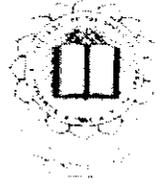# ELECTRONIC MEDICAL RECORDS MANAGEMENT SYSTEM

By

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Of

KUMARAGURU COLLEGE OF TECHNOLOGY
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A PROJECT REPORT

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of

**MASTER OF COMPUTER APPLICATIONS**

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BONAFIDE CERTIFICATE

Certified that this project report titled

ELECTRONIC MEDICAL RECORDS MANAGEMENT SYSTEM

Is Bonafide work of

Mr. S.SHABARI SHANKAR (Reg. No: 71202621042)

Who carried out the research under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.
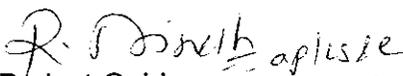
Project Guide 13/05/2005

Head of the Department

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in the project Viva-Voce examination held on _23 - 06 - 2005_

Internal Examiner

External Examiner

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ABSTRACT

The main object of this project Electronic Medical Records Management System abbreviated as EMRMS is to deliver relevant information of the services provided in the hospital. This system replaces the current system which is being partially computerized, i.e.... the billing and personal details of patients are being stored. It was initially developed to maintain the details of various services taken by the patient.

The technology growth in computers has thrown up a great deal of new possibilities to the hospital industry. The system is proposed to work over the intranet of the hospital where we can have a centralized access of information from anywhere in the hospital.

The document discusses the advanced features of this project like reservation of equipments and having the ability to modify records from any terminal with prior access permission. Integration of multi-user environment and client server technology. It describes the different modules of the system and its functions. The document also describes the environment in which the system was developed and its future enhancements.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW OF PROJECT

1.1.1 Electronic Medical Records Management System

Electronic Medical Records Management System Stores and Maintains the Computerized Records of Patients, Nurses, Physicians, Medical Equipments, Ambulance Services, Blood Bank Information, Claiming Insurance, Laboratory and Billing Details.

Modules in Electronic Medical Records Management System are

- Registration
- Practice Management
- Ambulance Services
- Medical Equipments
- Laboratory and Insurance
- Blood Bank Details
- Bill Payments
- Patient Care

1.1.2 Project Scope

- Significantly decrease serious Medication errors.
- Access all details at a Centralized Location.
- Quickly search for a variety of information.
- Enhance increased Efficiency by eliminating redundant data.
- Summary of patient Health is recorded.
- Correct posting errors quickly and maintain full audit trail.
- Automate paper work and access patient files easily.

1.2 ORGANIZATION PROFILE

Consolidated Cybernetics is a leading software house based at Coimbatore. It was established in 1993 and partnered with Digital Equipment Corporation and Oracle Corporation. It focuses on Health care and Manufacturing Industries.

Vision

To go beyond the possible limits, to become a contributing and respectable member of the Society.

Focus

The company has been totally focused on software development, web based application development, provide technology solutions and out sourcing for the healthcare industry. It has all along been a leading provider of integrated software system for healthcare automation services. They are

committed to provide error free software through continual improvement. They maintain highly competent human resources so that the customer's requirements are always met.

Services

The Company currently is providing software product development and research and development services to their local institutions. The technology solutions includes- Smart Cards, Equipment Interface, E-pen, Bar Code, Biometric

Products

Consolidated Cybernetics software suite is named as MediSoft specially designed to cater the needs of healthcare industry. The suite is available in four environments for large hospitals:

MediSoft-Chemist
MediSoft-Clinic
MediSoft-Lab

CHAPTER 2

SYSTEM REQUIREMENT AND SPECIFICATION

2.1 HARDWARE REQUIREMENTS

- Processor   : Intel Pentium III
- Processor   : 500 MHZ
- Memory   : 96 MB RAM
- Hard Disk   : 10 GB

2.2 SOFTWARE REQUIREMENTS

- Operating System   : Windows 2000 and above
- Tools   : VB.NET, ASP.NET
- Back-End   : SQL Server 2000
- Server   : IIS
- Browser   : Internet Explorer
- Packages   : Active Web Form Controls

2.3 SOFTWARE OVERVIEW

What Is Microsoft .NET?

Microsoft .NET is software that connects information, people, systems, and devices. It spans clients, servers, and developer tools, and consists of:

- The .NET Framework 1.1, used for building and running all kinds of software, including Web-based applications, smart client applications, and XML Web services—components that facilitate integration by sharing data and functionality over a network through standard, platform-independent protocols such as XML (Extensible Markup Language), SOAP, and HTTP.

- Developer tools, such as Microsoft Visual Studio® .NET 2003 which provides an integrated development environment (IDE) for maximizing developer productivity with the .NET Framework.

What is the .NET Framework?

The .NET Framework is a development and execution environment that allows different programming languages & libraries to work together seamlessly to create Windows-based applications that are easier to build, manage, deploy, and integrate with other networked systems.

The .NET Framework consists of:

- The Common Language Runtime (CLR)

A language-neutral development & execution environment that provides services to help "manage" application execution

The common language runtime (CLR) is responsible for run-time services such as language integration, security enforcement, and memory, process, and thread management. In addition, the CLR has a role at development time when features such as life-cycle management, strong type naming, cross-language exception handling, and dynamic binding reduce the amount of code that a developer must write to turn business logic into a reusable component.

- The Framework Class Libraries (FCL)

A consistent, object-oriented library of prepackaged functionality Base classes provide standard functionality such as input/output, string manipulation, security management, network communications, thread management, text management, and user interface design features.

The ADO.NET classes enable developers to interact with data accessed in the form of XML through the OLE DB, ODBC, Oracle, and SQL Server interfaces. XML classes enable XML manipulation, searching, and translations. The ASP.NET classes support the development of Web-based applications and Web services. The Windows Forms classes support the development of desktop-based smart client applications.

Together, the class libraries provide a common, consistent development interface across all languages supported by the .NET Framework.

Why ASP.NET?

It provides an easy access to data through the network. With SQL Server 2000, you can use HTTP to send queries to the database, perform full-text search on documents stored in database, and run queries over the network with natural language.

ASP .NET Controls

ASP .NET contains a large set of HTML controls. Almost all HTML elements on a page can be defined as ASP .NET control objects that can be controlled by scripts. It also contains a new set of object oriented input controls, like programmable list boxes and validation controls. A new data grid control supports sorting, data paging, and everything you expect from a dataset control.

Powerful database-driven functionality:

Like ASP (Microsoft's language preceding ASP.Net), ASP.Net allows programmers to develop web applications that interface with a database. The advantage of ASP.Net is that it is object-oriented and has many programming tools that allow for faster development and more functionality.

Memory leak and crash protection:

ASP.Net automatically recovers from memory leaks and errors to make sure that your website is always available to your visitors.

users do not need to dedicate database administrators to constantly monitor and tune the application.

Database Architecture

Microsoft® SQL Server™ 2000 data is stored in databases. The data in a database is organized into the logical components visible to users. A database is also physically implemented as two or more files on disk.

When using a database, you work primarily with the logical components such as tables, views, procedures, and users. The physical implementation of files is largely transparent. Typically, only the database administrator needs to work with the physical implementation

Each instance of SQL Server has four system databases (master, model, tempdb, and msdb) and one or more user databases. Some organizations have only one user database, containing all the data for their organization. Some organizations have different databases for each group in their organization, and sometimes a database used by a single application. For example, an organization could have one database for sales, one for payroll, one for a document management application, and so on. Sometimes an application uses only one database; other applications may access several databases.

It is not necessary to run multiple copies of the SQL Server database engine to allow multiple users to access the databases on a server. An instance of the SQL Server Standard or Enterprise Edition is capable of handling thousands of users working in multiple databases at the same time. Each instance of SQL Server makes all databases in the instance available to all

users that connect to the instance, subject to the defined security permissions.

When connecting to an instance of SQL Server, your connection is associated with a particular database on the server. This database is called the current database. You are usually connected to a database defined as your default database by the system administrator, although you can use connection options in the database APIs to specify another database. You can switch from one database to another using either the Transact-SQL USE database name statement, or an API function that changes your current database context.

SQL Server 2000 allows you to detach databases from an instance of SQL Server, then reattach them to another instance, or even attach the database back to the same instance. If you have a SQL Server database file, you can tell SQL Server when you connect to attach that database file with a specific database name.

The database engine has two main parts storage engine and relational engine. One of the most important architectural changes made in SQL Server 7.0 is to strictly separate the two engines within the server and let them use the OLEDB API to communicate with each other.

Features of SQL Server 2000

- Internet Integration.

    The SQL Server 2000 database engine includes integrated XML support. It also has the scalability, availability, and security features required to operate as the data storage component of the largest Web sites. The SQL Server 2000 programming model is integrated with the Windows DNA

architecture for developing Web applications, and SQL Server 2000 supports features such as English Query and the Microsoft Search Service to incorporate user-friendly queries and powerful search capabilities in Web applications.

- Scalability and Availability.

  The same database engine can be used across platforms ranging from laptop computers running Microsoft Windows® 98 through large, multiprocessor servers running Microsoft Windows 2000 Data Center Edition. SQL Server 2000 Enterprise Edition supports features such as federated servers, indexed views, and large memory support that allow it to scale to the performance levels required by the largest Web sites.

- Enterprise-Level Database Features.

  The SQL Server 2000 relational database engine supports the features required to support demanding data processing environments. The database engine protects data integrity while minimizing the overhead of managing thousands of users concurrently modifying the database. SQL Server 2000 distributed queries allow you to reference data from multiple sources as if it were a part of a SQL Server 2000 database, while at the same time, the distributed transaction support protects the integrity of any updates of the distributed data. Replication allows you to also maintain multiple copies of data, while ensuring that the separate copies remain synchronized. You can replicate a set of data to multiple, mobile, disconnected users, have them work autonomously, and then merge their modifications back to the publisher.

- Ease of installation, deployment, and use.

  SQL Server 2000 includes a set of administrative and development tools that improve upon the process of installing, deploying, managing, and

using SQL Server across several sites. SQL Server 2000 also supports a standards-based programming model integrated with the Windows DNA, making the use of SQL Server databases and data warehouses a seamless part of building powerful and scalable systems. These features allow you to rapidly deliver SQL Server applications that customers can implement with a minimum of installation and administrative overhead.

- Data warehousing.

SQL Server 2000 includes tools for extracting and analyzing summary data for online analytical processing. SQL Server also includes tools for visually designing databases and analyzing data using English-based questions.

2.4 SPECIFICATION

Platform Specification

Windows NT

This is a network operating system. This is based on the Client-Server architecture. Benefits of Windows NT are;

- More intuitive interface.
- Better multitasking and multithreading.
- Clients can be attached to workstations.
- Plug-and-play technology.
- Higher level of security.
- NTFS-a powerful NT File System.

Multiple language support:

> ASP.NET uses the new ADO.NET
>
> ASP.NET supports Visual Basic
>
> ASP.NET uses C# and C++
>
> ASP.NET supports Jscript.

Faster web applications:

> Two aspects of ASP.Net make it fast -- compiled code and caching. In the past, the code was interpreted into "machine language" when your website visitor viewed your page. Now, with ASP.Net the code is compiled into "machine language" before your visitor ever comes to your site.
>
> Caching is the storage of information that will be reused in a memory location for faster access in the future. ASP.Net allows programmers to set up pages or areas of pages that are commonly reused to be cached for a set period of time to improve the performance of web applications. In addition, ASP.Net allows the caching of data from a database so your website isn't slowed down by frequent visits to a database when the data doesn't change very often.

User Authentication

> ASP .NET supports forms-based user authentication, including cookie management and automatic redirecting of unauthorized logins.

High Scalability

Much has been done with ASP .NET to provide greater scalability. Server to server communication has been greatly enhanced, making it possible to scale an application over several servers.

ASP.NET Architecture
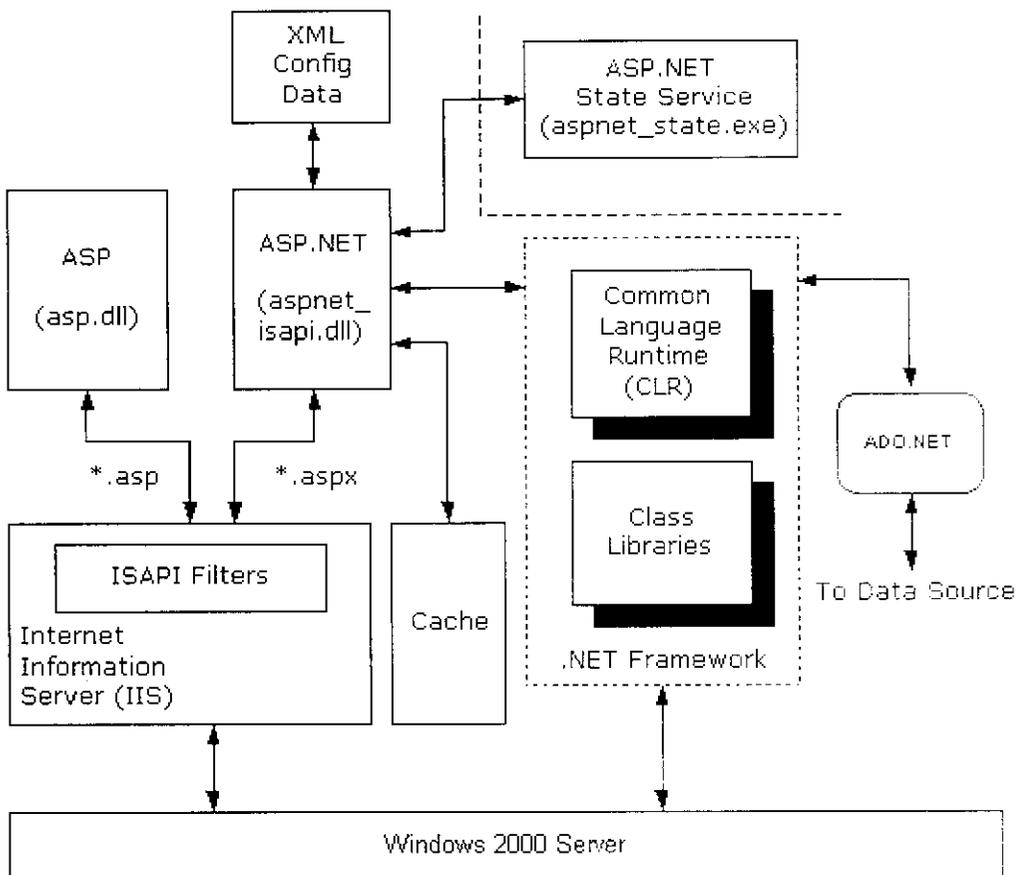
Database Design

Electronic Medical Records Management System uses Microsoft SQL Server 2000 as its Backend. Microsoft Extends the Performance, reliability, quality and ease- of-use of Microsoft SQL Server version 7.0. Microsoft SQL Server 2000 includes several new features that make it an excellent database platform for large-scale online transactional processing (OLTP), data warehousing, and e-commerce Application.

Fundamentals of SQL Server 2000 Architecture

Online Transaction Processing (OLTP) systems must be capable of handling thousands of orders placed at the same time.

Increasing numbers of corporations are implementing large Web sites as a mechanism for their customers to enter orders, contact the service department, get information about products, and for many other tasks that previously required contact with employees. These sites require data storage that is secure, yet tightly integrated with the Web.

Organizations are implementing off-the-shelf software packages for critical services such as human resources planning, manufacturing resources planning, and inventory control. These systems require databases capable of storing large amounts of data and supporting large numbers of users.

Independent Software Vendors (ISVs) must be able to distribute data storage capabilities with applications targeted at individuals or small workgroups. This means the data storage mechanism must be transparent to the users who purchase the application. This requires a data storage system that can be configured by the application and then tune itself automatically so that the

Windows 2000/NT Server

Microsoft Windows 2000/NT server 4.0 is a multipurpose server operating system. A multipurpose operating system integrates a variety of network services.

The services it provides are designed to address customer requirements and are managed in a single way. It offers a complete end-to-end solution. It gives the ability to exploit the popularity of compatible third party products and such application as Active Server pages, for dynamic content web pages or Server for specialized database tasks and web server for web services.

CHAPTER 3

SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

The existing system that is being used in the respective institution is a partly computerized one i.e. only the medical billing and personal details of patients are stored.

Disadvantages

- Tedious job of storing all relevant information about patients in paper.
- Most of the records stored are unavailable and incomplete.
- The records stored in paper work are poorly organized and not easy to retrieve.

3.2 PROPOSED SYSTEM

The Proposed System Electronic Medical Records Management System is developed using ASP.NET and MICROSOFT SQL SERVER 2000 as database. The system is being developed to decrease serious medication errors by implementing a computerized entry system to store all the relevant information about the patients and retrieve it at any time. All these details can be centrally accessed.

Advantages of Proposed System

- Cost effective
- High quality
- Increased efficiency
- Expanded accessibility
- Enhanced timeliness

3.3 PROTOTYPING

Planning the software development process involves several important considerations. The most important consideration is to define a product life-cycle.

The software life cycle encompasses all activities required to define, develop, test, deliver, operate, and maintain a software product. Different models emphasize different aspect of the life cycle, and no single life-cycle model is appropriate for all software products. Life-cycle models used are the phased model, the cost model, the prototype model and the successive versions model.

The Prototype Life-cycle Model

Prototype is a mock-up or model of a software product. A prototype incorporates components of the actual product. Typically, a prototype exhibits limited function capabilities, low reliability, and inefficient performance.

There are several reasons for developing a prototype:

- To illustrate input date formats, message, reports, and interactive
- Dialogues for the customer. This is used to explain various processing option to the customer and to gain better understanding of the customer's needs.
- To explore technical issues in the proposed product.

The nature and extent of prototype to be performed on particular software is dependent on the nature of the product. New versions of existing products can most likely be developed using the phased life-cycle model with little or no prototyping. Development of a totally new product will probably involve some prototyping during the planning and analysis phase or iterating through a series of successive designs and implementations may develop the product.

CHAPTER 4

SYSTEM DESIGN

4.1 ARCHITECTURAL DESIGN

Architectural Design is concerned with refining the conceptual design of the system, identifying internal processing functions, decomposing high level functions into sub functions, defining internal data streams and data stores and establishing relationships and interconnections among functions ,data streams and data stores.

4.1.1 Electronic Medical Records Management System – Module Overview

EMRMS consists of eight Modules:

- Registration
- Practice Management
- Ambulance Services
- Medical Equipments
- Laboratory and Insurance
- Blood Bank Details
- Bill Payments

- Patient Care

Registration Module

The registration module is used to register a new patient who comes to the hospital and provide him a unique identification number which will be used to access all the services provided in the hospital. The personal details of the patients will be stored in this module and can be retrieved at any time.

Practice Management

The practice management module is used to store and maintain the medical records of the patients. Patients are categorized in to two:

Out Patients

In patients

Out patients are those persons who are scheduled for consultation with respective doctors on daily basis. The details such as blood group, diagnosis and treatment and name of the physician consulted are maintained in out patients form design.

In patients are those persons who are recommended by the physician to be admitted in case of serious medical conditions. A room is allotted to the patient admitted; the diagnosis and the treatment provided are maintained in this form design. A discharge summary is being created at the time of patients discharge from the hospital.

Ambulance Services Module

The ambulance service module stores the details of ambulance call details. The call details include purpose of trip, incident details, run destination and credits the amount to the patients bill details. This module also maintains the descriptive details of the vehicles, insurance details.

Medical Equipments Module

The medical equipments module is used to schedule the equipments needed by the patient for treatment purposes. The equipments are scheduled based on the availability. It also stores the primary details of the equipments such as cost of the machine dealer name etc...

Laboratory and Insurance

The laboratory module is used to store the details of the lab tests taken by the patients as recommended by the doctor. The total lab tests bill is credited to the patient's bill details and paid in detail.
The insurance module stores the insurance details of the patients and does the process of claiming insurance on behalf of the patient

Blood Bank Details

The blood bank details module stores the details about the blood storage in the hospital. It also stores the details of blood donors and blood receivers of the hospital.

Bill Payment

The bill payment module maintains all the charges incurred by the patient for his Medicaid. It posts all the ambulance, equipments charges for the respective patient and creates a total bill.

Patient Care

The patient care module stores the details of physicians and nurses. It schedules the physicians on daily basis. The scheduling information will change based on the patients consultation details.

4.2 TABLE DESIGN

4.2.1 Registration Table

Field Name	Data type	Description	Key
Rcode	Number	Registration code	Primary Key
Pname	Varchar	Patient name	
Paddr	Varchar	Patient address	
Pdob	Date time	Patient birth date	
Pgender	Char	Patient sex	
Page	Number	Patient age	
Ptelno	Number	Patient phone no	
Pmstatus	Char	Patient marital status	

4.2.2 Equipments Table

Field Name	Data type	Description	Key
Sno	Number	Serial No	Primary Key
Ename	String	Name of Equipment	
Ecode	Char	Equipment Code	Foreign Key
Ipcode	Char	Registration code	
Date	Date time	Date	
Dfrom	Date time	Time used from	
Dto	Date time	Time used to	
Rate	Number	Usage rate	
Totalamt	Number	Total Amount	

4.2.3 Lab Details Table

Field Name	Data type	Description	Key
Tid	Number	Lab test Id	Primary Key
Rcode	Number	Registration Code	Foreign Key
Tdate	Date time	Date of Test took	
Tamt	Number	Test Amount	
Totamt	Number	Total Amount	

4.2.4 Equipments Master Table

Field Name	Data type	Description	Key
Ecode	Number	Equipment Id	Primary Key
Ename	String	Name Equipment	
Mname	String	Mfr Name	
DlrName	String	DlrName	
DlrAddr	String	DlrAddr	
Dop	Date time	Date of Purchase	
Cost	Number	Cost	
Wexpdate	Date time	Warranty Date	

4.2.5 Transport Table

Field Name	Data type	Description	Key
Rcode	Number	Registration code	Foreign Key
Vno	String	Vehicle Number	Foreign Key
Sno	Number	Serial No	Primary Key
Dfrom	String	Destination	
Dto	String	Destination	
Incdetails	String	Incidents note	
Purpose	String	Purpose	
Amt	Number	Amount	
Stime	Date time	Start time	
Etime	Date time	End time	

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4.2.6 Transport Master Table

Field Name	Data type	Description	Key
Vno	Number	Vehicle No	Primary Key
Vmfr	String	manufacturer	
Vdealer	String	Dealer	
Vaddr	String	Address of Dealer	
dtelno	Number	Telephone No	
Vdrivername	String	Driver Name	

4.2.7 Blood Donors Table

Field Name	Data type	Description	Key
Did	Number	Donor Code	Primary Key
Dname	String	Name of Donor	
DAge	Number	Age	
DAddr	String	Address	
DPNo	Number	Phone	
DBGroup	String	Blood Group	

4.2.8 Blood Receiver Table

Field Name	Data type	Description	Key
Rid	Number	Receiver No	Primary Key
Rname	String	Receiver name	
Rsex	String	Sex	
RAddr	String	Address	
RBGroup	String	Blood group	
RPno	Number	Phone	
Bags	Number	Bags Obtained	

4.2.9 Nurse Details Table

Field Name	Data type	Description	Key
Ncode	Number	Nurse Code	Primary Key
Nname	String	Nurse Name	
Nqual	String	Qualification	
NDept	String	Name of Department	
Ntno	Number	Phone No	
NMob	Number	Mobile No	
NAddr	String	Address	

4.2.10 Operation Registration Table

Field Name	Data type	Description	Key
Odate	Date / Time	Operation date	
Otheatre	Number	theatre no	Primary Key
Ipcode	String	patient code	Foreign Key
Pname	String	patient name	
Sex	String	sex	
Bgroup	String	Blood Group	
Diagnosis	String	Diagnosis	
Dcode	Number	Doctor Code	
Dname	String	Doctor Name	

4.2.11 Doctor Details Table

Field Name	Data type	Description	Key
Dcode	Number	Doctor Code	Primary Key
Dname	String	Doctor Name	
Spec	String	Specialization	
Qual	String	Qualification	
Telno	Number	Phone No	
Mobile	Number	Mobile No	
Lno	Number	Doctor License No	
Dct	Datetime	Daily consultation time	

4.2.12 Insurance Details Table

Field Name	Data type	Description	Key
Rcode	Number	Registration Code	Primary Key
Iname	Text	Company Name	Foreign Key
Icode	Number	Company Code	
Edate	Date time	Policy Expiry date	
Pno	Number	Policy Number	
Itype	Char	Type of Policy	
Iamt	Number	Policy Amount	
Camt	Number		
Amtobt	Number		

4.3 DATA FLOW DIAGRAM

USER / STAFF

Display Error Message — Failed — Login Process — New user — Regist ration — Reg DB

User

Admn View

Display Blood Bank Facility

Display Lab Facility

Display Doctor Details

Display Equip Facility

Regist ration — Consulting Registration d
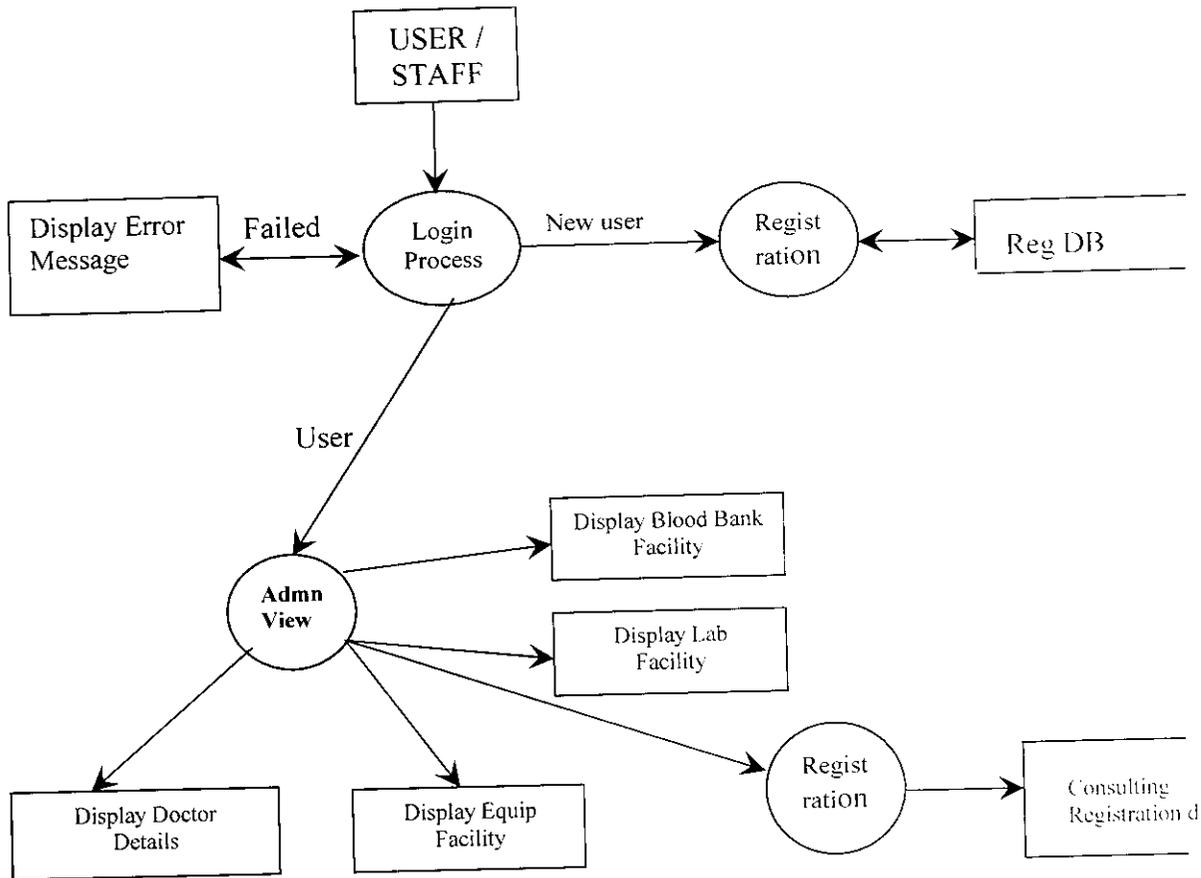
4.3.1 EMRMS MODULE DIAGRAM
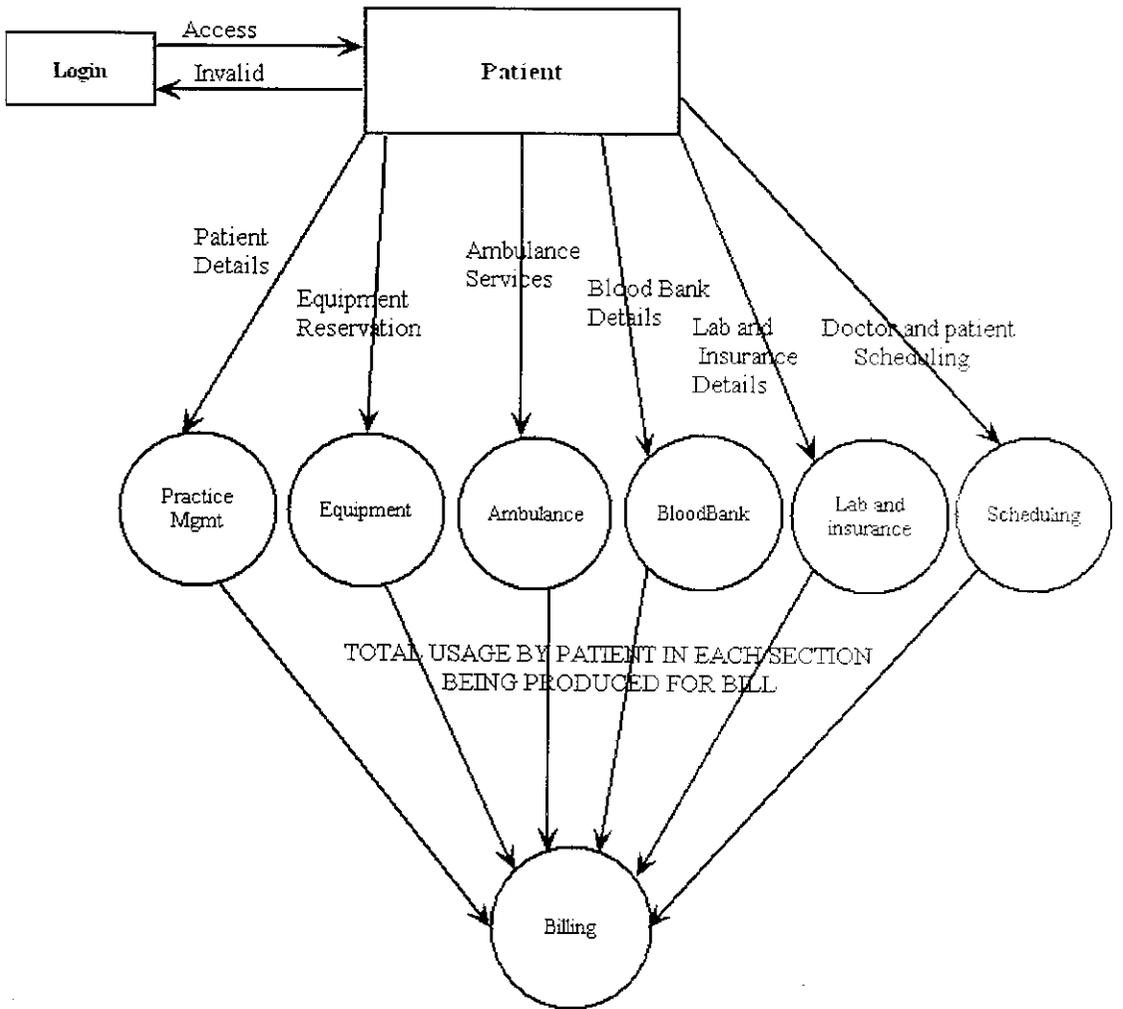
4.3.2   EMRMS SYSTEM DIAGRAM
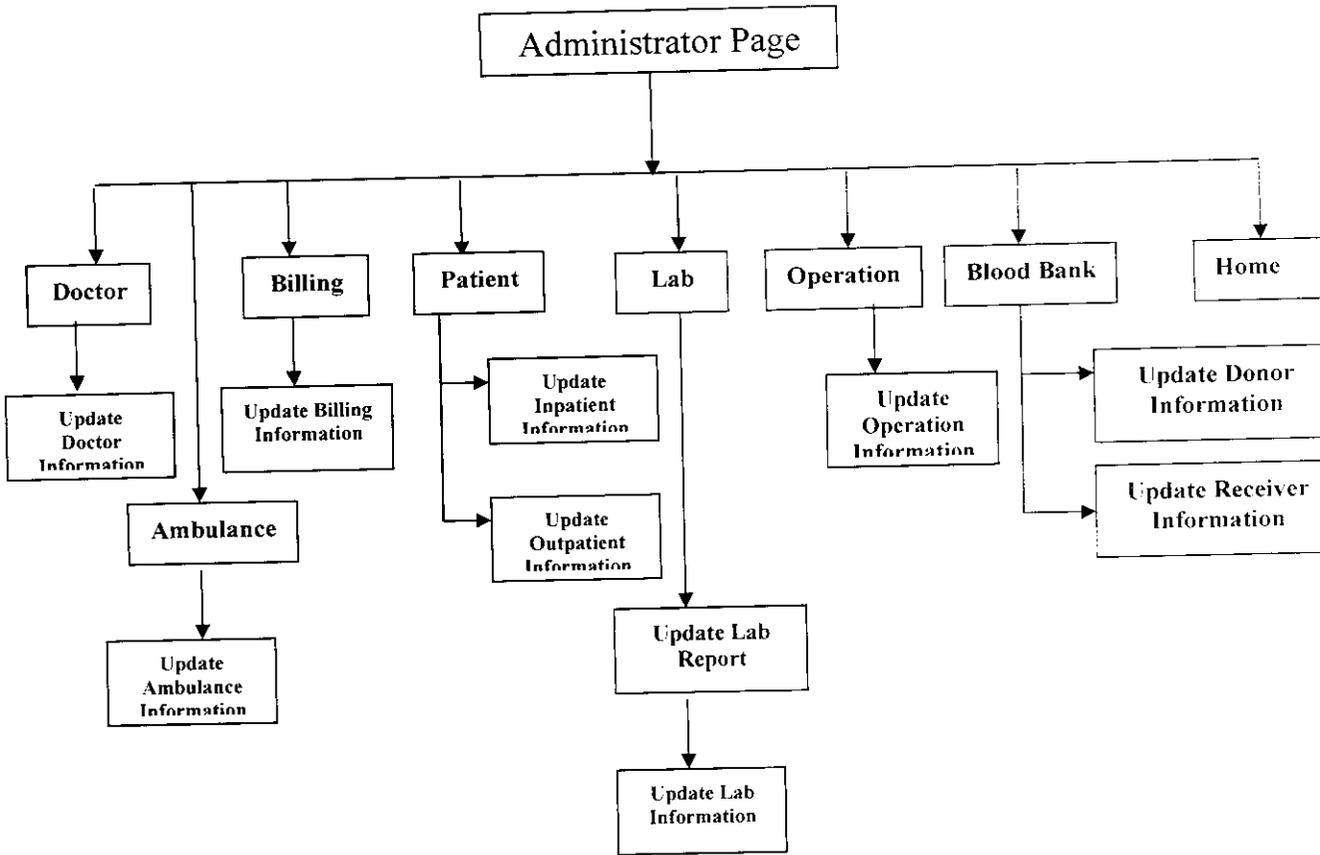
4.3.3 EMRMS ADMINISTRATOR VIEW

CHAPTER 5

SYSTEM TESTING AND IMPLEMENTATION

5.1 TESTING METHODS

5.1.1 Unit Testing

It focuses verification efforts on the smallest unit of software design, the module. This is also known as Module Testing. The modules are tested separately. This testing is carried out during programming stage itself. After the testing the following results are obtained from the system.

- Each module interface is tested which ensure that information flows into and out of the program properly.

- The local data structure is examined which ensured the data stored temporarily maintain its integrity during all the steps in the algorithmic execution.

- Boundary conditions are tested which ensured that the module opens properly at boundaries established to the limit restricts processing.

All error-handling paths are tested.

5.1.2 Validation Testing

Validation testing can be defined in many ways but a simple definition is that validation succeeds when the software functions in a manner that can be reasonably expected by the users.

After validation test has been conducted one of the two possible conditions exist

1. The function or the performance characteristics confirm to specification and are accepted
2. A derivation from specification is uncovered and a deficiency list is created.

5.1.3 Output Testing

After performing the validation testing the next step is output testing of the proposed system since no system is useful if it does not produce the required output in the specific format. Asking the users about the formats required by them tests the outputs generated or displayed by the system under consideration.

5.1.4 User Acceptance Testing

User acceptance of a system is a key factor for the success of any system. The system under consideration is tested for user acceptance by constantly keeping in touch with prospective system users at the time development and making changes whenever required.

5.2 IMPLEMENTATION

The implementation phase of software development is concerned with translating design specification into source code. The primary goal of implementation is to raise source code and internal documentation so that conformance of the code to its specification can be easily verified, and so that debugging, testing and modification are eased. This goal can be achieved by making the source code as clear and straightforward as possible. Simplicity, clarity and elegance are the hallmarks of good programs; obscurity, cleverness and complexity are indication inadequate design and misdirected thinking.

Source code clarity is enhanced by structured coding techniques, by good coding style, by appropriate supporting documents, by good internal comments and by the features provided in modern programming languages.

The goal structured coding is to liberalize control flow through a computed program so that the execution sequence follows the sequence in which the code is written. The dynamic structure of a program as it executes then resembles the static structure of the written text. This enhances readability of code, which eases understanding, debugging, testing, documentation and modification of programs. It also facilitates formal verification of programs. The structure coding techniques are as follows:

- Single entry, Single exit constructs
- Efficiency considerations
- Data Encapsulation

5.3 MAINTENANCE

Maintenance is the enigma of system development. It holds the software industry captive typing up programming resources. It could be described as the symmetric process of changing the software that is already in operation iq. order to prevent system failures and to improve the performance. Software maintenance involves keeping software interfaces simple and standard, paying particular attention to troublesome modules, replacing faulty components and generally planning to replace components that are ole, obsolete, faulty, or at risk for imminent failure.

There are several factors that require to be maintained. They are

- Hardware platforms change or become obsolete.
- Operating system change.
- Compiler change
- Language standard's change.
- Communication standard's change
- Graphical user interface change.
- Related application software package change.

Maintenance can be classified into

- Adaptive maintenance
- Perceptive maintenance
- Preventive maintenance

- Corrective maintenance

Adaptive Maintenance

It deals with adapting software change in the environment. It does not requirements. It also includes activities to increase the by- performance or to enhance its user interface. The objective of perceptive maintenance should be to prevent failures and optimize the software.

Preventive Maintenance

This deals with the repair of faults found. Some of the major causes of maintenance problems are:

- Unstructured code
- Maintenance programmers having insufficient knowledge of the system and on application domain.

CHAPTER 6

CONCLUSION

The electronic medical records management system is a successful system with all its requirements being satisfied. It successfully arrived to the functionalities it expected. Its major packages include:

- Patients details
- Equipments
- Transport
- Blood bank
- Billing

It helps accessing information throughout the network. It's very user friendly and easy to understand the screens.

Future Enhancements:

- Integrate laboratory and pharmacy module
- Implement the system on the internet
- Scheduling of nurses on the basis of shifts

APPENDICES – SCREEN LAYOUT

Patient Registration

Equipments Details

Outpatients Details

Inpatient Details

Discharge Summary
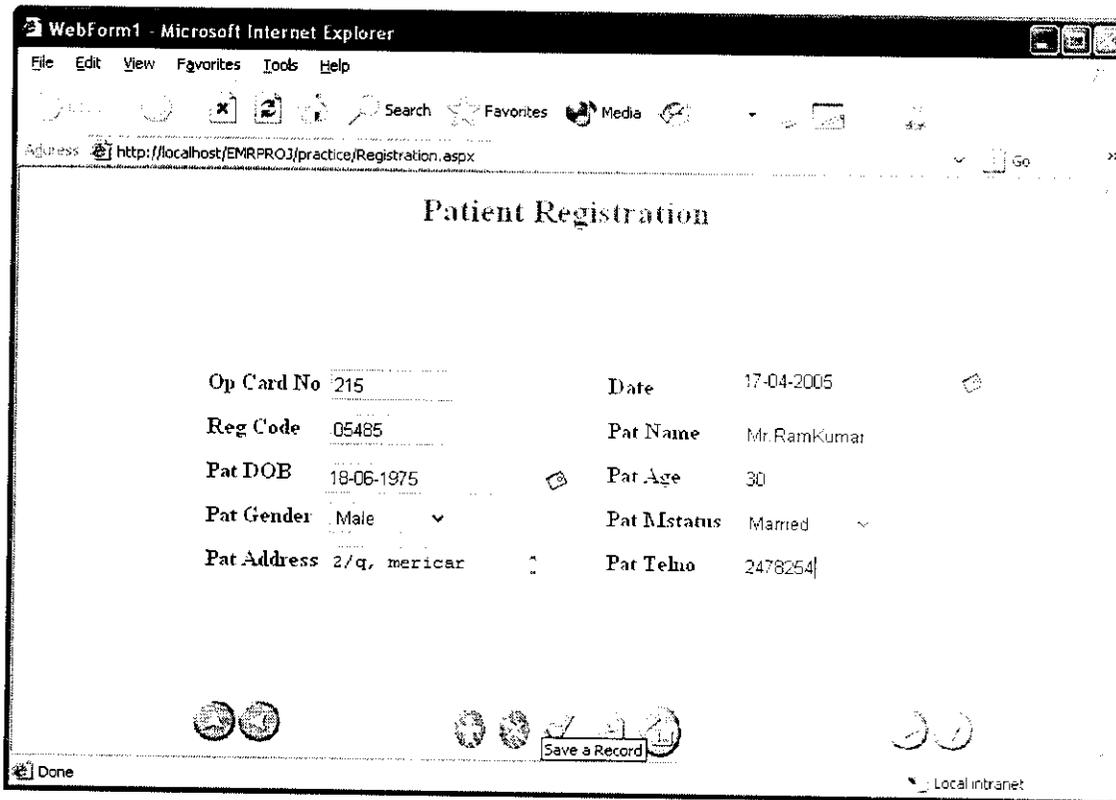
Discharge Summary — Microsoft Internet Explorer

File   Edit   View   Favorites   Tools   Help

Search   Favorites   Media

Address   http://localhost/EMRPROJ/practice/DischargeForm.aspx   Go

Dishcarge Summary

Pat Code   IP856   Doctor In-Charge   Dr.Ajay(ortho)

Pat Name   Mr.Ram Kumar   Sex Male   Age   30

Address   2/q,mericar road coimbatore-2

Admission   17-04-2005   Discharge   19-04-2005

Diagnosis   Old Wedge Fracture of L1 Vertebral Body

History and Present Complaints

52 years old manager,complaints of radiating pain
left lower limb since 2 days

Done   Local intranet

Operation Registration