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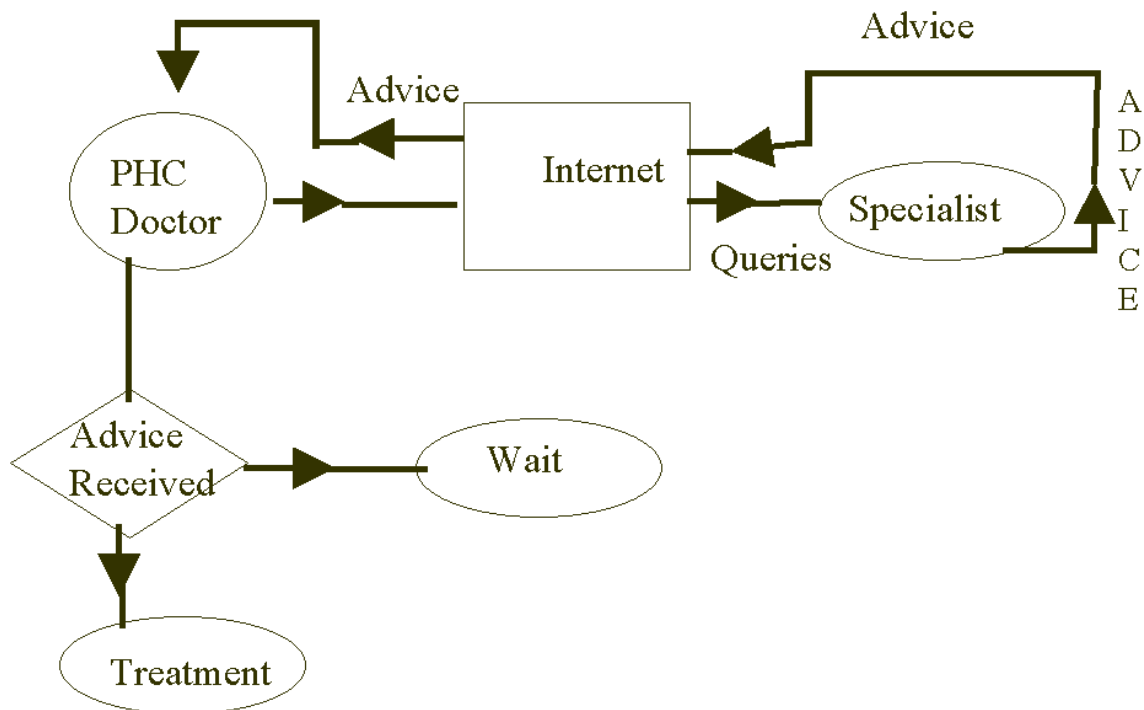
Web Services and IT Management in Healthcare and Grid Computing
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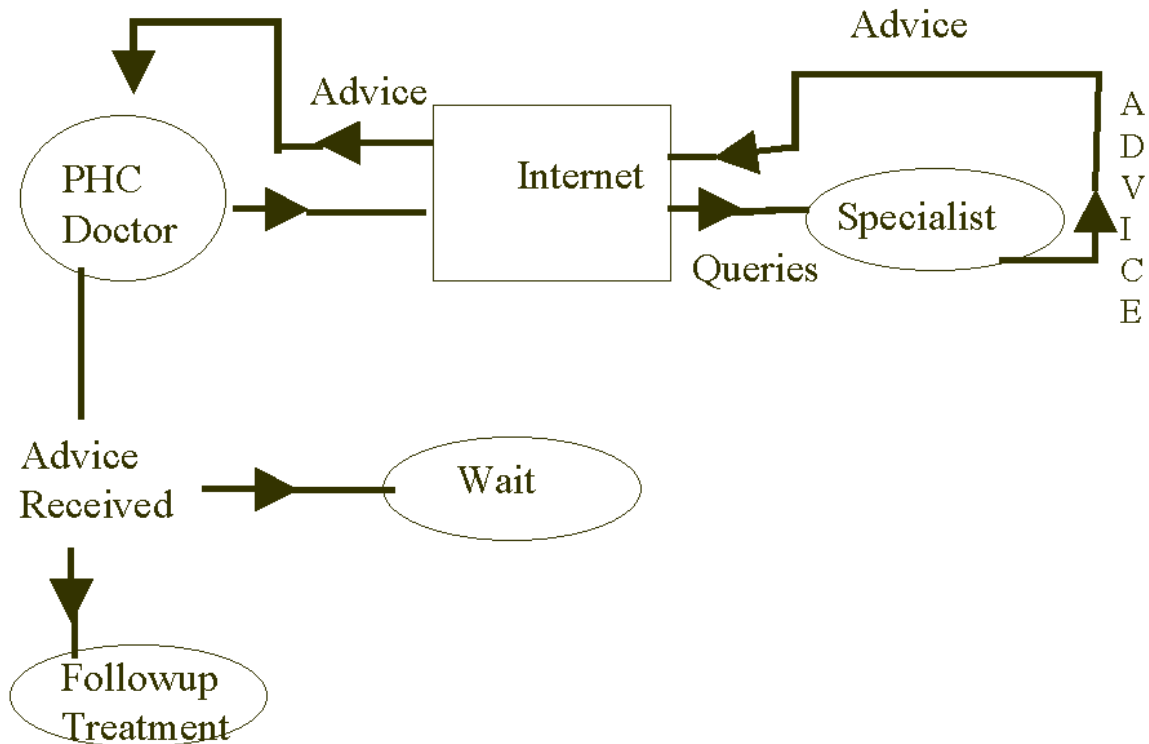
Health

Alma Ata Declaration on Primary Health Care defines , health as not just absence of disease but fitness at all levels i.e.Physically, mentally, Psychologically, spiritually, socially, and so on. RCH emphasizes fitness at all level along with health education and medical education. For the last one decade IT has contributed substantially in the healthcare domain. Tele-Medicine, Health informatics, using IT for Health for Prevention, curing, rehabilitation, Medical Education and accessing resources are the some of them.

Telehealth is the mechanism through which Teleconsultations for health are given in the remote centres from referral centres, and facilitate higher education. Further will also build medical informatics for quick process in clinical decisions using information technology.

Teleconsultation can still be classified as online consultation, offline consultation, second Opinion and expert opinion





Mechanism

Teleconsultation aimed at connecting remote centres with Medical Colleges, networking the Medical institutions, setting up the Telereferral Centre, Setting up the Remote Teleconsultation Centres at PHCs/ CHCs provide access to E-Journals and other resources.

Web services for health

Telehealth is using IT in health care. Web is used for Teleconsultations, appointment fixing for the specialist treatment, access of Medical Records online, seeking expert opinion, follow-up of patients, preparing patients for specialised care, bringing the specialists and physicians in a common platform.

Medical Education

Web is also playing an important role in Continuing Medical Education, Medical Education Online, recertification, online courses, use of groupware and courseware for medical education, training the medical personnel on IT skills, and research on IT in health care. In addition to that it is also used for accessing digital resources, open source materials such as, white papers, copy righted materials, links such as medical references, access to digital library,

Facilitating reviewing and uploading documents, interlinking research departments, facilitating research and so on.

Administration

Web services also had its role in digitization of medical records, workflow automation, notifications, online registration, official circulars and notices and forms. It also acts as a communication media. Web is also used for the creation of Electronic Medical records, linking Medical records with departments, and securing the medical records.

Portal for health and health informatics

Telehealth portal

- To reach the nooks and corners of Kerala to prevent and control diseases and create awareness of Health and Medicine in Rural Areas.

Objectives

To educate the common masses

To provide treatment and consultation in rural areas.

To empower local physicians

To streamline referral system

To generate digital database of patients

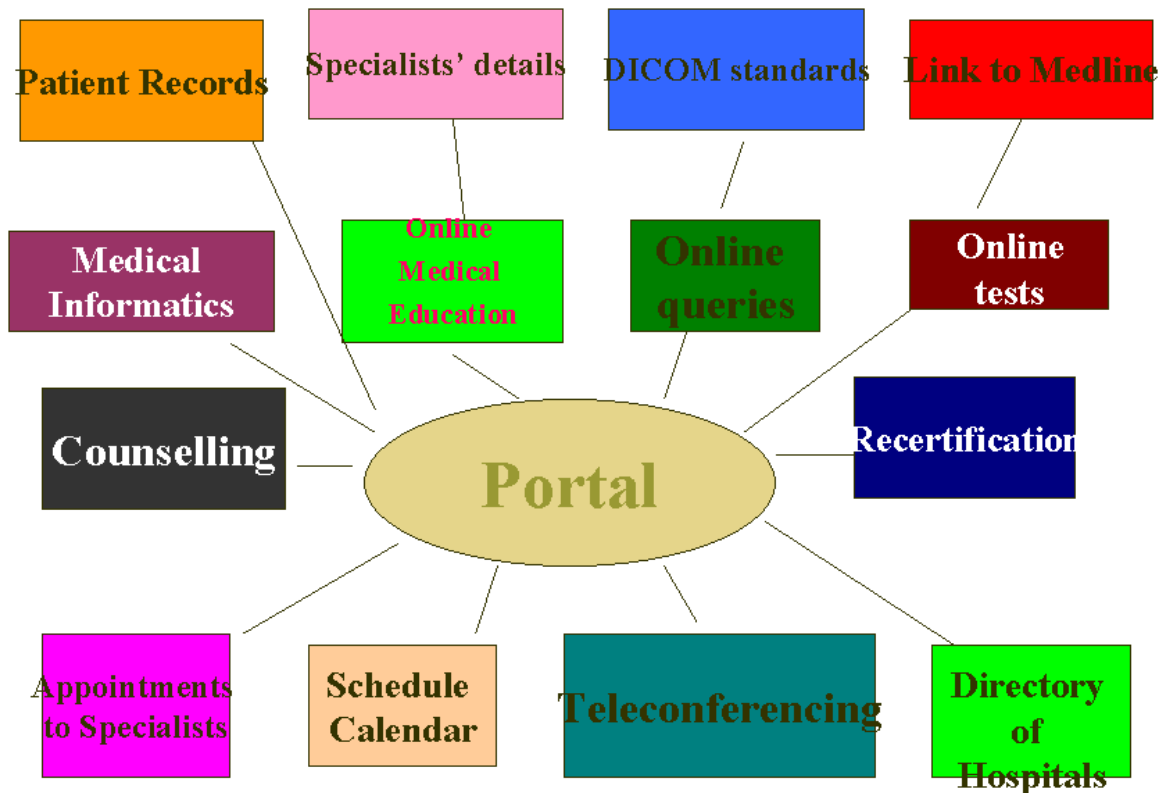
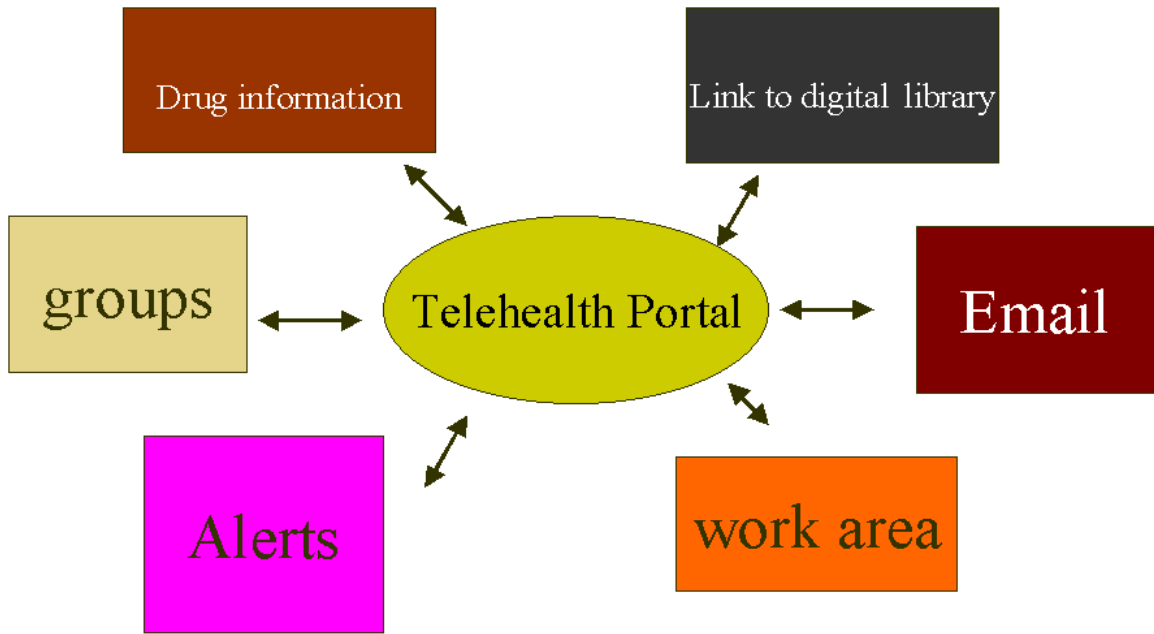
To minimise expenditure incurred while travelling for treatment

To provide follow up for patients already treated at tertiary hospitals

To prepare patients for specialised treatment

To reduce crowd in tertiary hospitals

To provide medical education and continuing education.



Online Consultation

The online consultations are generally fixed in a regular frequency of time. For an example one hour in a week. The queries are generally channelled and stored in a secure

system which have restricted access and proper protection of documents from viruses and other damages. At every level the confidentiality and ethics are strictly followed.

Before beginning any consultation, consent from the patient is received. Every patient have to sign a written consent signed by the patient before consultation. The process and its limitations are discussed with the patient. The doctors are instructed to provide identity information before consultation. There is also a Confidentiality Form signed by all parties who are part of the project.

Legal issues

In case of any misuse of the documents necessary steps have been taken to notify immediately. All the cases are treated as legally sensitive. All the patient information have to be retrievable in need. All the documents have to be authenticated for future use.

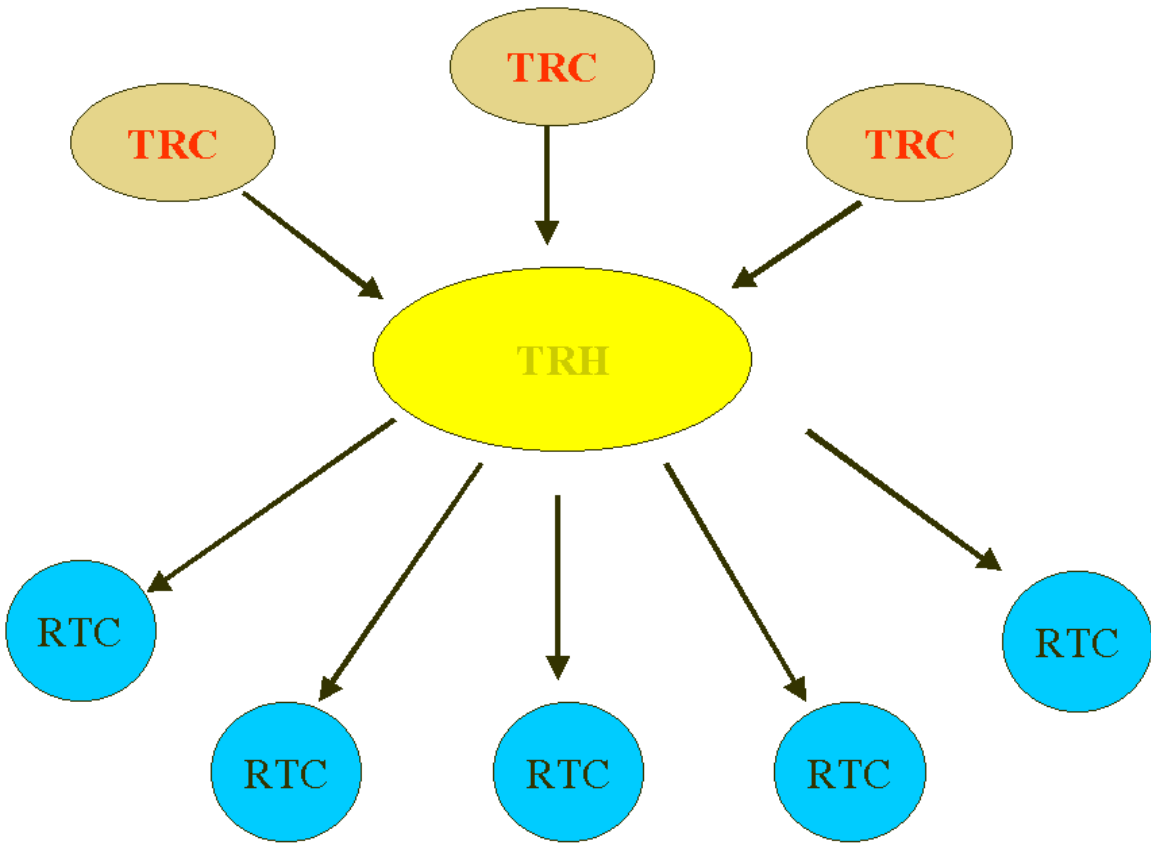
Responsibilities

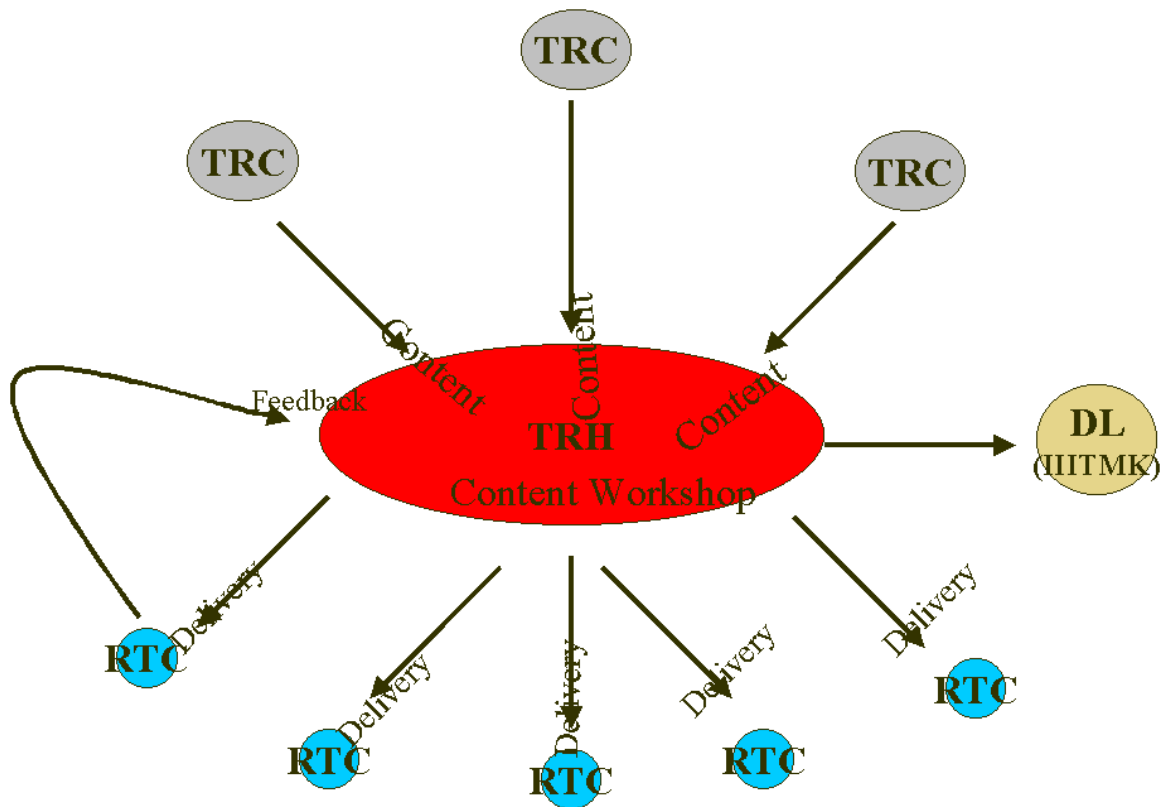
There are various responsibilities defined for every one in the teleconsultation. Service Provider has to look after web development, design, and maintenance network creation, server configuration, portal maintenance, database management, Digital Library services organisation and creation of E-groups.

Telehealth administrator has to sort the information and forwarding it to the appropriate specialists

. The physician has to discuss with the patients, acquiring the information, digitising, distribution, accounting, recording and documenting.

The consultant has to respond to queries, counselling, advising, opinion giving, and further reference.





Modality for Medical Education

The Medical Education using the web services aimed at the following.
 Conducting Continuing Medical Education(CME) using the Telemedicine Network
 Experts from all the TRCs will be identified for developing contents
 Remote Centres will be the beneficiaries

The deliverables of the Medical Education include the following.

- Workshops on content development
- Scheduling of CMEs
- Managing the CMEs, Content Management and Archiving
- Studying the effectiveness of Telemedicine and Tele-Education
- Helping the RTCs to participate in the Telemedicine and Tele-Education Programme

Teleeducation objectives

- Launching a PG course in Medical Informatics
- Online classrooms
- Develop courseware
- Coordinate the effort with faculty
- Support material for the course
- Digital library
- Codifying transactions
- Conducting studies to assessing the impact
- Conducting seminars and workshops

Information products CME daily send the materials

Importance of Medical Informatics

The medical informatics is important in creating awareness among the Clinicians & Patients on importance of ICT in healthcare, improving the understanding of Medical Informatics among the graduating medical and paramedical students and practitioners.

The medical informatics course aims at,

- Developing and evaluating ICTs for a variety of Medical purposes
- Improving healthcare delivery in Clinical settings
- Facilitate innovations in Medical Sciences
- Enhancing the Medical images
- Generating Virtual labs
- Improving the understanding of Public Health and the ways in which new knowledge will be derived from information on patients and general population

For the purpose of achieving the above objective, an expert group is formed with the experts from interdisciplinary academic and research groups. The group is to create and validate models of how knowledge and data are used within biomedicine, study new methods for acquiring, representing, processing, and managing knowledge and data within health care and the biomedical sciences

Levels of course creation

The course is created in three levels,

- 1 A course outline in a brainstorming workshop
- 2 A short course for few days at the end of one month
- 3 A complete course at the end of three months

Administration

Experts from a particular specialty are identified and an expert group is formed for a specific course.

A coordinator will be selected from the members. He or she will be a specialist from the subject.

There is a convener identified for all the courses.

The team will be free to select the topics and identify the persons for developing the course.

The course coordinator will be coordinating the expert group.

The coordinator will be provided with financial assistance for creating the course contents.

A typical course will be of both textual, images and using multimedia wherever it is applicable.

This is made such that a course can be offered both as a regular course and online course. The members may create in one or more topics and will be compensated for the course creation as per the recommendation of the coordinator.

Computers in Radiology

This is a topic on which the present panel of faculty is working on

Objectives

To impart knowledge on the role of Computers in Radiology

To discuss the recent developments in Radiology

To prepare the radiologists and other specialists for a film less environment

To impart skills on the analysis of the images using advanced techniques

Create a research group of specialists for continuing research.

Target

Any Medical practitioner interested in the development of Radiology

The practicing Radiologists

Imaging scientists

Computer Scientists interested in Medical Imaging

Radiographers

The specialists using Radiology for diagnosis and research

Content

An Introduction to Computers for Medical Radiation Technologists

Medical Imaging, Radiology Computers and Management in Health Care

Computers and Networking for Radiology

Computers in Radiology and Nuclear Medicine

Radiological science and medical imaging

Diagnostic medical imaging

Computer Radiography

fMRI

Digital Mammography

Neuroimaging Informatics

Standards for Imaging- DICOM, HL-7, HIPAA

PACS

Resources for radiographers, radiological technologists and radiologists

Resources for radiologists and professionals in the medical imaging industry

Interactive Portal for Continuing Medical Education: A Case Study

Overview

The Interactive Portal For Continuing Medical Education offers a variety of health-related services to members in the medical care, education, and research arenas. The project is funded by Government of Kerala, India. The project is a part of the telemedicine and teleeducation initiative at Indian Institute of Information Technology and Management- Kerala.

The major features include teleconsultation, collaborations, online quiz, educational resources, and submission module. The teleconsultation module deals with patient medical records. It enables the creation of medical records, updating and managing along with search capability. Collaboration module will facilitate online discussions for the users. This facility is open to all type of users. Educational resources module gives access to medical resources to medical students. Online quiz module is created for conducting online quizzes for registered students. Submissions module facilitates submission of assignments and project report to system by registered users.

The project mainly aims to provide service to doctors, specialists, medical students and patients. So the main users of the system are doctors, specialists and medical student. The users can register into the system with a registration page. Administrator of the system is responsible for giving access for these users. Once the user is given access he/she can utilize the system services. The collaboration part of the system is open to all users whether registered or not.

Existing System

Overview

In the existing system a patient's record is first created by a doctor, and in case of any specialist's consideration it is to be imported to him. This may take a lot of time of both doctors and patient and require many procedures.

Also there is no way for people to interact with doctors, specialist to solve their problems and queries. In the existing system educational resources are not

incorporated to provide information related to medical field for medical student. No consideration is given to medical students.

Proposed System

Overview

The proposed system mainly contains modules for teleconsultation, collaboration, educational resource, online quiz and submission. Teleconsultation allow doctors to interact and provide specialist services regardless of the physical location of the care providers or patients. Every registered doctor can send patient record to registered specialists. Doctors have also the privilege to upload files to specialists and also to medical students registered to the system. Specialist doctor can create online quizzes and medical student can participate in these quizzes online. The collaboration module allows all type of users whether registered or not to enter into discussion on any topic.

Advantages of Proposed System

The advantages of the proposed system are

- Higher concentration on critical patients
- Reach health facilities to rural masses
- Reduce the cost of treatment
- Improve students knowledge
- Participate in open discussion
- Online quiz for medical students

System Design

Design Plan

Design of a system can be defined as the process of applying various techniques and principles for the purpose of defining a device, a process or a system in sufficient detail to permit its physical realization. Thus system design is a 'how-to' approach to the creation of a new system. This phase provides an understanding of the procedural details necessary for implementing the system. The design step produces a Data Design, an Architectural Design and a Procedural Design.

The data design transforms the information domain model created during analysis into the data structures that will be required in implementing the

system. The architectural design defines the relationships among major structural components into a procedural design or description of the system. Source code is generated and testing is conducted to integrate and validate the system.

Logical Design

Logical design aims at establishing the users' requirements, which the new system must satisfy. In this stage, the system analyst has to identify the relationships required between various items of data and the grouping of items of data together into records. This is known as a logical data structure, which is required to produce the outputs, which in turn are required by the users. Once this is agreed, the logical design can be turned into a physical system with more detailed design. In the design phase it was decided to divide the system into following modules.

- Teleconsultation
- Online quiz
- Blogs
- Educational resource

Physical Design

Once the logical system is agreed, the detailed designs of the physical system can commence. The physical design of the computer subsystem can be broken down into the input design, output design and architecture design.

Input Design

Input design is a part of overall system design, which requires very careful attention. If data going into the system is incorrect, then the processing and output will magnify these errors. The designer has a number of clear objectives in the different stages of input design like producing a cost effective method of input or achieving the highest possible level of accuracy or even ensuring that input is acceptable to and understood by the user.

There are interfaces for:

- Login Screen for the users.
- Registration Page for a new user
- Search Page for giving the criteria on which the search process is to be done.
- Page for selecting questions for quiz.
- Page to select subject or enter new subject
- Page to post new message.
- Page to post reply on listed messages.
- Page to upload documents.

- Page to select documents to be downloaded.

Output Design

At the beginning of output design the various outputs to be given by the system are defined. Then the format, content, location, frequency, volume and sequence of the output are specified. The content of the output must be defined in detail. The system analyst has two specific objectives at this stage. They are : (i) interpreting and communicating the results of the system to the users in a form that they can understand and which meets their requirements and (ii) communicating the output design specifications to programmers in a way, which is unambiguous, compressive and capable of being translated into a programming language. Expected output includes the following:

- Registration conformation.
- Deletion conformation.
- Patient record creation modification and search results.
- Quiz creation.
- Quiz performance.
- Answer of selected quiz.
- Creation of quiz conformation.
- Page to upload documents.
- Messages posted by different users.

System Implementation

Implementation is that stage of the project when the theoretical design is turned into a working system. If the implementation stage is not carefully planned and controlled, the system may not work as intended. Thus, it can be considered as the most crucial stage in achieving a successful system.

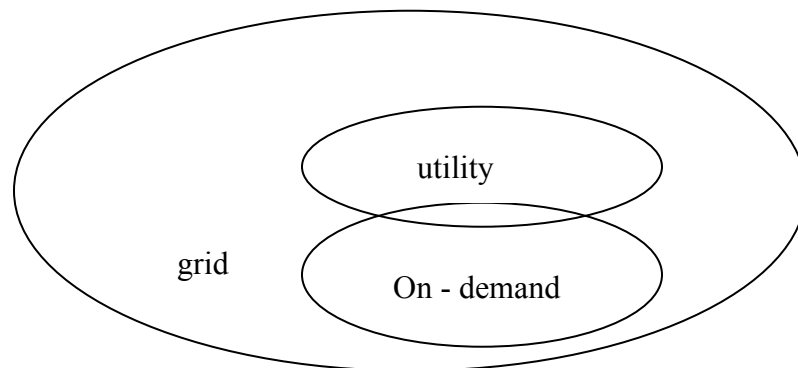
The Interactive Portal For Continuing Medical Education System has been implemented with a web-based architecture. There are three main components in the system. The user interface is displayed in a web browser. The database stores all the data before and after the processing. The business logic layer is the most important one, translating commands from the user interface to the database, and also returning results from the database to the user interface. This project is implemented using Java Server Pages and HTML for the user interface, Java Beans for the business logic and MySQL for the database. An object-oriented approach is followed throughout the development of the

system. During the implementation phase the first preference has been given for error handling and error recovery. If the user forcibly enters wrong data, the user interface will display error messages and alerts, depending on the context. Client-side validation has been implemented with the help of JavaScript. For server-side validation, methods have been implemented in the corresponding beans for each of the user interface modules. As all the data entered by the user is validated before entering the database, only minimum amount of checking is required at the back-end. This in-turn ensures faster performance. The fully developed system has been tested thoroughly by a dedicated testing team in the organization.

What is grid?

Grid is a system that uses open, general-purpose protocols to federate distributed resources and to deliver better than best effort qualities of service. Grid technologies enable:(a) on demand access to computing capabilities; and (b) the federation of distributed resources and the management of those distributed resources to meet end user requirements. The term also describes solutions relating to the flexible use of distributed resources for a variety of applications as well as a term that emphasizes the importance of standards to interoperability.

Grid is also often applied to grid infrastructure, utility computing, on demand storage, and data center automation (management of resources within an enterprise).



Ref: QUEUE Jul-Aug 05

In case of the Web services in Health, some of the above functions are performed. For teleconsultation, the medical record is stored and at times processed. The records are accessed through the web on demand. In case of the medical image processing it has also been tried to upload the images to be processed and the centres having capabilities process them and send back to the researcher. This satisfies the computational function. In case of the information required for the research and consultation, the medical library and research reports are uploaded in the storage area for the utilization of the researchers and practitioners. This satisfies the utility function. The above functions give scope for health to go for a complete grid technology. The grid application is often used to refer to applications that have been adapted to use a distributed infrastructure.

The Computers in Radiology is proposing to use this application by networking national important institutions in the area of Medical Imaging to do the image storing, processing, and doing computing using the images. There are initiatives in the Brain Mapping, Segmentation, and Coregistration. It is also proposed to do computing the imaging data by processing the imaging using imaging techniques – such as SPM for image processing and so on.

Reference:

1. Ian Foster “Describing the Elephant: The different facts of IT as Service”, QUEUE, July/August 2005.
2. Kumar, Pankaj, Web Services and IT Management, Enterprise Distributed Computing, Vol.3, NO.6, July/ August 2005-10-18.
3. Chen, Huan, and Mohapatra, Prasant, “ Using Service brokers for accessing backend servers for we applications”, Journal of Network and Computer applications, 28 (2005) 57-74.
4. Foster, Ian, Kesselman, Carl, Nick, Jefferey M., and Tuecke, Steven, “The physiology of the grid”, work in progress document, 2002.
5. Pierce, Marlon and Fox, Geoffrey et.al, “Interoperable Web Services for Computational Portals”, IEEE, 2002.
6. Foster, Ian, Kesselman, Carl, Nick, and Tuecke, Steven, “The Anatomy of the grid”, International Journal Supercomputer Applications, 2001.