Features document for HMIS.

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Hospital Management Information System (HMIS) Software:

Web based online HMIS Software is in line with the Global Corporate structure. This solution can work as a close intranet as well as internet based solution. Based on back bone of **Strong Security** framework, all the users can access it anywhere anytime based on the access rights given to them. This software has been meticulously designed in consultation with Smt. Motiben Dalvi Hospital to take care of every possible aspect in hospital management.

HMIS is simple to use, easy to configure. Being an **Object oriented model**, it is highly scalable, and easier to maintain. It will have Excellent Data Analysis with simplicity in Design and extended Data and Network Security with built in support for SSL (Secure Sockets Layer) for extensive data protection when travelling over the net.

It covers the entire gamut of activities related to patients, doctors, referring doctors, billing, and receivable. Depending on the requirements of a particular hospital, provision for customization is there to satisfy the specific needs of the hospital.

Design Architecture:

This part of the document presents design approach that will be used to implement the web application. Our team has closely worked with such systems and has come up with successful results.

We use **Multi-Tier architecture,** separating the Presentation Layer, Business Logic and Data handling. This would involve more work, but is recommended for such a complete application, we would need scalability and performance.

We use the **Microsoft Dot Net Framework**.

For the size and transactions expected, and the kind of topology for the solution, we would suggest **SQL Server 2005** as the RDBMS. (Though we are absolutely open to any other system in case the client wishes, and have experience and ability to handle other databases)

Suggested environment for the web server/ App server is as follows.

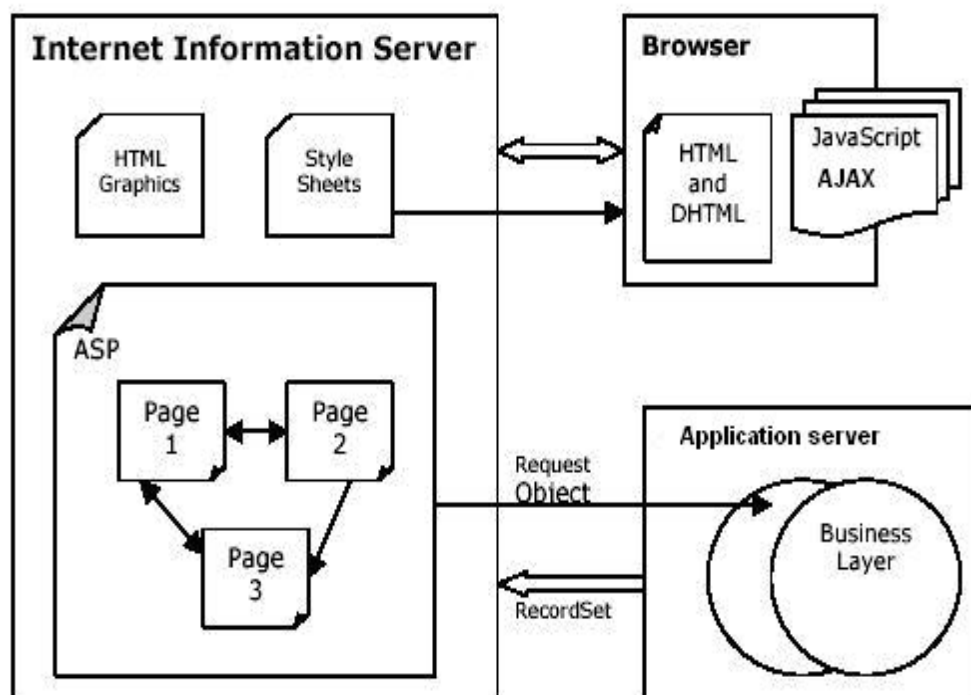Web/ Application Server: IIS on Win 2003 Server or above.
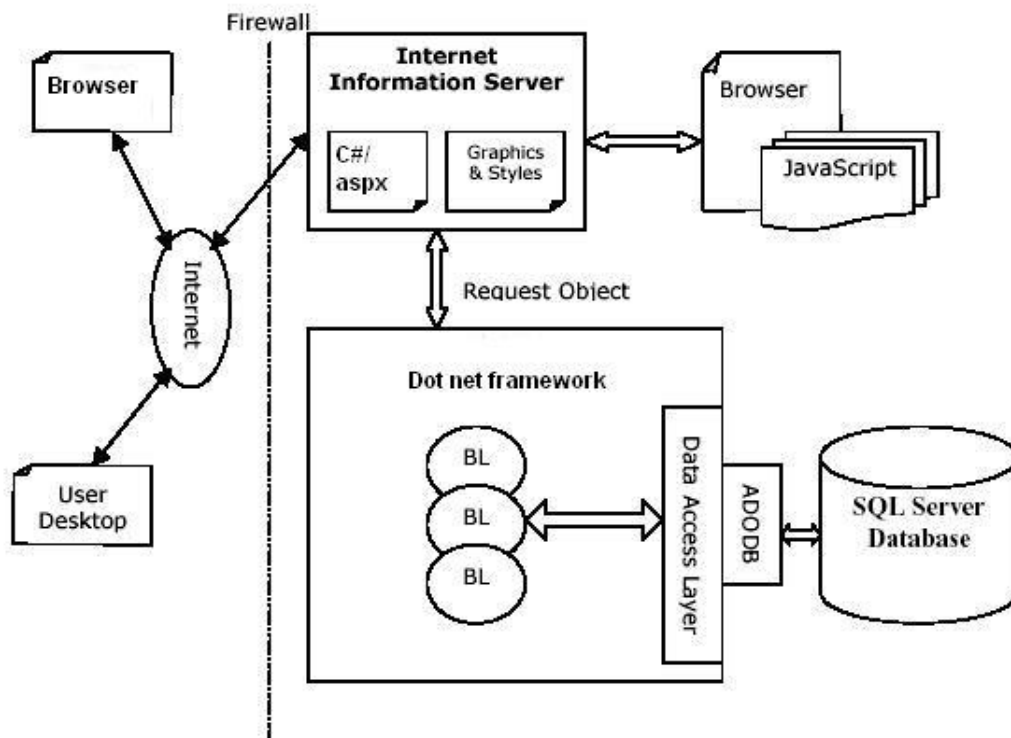
The architecture of the system can be divided into 3 logical tiers.

1. The Presentation layer (C#, VB, HTML):

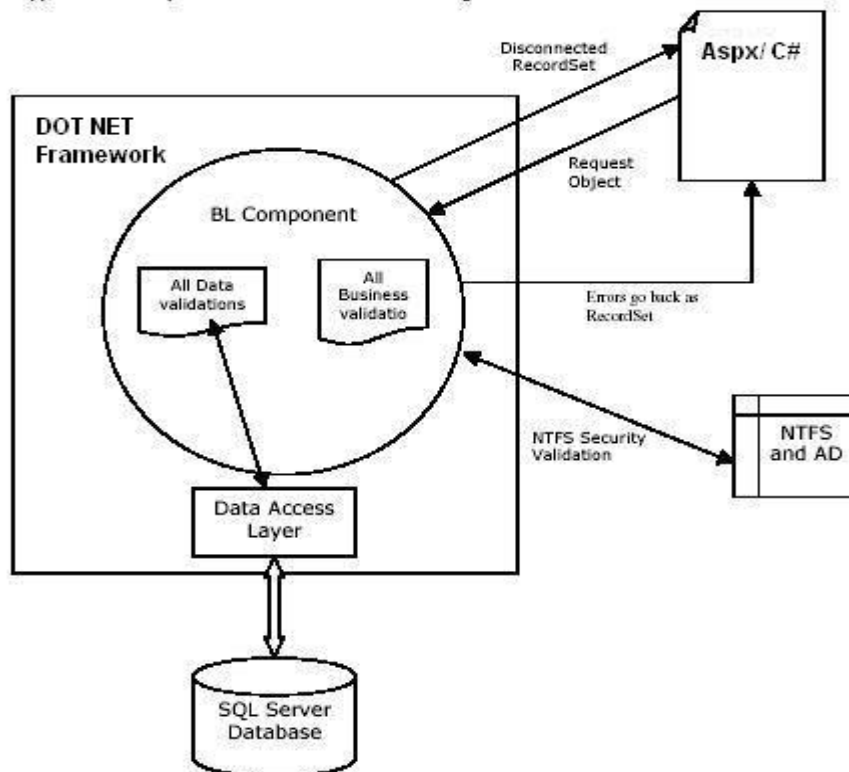This is the Web based User Interface in C#, VB and HTML.

Presentation Layer

2. **The Business Layer (Web Services):**

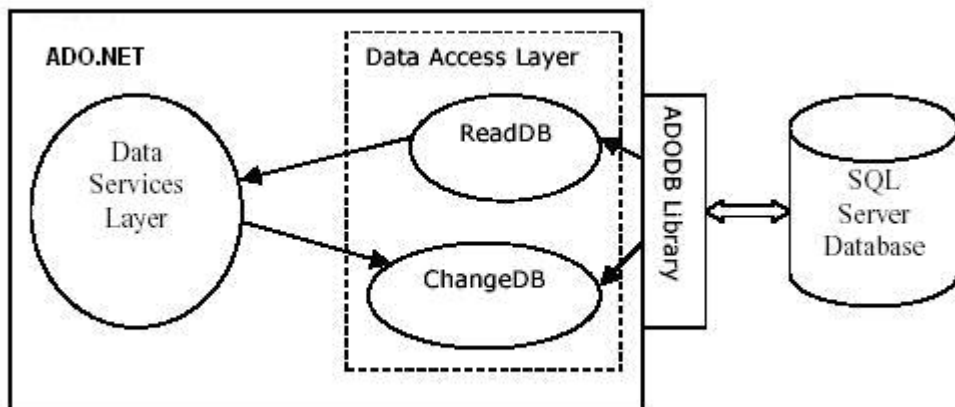This contains the Business Logic for the system.

A Typical BL component looks like the following:

3. The Database layer (SQL Server):

This layer may consist of Data handling processes and Stored procedures both at the server side.

The DAL is designed as follows:

Entire system is developed in a Modular approach given below are the key modules of the Hospital Management Information System

Patient Registration Module:

Every patient who visits the hospital has to get registered prior to getting any consultation, treatment or investigations done. Registration of patients involves accepting certain general and demographic information about the patient. The patient is allocated a unique Registration number and a Patient Identification number. The Patient ID will remain same for his all subsequent visits to the hospital whereas he will be allocated a new registration number on every visit. Patient Registration can be under two types, viz. registration for IPD and OPD. The Registration charge (which varies depending upon the type of Registration) can be collected from the patients during registration and a receipt will be generated.The Indoor patient module commences when the patient is being registered and allotted a bed in the ward. It deals with the complete treatment and services provided to the patient during his stay in the hospital.

The consultation charges (if applicable) can also be collected for the OPD patients during registration and a receipt will be generated.

The following information is required for the registration of OPD Patient

- ➢ Patient Demographic Details like Name, Father's/ Spouse's Name, Age, Sex, Address, Contact number, etc.
- ➢ Referring Doctor
- ➢ Department & Consultant to be visited.

Billing Module:

This module works at the nursing station. During his/her stay in the hospital, every patient is provided various services in terms of consultants visits, investigations, procedures, medicines & consumable, room services, diet, etc. All these services are entered online to the patient record through nursing station. This data serves as major input for the IPD billing.

For billing of any OPD service like Pathology Tests, or any imaging investigation, the patient moves to OPD billing counter. Here the services are charged as per the rates already defined for various services in the master. The Payment is collected for the service provided and a receipt is generated. This module is closely linked with the Finance module.

The Salient features of this module are

➢ Record Charges to be taken from the patient.

➢ Record details of the concession & concession authority.

➢ Consultant charges are automatically picked according to general or emergency charges.

➢ The charges for the services are automatically picked from the master.

➢ The charges are also dependent on time when the service is being given to patient.

➢ When patient revisits his information will be automatically picked using his identification number.

➢ Patient can be defined under Cash OPD.

➢ All relevant information is transferred to the respective departments.

The high-level objectives of the implementation of the Laboratory Information Management System (LIMS):

A) **Improved Patient Care** – This is the primary objective of the implementation of such a system as information exchange not only reduces human effort and errors, but ensures timely delivery of patient critical data to clinicians.

B) **Informed Decision Making** – With the advanced reporting and easy access to patient test data, clinicians are capable of making better decisions to treat patients in a maximally error-free reporting environment.

C) **Security & Traceability of Data** – Ever numerical result value or text based report for a given patient is transmitted under the most stringent security standards with every single value or report modification being completely traceable right up to the point of report delivery.

D) **Comprehensive Test Reporting** – The completely user-defined test result reporting capability of LIMS allows the pathologist to modify the way their tests are reported in an innovative and easy to use format. The software comes with pre-defined report templates as well.

❖ **Masters:** Various Master are used to efficiently control technical and commercial aspects of the organization. Examples of few important Master are as follows:

  ▪ **Test Master**: Various tests with vital details like Name, test units, charges, department, group, test schedule, machines on which they are analyzed etc will be stored.

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- **Combine Tests**: Examples of a Combine Test are CBC, Urine analysis etc. Vital information like Name, Charges etc. will stored. It will also have a list of all the individual tests which are carried out.

- **Profiles**: Combinations of various tests and combine tests make a profile. Profile name, charges and list of tests and / or combined tests are stored.

- **Sex Master**

- **Test wise, Sex wise Normal Range Master**

- **Result Abbreviation Master.**

- **Report footer Master.**

- **Container (Sample Collection) Master.**

- **Referring Doctor**: Name, Address, Phone number, Clinic's address, Mobile No., Fax, e-mail ID etc. will be stored.

- **Patient Master**: Patients are registered through this module giving them a computer generated Unique Patient ID. Patient cards if desired can also be printed. All the Vital information such as patient demographic, date of admission, date of discharge etc. of the Patient is Stored.

- **Remark master:**

  Various results, observations which are repetitive in nature are stored here and will be attached to the patients' findings/results by users as per requirements. This master will expedite the report preparation and printing process.

- **Interpretation master:**

  Certain procedures may require interpretations; this is required to be printed along with the procedure description automatically. All such text of information can be stored in this master.

- **State,City and zone master:**

  State, city and zone masters are simple information of code and name, useful for commercial analysis. The centers revenue and workload comparison can be achieved by defining state, city and zone in masters like doctor, collection center, credit party, patient masters etc.

- **Report format :**

  A unique patient report creation tool will be provided through this module where users can create their own reports for procedures/tests performed. These reports can be altered by authorized users without calling for program changes. This is achieved by simple to use drag and drop options. This will allow the users to place headings, findings, remarks, footer etc in the position and in the sequence needed by the user. This dynamic state of the art user report creation feature not only saves time but also cost as almost no program alteration will be needed.

- **Formula:**

  For avoiding human errors in crucial result data entry formula master will be provided so based on formula defended for test result will be calculated.

- **SMS gateway:**

  A generic SMS gateway master will be provided in application for connecting to gateway of the SMS provider. The vital information user name, password, version and URL will be captured.

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- **SMS message:**

  For sending user defined message to patient, collection center, corporate will be defined in this master. SMS for report collection, balance intimation, bill payment etc. can be defined in this module. Vital information like code, message type, message sub type description will be captured.

❖ Transaction:

❖ Sample accession module.
  o Sampler accession entry module
  o Report for sample received date, time and sampler.
  o Reporting date time change entry.

❖ Consent letter module.
  o Consent letter for tests like HIV, IVP, FNAC etc.
  o Consent letter printing.

❖ **Protocol / Worksheets:** Protocols can be printed either by Lab No. or Machine group or Test wise. Each protocol is given a unique protocol number to facilities user for patient report entries.

❖ **Result Entry:** Patient results are entered either by Lab No or Protocol number, Abnormal (out of Range) values are flagged. Extremely fast and User friendly module.

❖ **Machine interface:** Test result values will be transferred without user interference by machine interface utility. These utility divided into uni-direction and bi-direction transferring of data. Such utility will ensure the integrity of result value processed on analyzer.

❖ **Second level Authorization:** Patient result value will be authorized by HOD's in second level authorization before it goes for final authorization. Department HOD's will get selective SID no. along with vital information such as patient name, test name, result value, normal ranges relevant to their department.

- ❖ **Final Authorizations:** Before the reports can be printed, reports need to be authorized. In this module, all the reports, which are ready for printing are shown for final authorization.

- ❖ **Result Printing:** Reports are printed after final authorization. We have provided a <u>complete user defined report format</u>, you may set the order of how the reports need to be printed. You can have multiple report formats based on the tests. This is very user friendly and flexible component. You can report formats with virtually nor program changes.

- ❖ **Commercial Reports:** Many Reports are available to manage and control the Organization. Few examples of the reports are as follows: -

  - Daily Registers.
  - Balance due reports.
  - Department wise Revenue Reports.
  - Monthly comparative Charts etc.

- ❖ **MIS Reports**

  - Sample rejection report will illustrate SID no. , name of patients, test name, reason for rejection, date & time rejection and user name.
  - List of patient registered within the given time frame will show details such as SID no. , name of patients, test name, amount, discount, net amount, date of report etc.
  - Detail report for authorized reports and unauthorized reports.
  - Summary report for patients count with positive value and negative value.
  - For numeric tests patients count for result value above, below or equal to given value.
  - Reports turn over time for particular patient and individual test.

Finance Module:

A Financial accounting module is linked with hospital billing module. You get online accounting of all revenue generated along with expenses incurred. There is no need to enter the revenue entries as they are already fetched from the billing module. All relevant information for the staff salary/wages, consultant share, etc is available.

Salient Features of this module are:

- ➢ All revenue entries are transferred automatically from billing module.
- ➢ Just enter the expense vouchers and the accounts are complete up to balance sheet.
- ➢ Consultant Share and other relevant Information already available.
- ➢ User defined ledger Groups & Accounts.
- ➢ User definition of Cost Centre.
- ➢ Department wise income detail.
- ➢ Party Ledger
- ➢ Account Ledger
- ➢ Day Book
- ➢ Cash Book
- ➢ Bank Book
- ➢ Sale Book
- ➢ e-TDS
- ➢ Trial Balance as on date.
- ➢ Group wise Trial Balance.
- ➢ Profit & Loss Report.
- ➢ Balance Sheet

Security:

The integrated solution will be built on a high security standard. Following features are standard functionality of our system.

User access control: Many layers of user access controls, over data, over functionality, based on multiple parameters, like user, user groups, departments, date ranges, and other logical rules.

HTTPS protocol/ Secure Sockets Layer: Most important aspects of the transactions online (example user login) will be done over Secure socket layer, with 128 bit key encryption, which is practically unbreakable.

Centralized Data management: All data residing at one place makes it easier to maintain and manage backup, security etc.

Sensitive fields can be encrypted: Any information, if the client feels should be encrypted (in a way that the developers of the system too wont be able to have access to this information: Example, if this feature is opted for, then the maintenance team can handle database, but wont be able to view some contents.) it can be stored in encrypted manner. Data can be made to travel over encrypted channels using SSL so that it does not fall into wrong hands. All passwords are encrypted and stored in the database. An unencrypted password never travels over the Net.

Audit trail: The system can keep a very detailed audit of system usage, based on 'users', 'menus', 'data handled', and even the machine from which it was handled. This makes the system highly secure, and gives auditors to track back issues and problems and locate the source.

System audited against well-known hacking attacks like SQL Injection and Cross Site Scripting.

Knowledge of common hacking attacks and ability to prevent them (example: SQL injection attack is very common in web based solutions, if not written with care)