CD.

5. Create a system dsn by the name "system" , having the userid "system" and
   the password is kept empty and connect to the SQL Server and set the default database
   to "hos_man_sys".

6. Now you can run the website by the address "http://localhost"

7. Admin module is present in the folder "hospital_new\Admin-Module" in the CD.
   Run "prosystemadmin.exe".

Register As A User Of the Hospital Management System

To be an authorized user of the Hospital Management System (HMS), you must first register your name with the administrator to obtain a user name and a password.

At the administrators module you will be assigned into a user group which enables you to access into the modules corresponding to your user group.
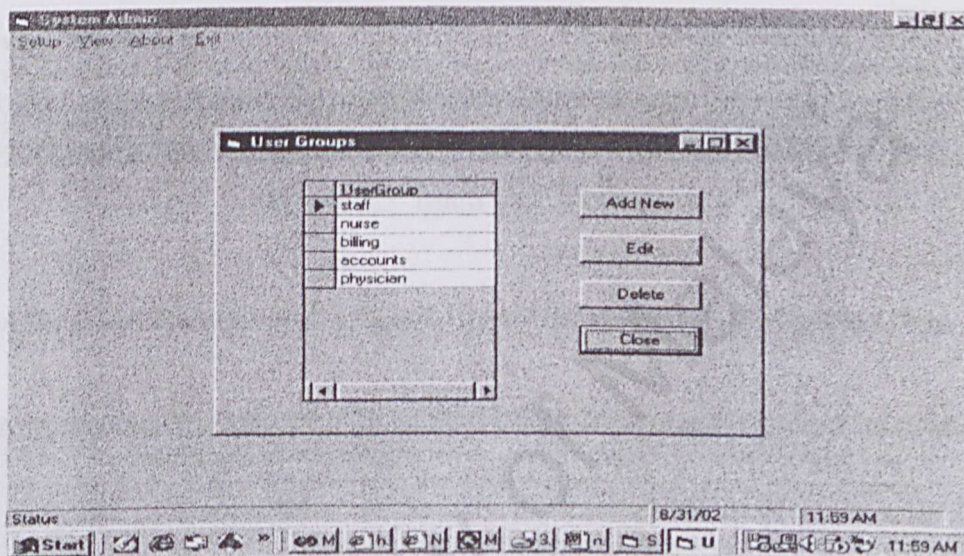
Figure 1.1 Admin Module to Add User group

When you have registered as an authorized user, you can proceed to view the HMS. To enter the HMS, you must first be logged on to:

http://www.202.185.109.143/hospital/mainpage.asp

You will be able to view this page once you have logged on to the site.
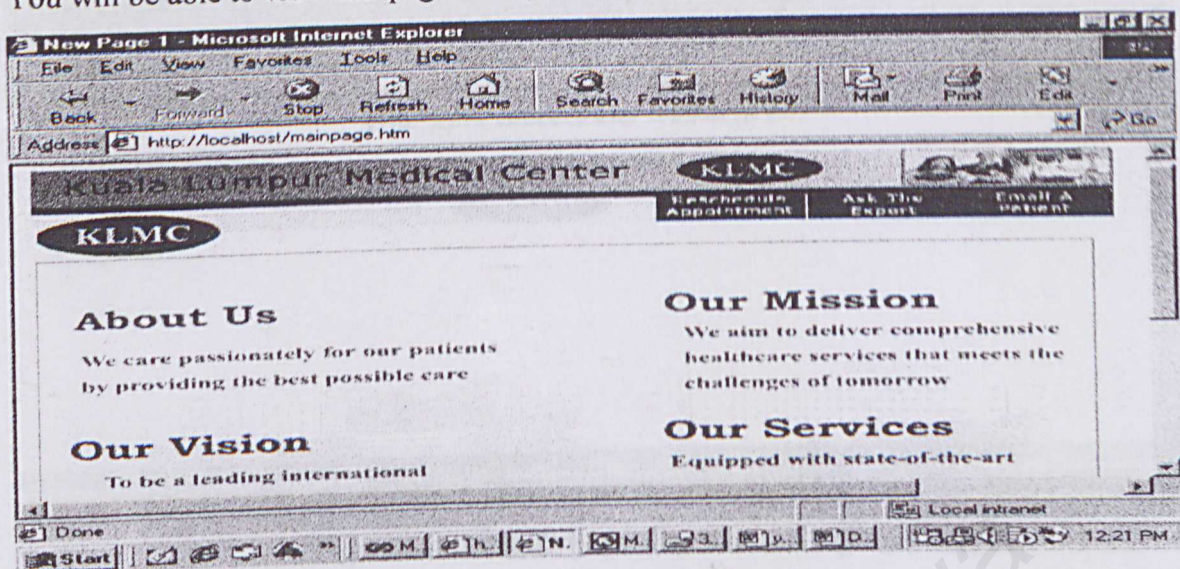
Figure 1.2 Main page of the HMS

Click on the KLMC button link to log on. You will be directed to the login page.
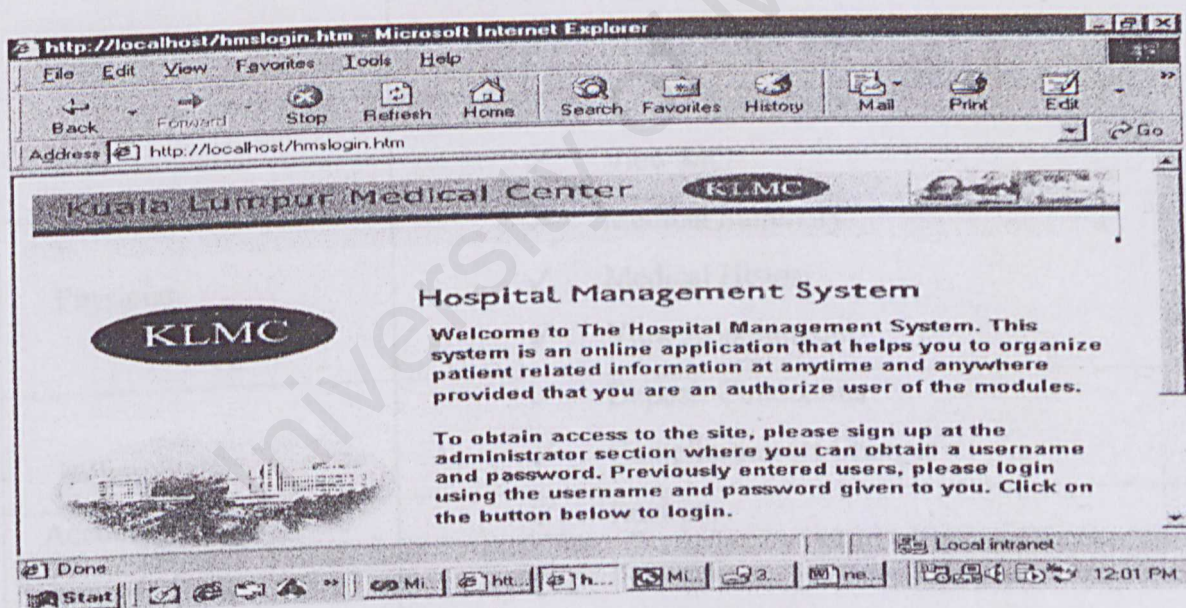
Figure 1.3 Login Page of the HMS

Here, enter your username and password that was assigned to you by the administrator.

After successfully logging into the system, you will directed to the default page.
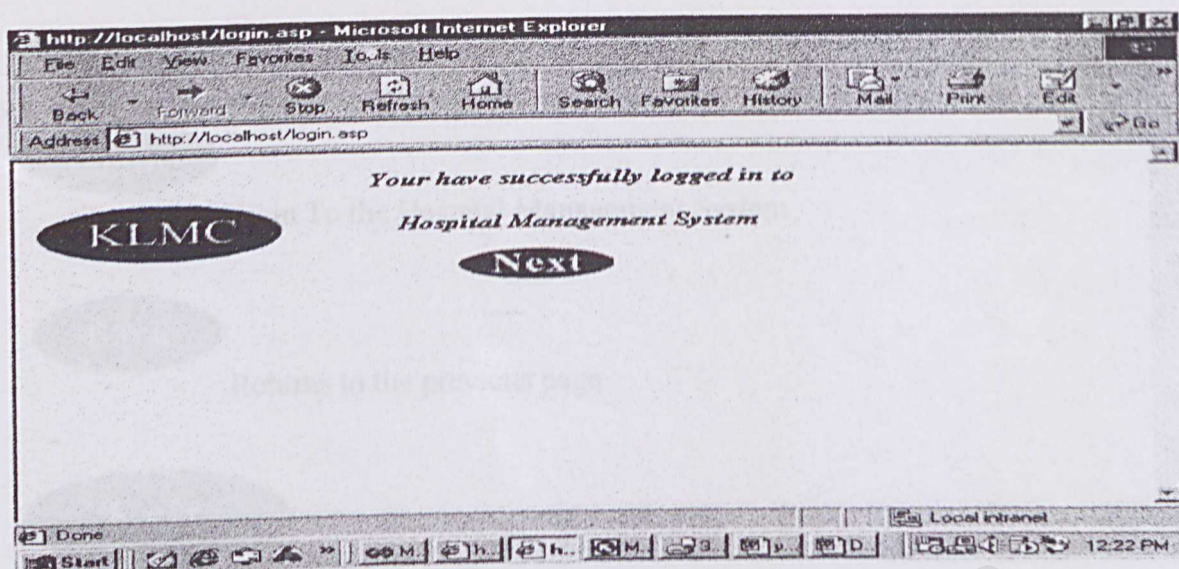
Figure 1.4 Default page after success login.

You will only be able to access the pages, which corresponds with your usergroup. The list is as follows :

Usergroup	Accessable Sub Modules
Staff	✓ Add New Patient Record
	✓ Update Patient Record
	✓ View Appointment
	✓ View MC
Physician	✓ Medical Summary
	✓ Medical History
	✓ View Appointment
Billing Staff	✓ Deposit Collections
	✓ Computation Of Charges
Accounts Staff *Proceeds from computation of charges	✓ Reclaim
	✓ Payment
	✓ Transfer
Nurse	✓ Admission Discharge And Transfer
	✓ Inpatient Information
	✓ Daily Checklist
	✓ Location

Legend : Buttons

Login

       Login To the Hospital Management System

Back

       Returns to the previous page

Exit

       Exit the Hospital Management System

KLMC

       Login (first time) to the Hospital Management System

Next

       Continue to the next page

Submit   Submits the information keyed in to be

Calculate   Calculates the charges

PATIENT MANAGEMENT SYSTEM

The Patient Management System is divided into 7 sub modules. It deals with the registration of patient, medical report database, and patient's admission, discharges and transfer information. The Sub Modules are as follows :

- Add New Patient
- Update Patient Data
- Medical Summary
- Medical History
- Inpatient Registration
- Daily Checklist
- ADT

Staff

As a staff, you are only able to access the Add New Patient Link and the Update Patient Information Link.

When you have successfully entered the system, you will be able to view the links situated on the Patient Management System pages.

Add New Patient

When you click on the Add New Patient Link, you will be directed to this page :

Figure 1.4 Add New Patient Page

- Here, you are able to key in the demographic information of new patients. In fields that are not applicable, you are required to enter (-).

- When you click on SUBMIT, you will be directed to a page, which informs you that your record is saved.

- Then you may choose to either return to the New Patient Registration Page by clicking the Back button or click on the PMS button to return to the main page.

Update Patient Record

When you click on the Update Patient Record Link, you will be required to enter the NRIC number of the patient whose information is required to be updated to generate a search.

- If the NRIC is valid, the patient's information will be displayed and you are able to alter the relevant changes.

- Fields such as the Patient ID, Patient Name, NRIC number, Date Of Birth and the fields situated under the Management Use column cannot be altered.

- Click on the update button once the information has been updated and you will be prompted to either return to the update page or return back to the main menu.

Physician

As a physician, you are only able to access the Medical Summary And Medical History links.

When you have successfully entered the system, you will be able to view the links situated on the Patient Management System page which is the medical report. When you click on the link, it will direct you to make a selection to either enter Medical Summary or Medical History.

Medical Summary

When you click on the Medical Summary option, you will be directed to this page :

Figure 1.5 Medical Summary

- This page enables you to key in the health condition of the patient during consultation.

- For Prescribing the necessary medication, please click on the Prescription Link.

- This link takes you to a page where you are able to choose the medication, prescribe the amount of dosage and view your precription while you prescribe the next medication. After doing this, you may click the BACK button to return to your medical summary page. This process goes for lab tests as well as others.

- Future appoinments and the issue of Medical Certificate can be done following the link on the medical summary page.

- When you are done, click SUBMIT and you will be prompted to either return to the Medical Summary Page or return to the Main Menu.

Medical History

When you click on the Medical History option, you will be directed to this page :
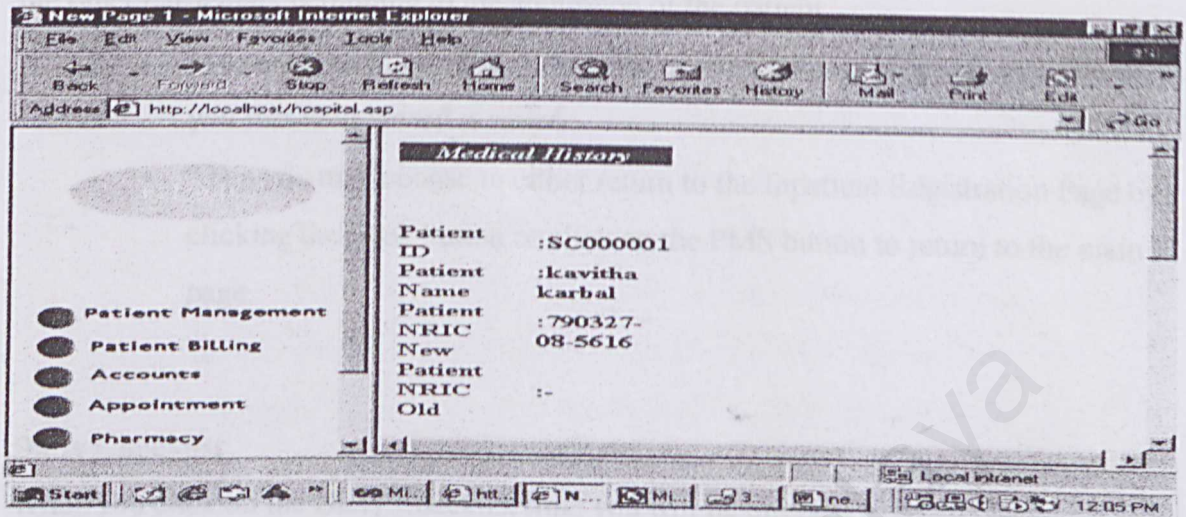

Figure 1.5 Medical History

- This page enables you to view the prescription and health conditions of the patient since the last consultation.
- You may click on the date of consultation to view the full medical report regarding the patient.

Nurse

As a nurse, you are only able to access Inpatient Registration, Daily Checklist and ADT(admission, discharge and transfer)

When you have successfully entered the system, you will be able to view the links situated on the Patient Management System pages.

Inpatient Registration

When you click on the inpatient registration link, you will be directed to a page that requests you to enter the Patient NRIC number to generate a search. Then you may fill in the other particulars pertaining to the admission of the patient.

- When you click on submit, you will be directed to a page, which informs you that your record is saved.

- Then you may choose to either return to the Inpatient Registration Page by clicking the Back button or click on the PMS button to return to the main page.

Daily Checklist

When you click on the Daily Checklist link, you will be directed to a page that requests you to enter the Patient NRIC number to generate a search.

This module is only available in the wards.

- You are requested to click on the Prescription link to insert the medication that was prescribed by the physician and the exact dosage. Previous records keyed in will also be recorded under this column.

- When you click on the Lab Test link, you will be able to insert the lab test that the patient was assigned to by the physician in charge. Previous records will also be displayed regarding the patient's lab test that were taken before.

- When the you click the Other Items link, you will be able to insert other miscellaneous charges that the patient may have used that need to be accounted for.

- If the user clicks on the reset button, all recently input records will be deleted.

- When all is done, then you may click the calculate button. This button will sum the charges that are accounted for the patient. You will be redirected once again to the Inpatient Checklist and return to the Patient Management System main page by clicking the PMS button.

Admission Discharged and Transfer (ADT)

When you click the ADT link on the Patient Management System main page, you will be prompted to enter the NRIC number of the patient, which was admitted.

- Information about the patient's whereabouts and date of admission will be displayed.
- When the patient is rescheduled to be discharged, you are required to select the reasons of the discharge All fields including the time and date that the patient was discharged will be saved for future references.
- If the patient is transferred to another department or another hospital, then the user should also input the information about the transfer. All the information will be saved in the database for retrieval purposes.
- If the user clicks on the reset button, all recently input records will be deleted.

Billing Staff and the Accounts Staff are not able to view any links on the patient management system.

PATIENT BILLING SYSTEM

The Patient Billing System is divided into 3 sub modules. It deals with the computation of charges for patient's medication and deposit collection. The Sub Modules are as follows:

- Deposit Collection
- Inpatient Computation
- Outpatient Computation

Staffs, Physicians and Nurses are not allowed to view any links on the Patient Billing System. Only the Billing And The Accounts Staff is allowed to view these modules.

Billing Staff.

As a billing staff, you are able to access all the links in the Patient Billing System. When you have successfully entered the system, you will be able to view the links situated on the Patient Billing System pages.

Deposit Collection

When you click the Deposit Collections link on the Patient Billing System mainpage, you will be directed to this page.

Figure 1.9 Deposit Collection Page

- You are required to enter the NRIC number of the patient to generate a search.

- Information on the patient will be displayed.

- Next, you are required to choose the status of the patient. For each status except self, no charges will be taken into account.

- In the Transferred Deposit field, previous balance (if any) that has not been reclaimed by the patient is automatically added into the transferred deposit field.

- You may key in the current deposit collected from the patient and the total deposit collected will be displayed.

- This information will be saved and the Staff Id of the user will be noted for future references.

- When the user selects the submit button, the user is directed to choose either to return to the deposit collection page or to return to the main screen of the Patient Billing System.

Computation of Charges

When you click the Computation Inpatient link on the Patient Billing System mainpage, you will be directed to this page.
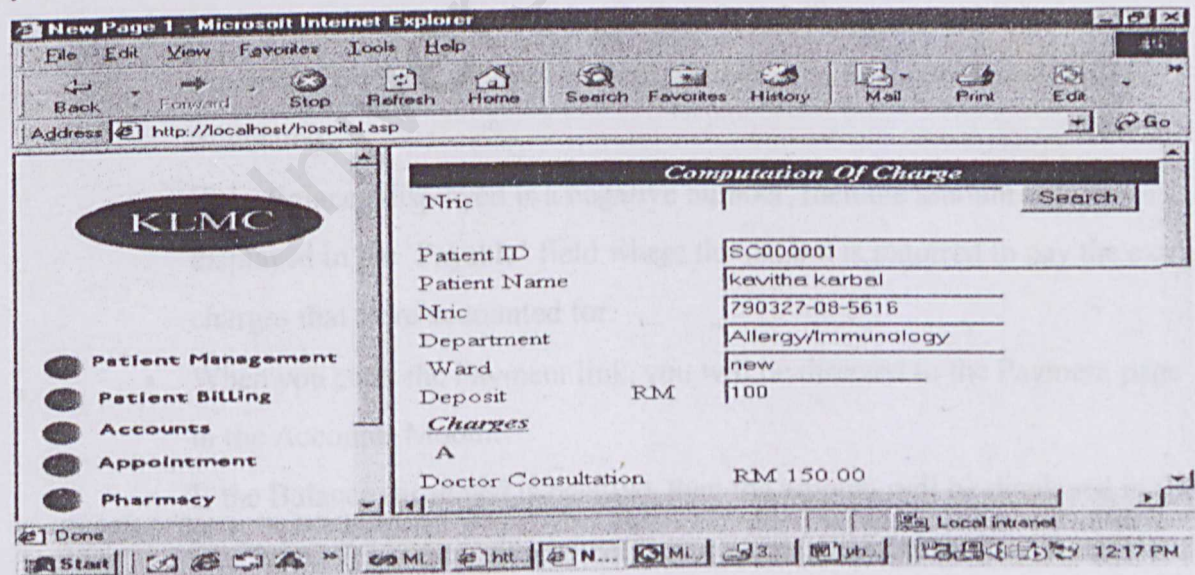

Figure 1.10: Computation of Inpatient Charges Page.

- You are requested to input the NRIC number of the patient to generate a search.

- In section A, the charges for Medication, Lab Test, Miscellaneous Charges and Operation charges will be displayed automatically (if any) which will also be calculated and displayed.

- As for section B, all the information is to be inserted by the Accounts Clerk.

- If the bill is settled, you are required to choose the 'Bill Settled' option button and the exact amount will be displayed on the 'Paid' field.

- If the bill is unsettled, the unsettled amount will be displayed in the 'Balance Unsettled' field.

- The Staff ID Date and Time will be saved including the information keyed in.

- By clicking the Print button, the receipt for the patient will be printed out.

- When you click the submit button, you will be redirected to either the inpatient computation page or the main screen of the Patient Billing System.
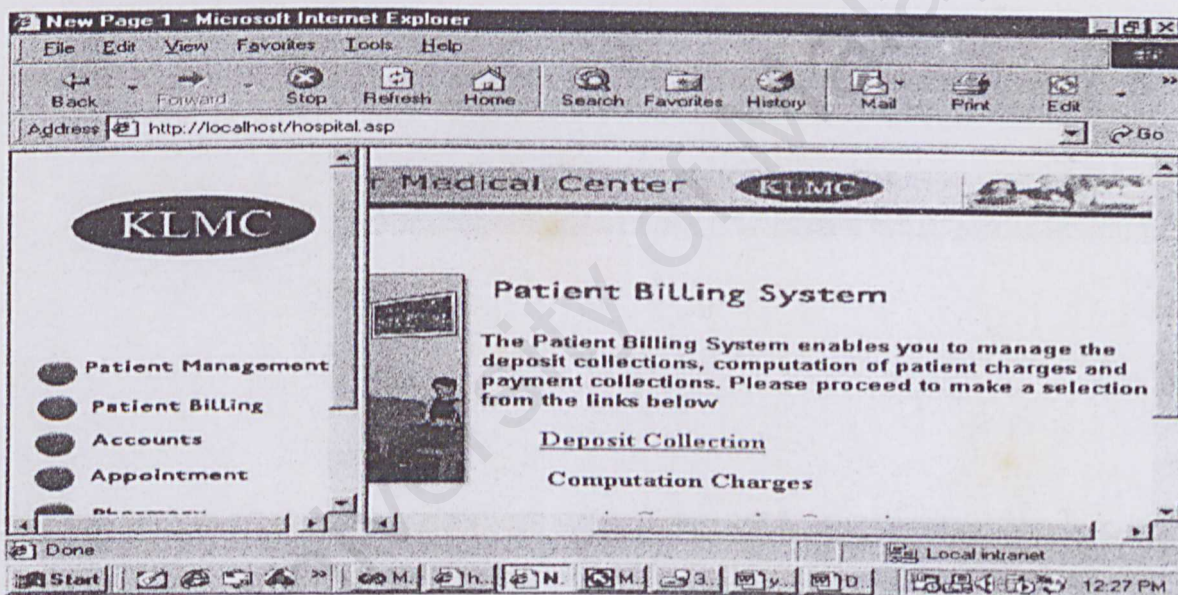
Computation Outpatient

- You are requested to input the NRIC number of the patient to generate a search.

- Under the charges column,, the charges for Medication and Diagnostic Lab charges(if any) will be displayed accordingly and the total charges will be calculated .

- If the Balance displayed is a negative number, then the amount will be displayed in the 'Payable' field where the patient is required to pay the extra charges that were accounted for.

- When you click the Payment link, you will be directed to the Payment page in the Accounts Module.

- If the Balance displayed is positive, then the amount will be displayed in the 'Reclaim' field where the patient can reclaim extra charges by visiting the Accounts Department.

- When the Reclaim Link is clicked, you will be directed to the 'Reclaim' page in the Accounts Module.

- Here is where the patient is allowed to transfer his deposit to his account.

Note : If the patient wishes to transfer the deposit, the amount to be transferred is keyed in and the information will be saved when you click on the Submit button. Both the operation is conducted by the Accounts Staff. This information will be displayed in the Deposit Collections page.

When the user clicks the submit button, the user will be directed to choose either to return to the calculation page or back to the Patient Billing System main page.

Account Staff

As an Accounts Staff, you are responsible in maintaining the patient's accounts. Proceeding from the Computation Of Charges for Inpatient and Outpatient, you are requested to handle the payment of reclaims to the patients and transfer of deposit as explained earlier in the billing module.

Exiting the Hospital Management System.

All users wishing to exit the module may do so by clicking the 'Exit' button.