DESIGN AND IMPLEMENTATION OF A TELEMEDICINE SYSTEM IN NIGERIA

BY

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DECLARATION

I declare that the work in the dissertation entitled "Design and implementation of a telemedicine system in Nigeria" has been performed by me in the Department of Mathematics under the supervision of Dr. O. S. Adewale. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this dissertation was previously presented for another degree or diploma at any university.

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CERTIFICATION

This thesis entitled "DESIGN AND IMPLEMENTATION OF A TELEMEDICINE SYSTEM IN NIGERIA" by YISAH Ozohu Safinatu meets the regulations governing the award of the degree of Master of Science in Computer Science of the Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

I dedicate this work to my loving husband and sweet children.

ABSTRACT

In most under-developed or third world countries like Nigeria, there are very large numbers of patients in the remote rural areas that need specific healthcare support services at home. Due to shortages of medical experts, hospitals coupled with geographic isolation and lack of opportunities for these experts, the few available medical experts are often reluctant to serve in such poorer areas with lesser opportunities and advantages. As a result of this, people living in these rural and poorer areas have limited access to basic healthcare services and consequently receive lower quality healthcare services, compare to those living in urban areas where best equipped hospitals and with medical experts are distributed. Those patients living in the rural areas requiring the attention of healthcare practitioners to meet their needs must travel to distant healthcare centres, which is quite unaffordable due to the present state of medical emergencies.

Thus it has become very crucial and important to develop a robust system that will drastically improve and change the present state of healthcare delivery services. In this research work, an interactive-mode telemedicine environment is designed to provide tools for overcoming the unequal distribution of medical experts, establishing meaningful consultations between the rural health workers and specialists located in larger medical centers.

The proposed system also provides opportunities for the healthcare workers to gain access to vital information that can aid in the diagnosis of patient's health state or the development of suitable treatment plans and for the patients to fully enjoy an enhanced healthcare service in the rural areas and urban cities.

The technological approach for the implementation of the proposed system is based on open source solutions. The system is implemented on Windows 2003 network operating system platform. Web server is apache extend with support for PHP. In recognition of the

confidentiality of data contained in the system, communication network are protected with open-(ssh) library for data encryption and role-based authentication is built into the system as security pass mark for accessing information in the data base**.**

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Telemedicine can be broadly defined as the use of information and telecommunication technologies to provide medical information and services at a distance. Telemedicine has existed long before the internet, some authors observed that telemedicine was broadly conceived even when the term was used almost three decades ago. Some of the first telemedicine reports were of group therapy (Withson, et. al., 1961), nursing interactions (Cunningham, et. al., 1978), education and training (Menolascino et. al., 1970), telemetry (Fuchs, 1979), televisits to community health workers (Straker, et. al., 1972), and home care (Mark, 1974), among other applications. In many cases, no physician was involved, and interactivity was not a necessary aspect of the processing.

The term Telemedicine is the delivery of medicine at a distance. The term is composed of the Greek word *τελε* (*tele*) meaning 'far', and *medicine*. Telemedicine may be as simple as two health professionals discussing a case over the telephone, or as complex as using satellite technology and video-conferencing equipment to conduct a real-time consultation between medical specialists in two different countries. It can also involve the use of an unmanned robot.

Telemedicine generally refers to the use of communications and information technologies for the delivery of clinical care.

Telemedicine is most beneficial for populations living in isolated communities and remote regions and is currently being applied in virtually all medical domains.

Specialties that use telemedicine often use a "tele-" prefix; for example, telemedicine as applied by radiologists is called Teleradiology. Similarly telemedicine as applied by cardiologists is termed as telecardiology, etc.

The ability of telemedicine to facilitate medical care irrespective of distance and availability of personnel on site makes it attractive to both the public and private health sectors. Telemedicine allows better utilization of scarce medical personnel and resources. It enhances citizen’s equality in the availability of various medical services and healthcare despite geographical and economic barriers, at a lower cost. In particular, telemedicine may be seen as a valuable tool for providing much needed medical services to remote rural areas. It promises to enhance continued medical education of our young doctors, nurses and other healthcare practitioners in rural areas, both in training and in established practice(O. S. Adewale, 2004).

Healthcare system ranges from highly specialized urban areas, to small rural clinics in most part of underdeveloped and developing countries. The legacy of recent decades is an inappropriate distribution of health practitioners and expertise that are concentrated in major urban centers, while people living in rural areas have limited access to basic healthcare because of geographical isolation and poor public transportation.

Telemedicine is one form of advanced technology that may be part of the solution to a number of healthcare and education problems in most underdeveloped and developing countries.

Therefore, in this thesis, a web-based medicine system is designed and implemented for Nigeria.

1.2 MOTIVATION OF THE STUDY

The third world countries are usually characterized by high population density. Nigeria for instance has an estimated population of about 120 million people. More than seventy percent (70%) of her populist reside in the rural areas with shortages of medical experts, and hospitals. Due to geographical isolation and lack of opportunities for medical experts, few available medical experts are often reluctant to serve in remote rural and poorer areas. As a result of this, people living in this remote rural and poorer areas have limited access to basic healthcare services and consequently receive lower quality of healthcare service compare to those living in urban areas where best equipped hospitals and medical experts are available. Patients living in these areas requiring the attention of healthcare practitioner to meet their needs must travel to distance healthcare centres, which is quite impossible due to the present state in medical emergences.

Therefore, there is the need to develop a web-based telemedicine system that will improve upon the quality of medical services, lower cost of delivering such service to the people in remote areas, and providing more up-to-date medical information to rural healthcare workers demarcated from the main stream of information awareness.

1.3 OBJECTIVE OF THE STUDY

The main objective of this work is to provide, develop and implement a telemedicine system, which will:

i) enhance citizen's equality in the availability of various medical services and healthcare delivery despite geographical and economic barriers through the use of web-based telemedicine application.

ii) reduce direct and indirect cost (loss income), usually incurred as a result of moving patients from one geographical location to another in search of better and quality medical services.

iii) improve consultation and co-operation among various units of healthcare services in both special cases and primary care by bridging the distance between practitioners and specialists.

iv) provide opportunities for the healthcare practitioners to gain access to information that can aid in the diagnosis of patient's healthcare conditions.

1.4 RESEARCH METHODOLOGY

A review of related literature was carried out. A web-based telemedicine system that would provide efficient and convenient methods for the remote rural healthcare workers and physicians located at the cities to collaborate with one another over patient's cases was developed and implemented. Technological approach to the development of the system is based on apache as a web-server with extended capability for PHP scripting language and MySQL as a relational database.

1.5 CONTRIBUTION TO KNOWLEDGE

The need to develop a web-based telemedicine system that will improve upon the quality of medical services, lower cost of delivering service to the people in remote areas, and providing more up-to-date medical information to rural healthcare workers demarcated from the main stream of information awareness.

1.6 ORGANISATION OF THE REST OF THE THESIS

The rest of the thesis is structured as follows: in chapter two, we review telemedicine system generally and discussed its features and prospect as regards to the medical profession generally. Some related literature was also reviewed.

In the third chapter, we describe and design an automated system for the proposed telemedicine system.

In the fourth chapter, an implementation of the system designed is presented using PHP and MySQL.

In the chapter five, conclusion and recommendations were made.

CHAPTER TWO

LITERATURE REVIEW ON TELEMEDICINE SYSTEM AND RELATED WORKS

2.1 INTRODUCTION TO TELEMEDICINE

Telemedicine is defined as the use of telecommunication technologies to provide medical information and services. It may be as simple as two health professionals discussing a patient's case over a telephone line, or as sophisticated as using satellite technology to broadcast a country using video conferencing equipment.

The America telemedicine Association defines telemedicine as the use of medical information exchanged from one site to another via electronic communication for health and education of the patient or healthcare providers and for the purpose of improving patient care.

Wootten (1996) considered telemedicine as a process, rather than a technology: Telemedicine connects patients and healthcare professional in a chain of care.

Telemedicine is useful as a communication tool between a general practitioner and a specialist available at a remote location.

Care at a distance (also called *in absentia* care), is an old practice which was often conducted via post; there has been a long and successful history of in absentia health care, which - thanks to modern communication technology - has metamorphosed into what we know as modern telemedicine (O. S. Adewale 2003).

2.2 HISTORY OF TELEMEDICINE

Telemedicine technologies can be traced to the pre-electronic era. For example, wealthy families commonly sent urine samples to their doctors, who would use a urine chart to arrive at a diagnosis (Sosa-Iudicissa et al., 2000). This would be an early example of pathology. Teleprescribing was practiced before postal services were established and there are well-documented examples (Jurin, 1726). The development of postal services in the mid-nineteenth century facilitated prescription by pos: a sick person would write to an eminent physician enclosing his medical history. The physician's reply would include a diagnosis, directions for a regimen and a prescription (Porter and Porter, 1989).

Telephony that became widespread in the late nineteenth century was used for medical work from the beginning. It is still widely used for this purpose. However, the telephone can be used for other purposes than simple voice communication. The first trans-telephonic "electrical stethoscope" was demonstrated in England in 1910 (Brown, 1910), which was used to amplify the sounds from a stethoscope and transmitted them through the telephone network. Similar devices are still in use today to permit a physician to carry out remote auscultation using low-cost equipment. Other medical uses for ordinary telephone network include transmission of images and ultrasound images via a computer modem (Shaint, et. al., 1996) and also the use of fax machines (Rollger, et. al.,1997). Internationally, there has also been mounting interest in call centers and their use of modern telecommunications for the purpose of medial triage (Lancet, 2001). These initiatives originated mostly in the US in response to the

need to reduce escalating healthcare costs (Fries et al., 1993) However, they became widespread in the early 1990s as part of a broader strategy by many US healthcare organizations to implement demand-management strategies focused on improving consumer health knowledge and preventing unnecessary use of expensive health resources.

These services, staffed largely by registered nurses, often act as gatekeepers for access to emergency healthcare services and provide telephone triage, recommending appropriate levels of care supplemented by advice on self-care and information about provider availability. In countries with large public health systems, such as the UK and Canada, gatekeeper functions are performed mostly with existing primary care services. Thus, potential indirect benefits such as improvement in service access and availability (especially after-hours) have made telephone triage a rational and popular policy initiative. The largest whole-of-population approach to date has beenn implemented by NHSDirect in the UK. This service began in 1997 and currently about 65% of the England has 24-h access (DOH 1997). In the US 100 million people are estimated to have access to telephone triage, while in Ontario, Canada, the ministry of health and long-term care has instituted a similar approached for a population of more than 10 million people (Turner et al., 2002). In 1966, Australia followed the US, the UK and other developed countries in promoting the use of nurse-led telephone services. The core of these services is very similar: nurses follow computer-driven protocols to give advice about a wide range of problems related to acute minor illness (Roland, 2002).

Turner and colleagues reported the operation of a nurse-led telephone advice service has been widely Australia, Health Direct in Western Australia (Turner et al., 2002). The service has been widely used, with over 300,000 calls being received during the first 2 years of its operation. It operates from a dedicated call centre with 33 full-time equivalent operational staff (48 nurses) and is available to the whole state, 24h a day, 7 days a week. The 10 most frequently used guidelines of the service covered more than half of all the calls to HealthDirect, and more than half of callers were advised to contact their general practitioners. As in other countries, most callers were young adults or parents calling on behalf of children. There is some concern that the increasing use of telephone advice may disadvantage elderly and ethnic people, who found it less easy to use the telephone.

Healthcare planners are clearly interested to know whether these services will reduce the demand for existing healthcare services. Turner and colleagues found that HealthDirect has reduced telephone calls to hospital emergency departments. In the UK, a reduction in the number of calls handled by the emergency departments staff coincides with the introduction of NHSDirect (Munro, et. al.,2000).

In the early 1990s, radio communications were used for providing medical services to Antarctica (Sullivan and Lugg, 1995). The potential of radio to provide medical advice for seafarers was very quickly recongnised, and by the 1920's most of the maritime nations had established services (Goethe, 1984). The Italian service, CIRM, for example, treated over 35,000 ship-borne patients by

radio in its first 60 years of existence (CIRM, 1995). The growth in long-distance air travel in by second half of the century brought about a new medical problem: the provision of medical advice to passengers of the aircraft. In-flight medical incidents, which enquire professional assistance, occur at a rate of about 1 in 50,000 passengers carried (Bagshaw, 1996). In cases where there is no doctor on-board, airlines maintain an on-call service by which aircraft captain can obtain radio medical advice from the ground (Sosa-Iudicissa et al., 2000).

The first use of close-circuit television, that is, interactive video communication in healthcare occurred in the 1950s, when the Nebraska Psychiatric Institute used a two-way interactive television system for telepsychiatric clinic consultations with Norfolk State Hospital, 112 miles away. This link was developed for educational, specialized treatment, and consultation between specialists and general practitioners (Wittson et al., 1961). Another experimental project became active in 1959, when a Canadian radiologist used images transmitted by coaxial cable for a diagnostic consultation (Jutras, 1959). In the late 1960s, a teledermatology demonstration project linked a Polytechnic from Logan International Airport in Boston to Massachusetts General Hospital. Using an interactive audio-video system, physicians were able to deliver services by using gray scale screens to communicate relative degrees of erythematic (Murphy and Bird, 1974). The introduction of low-cost computing and digital communication has led to the development of videoconferencing. This has been used for telemedicine, for example, teleconsulting, initially with room systems and more recently with desktop systems (Grisgsby and Allen, 1997).

The recent development of mobile phones has allowed mobile telemedicine and research includes the transmission of slow-scan video pictures from ambulances (Curry and Harrop, 1998; Harrop and Curry, 1998). Wireless techniques also include the use of satellite communications. One of the uses of telemedicine in the third world was the use of low-cost satellite system to enable internet access for healthcare workers. It linked urban medical centers to remote clinics and practitioners in nine African nations, the Philippines, and three countries in the Americas. The system provided e-communications and CD-ROM availability via the HealthSat satellite (LEO satellites, for a fraction of the cost of geostationary satellites (Groves, 1996; Ferguson, et. al.,1995; Garshnek, et. al., 1997).

Using off-the-shelf hardware components and a specially developed high-end wavelet-based interactive video communication software system, satellite networks for various applications of interactive telemedicine have been designed and developed. Based on the successful generic advanced low-cost trans-European network over satellite several projects such as medical assistance for ships; disasters emergency logistic telemedicine advanced satellite system. And Euro-medeterranean Internet-satellite platform for health, medical educational and research are being currently realized (Graschew, et. al., and 2002; Saleman, 2002).

The National Aeronautics and Space Administration (NASA) were also central in the early development of telemedicine. Concerned about the effects of zero gravity on the physical conditions of astronauts, NASA had an early need to

monitor vital signals during space missions. Fulled by its successes, NASA supported the establishment of a comprehensive test-bed system the Tohono Odham reservation in Arizona. The programme tested satellite-based communications designed to provide both the reservation and astronauts with range of medical services (Fuchs, 1979).

NASA was also a pioneer in distributing advanced telemedicine technology following the devastating earthquake that struck Mexico City in 1985 (Garshnek, et. al.,1997). NASA maintained its interest in disaster assistance through telehealth technology. In 1988, NASA conducted the first international telehealth programme, known as space bridge now called space for Russia, to provide medical consultation to earthquake victims in Armenia. This programme was based on technology originally developed for astronauts (Garshnek, 1991; Llewellyn, 1995). Consultants used satellite-based communication to deliver one-way video, voice, and fasimile medical care from four medical centers in the US to a health centre in Yerevan, Armenia, in the areas of psychiatry orthopaedics, neurology, infections disease and general surgery (Garshnek and Burkle, 1999 Nicogossian, 1989).

It is observed that the appearance of telemedicine solutions is usually associated with the need of addressing a particular unfulfilled necessity in terms of medical services, in the context of a nation healthcare system. The trend towards telemedicine comes from the rich, developed and industralised countries. In developing countries, there is also a growing interest in the possibilities that

teledicine and telecare can offer in the context of their particular conditions of scarce human and material resources (O. S. Adewale 2003).

An important number of international initiatives have promoted the development of telemedicine at different levels. In Europe, important efforts date back to the late 80s' under the auspices of the European community initiatives, advanced informatics in medicine and later on health telematics (Sosa-Iudicissa, 1991-1994; Laires, et. al., 1995; Van Goor and Christensen, 1992).

Also at the international level WHO and some of its branches analysed the potential of health informatics and telemedicine and provided guidance to member countries (WHO, 1997) and also its health-for-all policy for the 21st century: "health telematics".

2.3 REVIEW OF E-HEALTH

The application and use of machines and computer-based technologies in health care have undergone an evolutionary process. Advances in information, telecommunication, and network technologies have led to the emergence of a revolutionary new paradigm for health care that some refer to as e-health.

2.3.1 E-HEALTH HISTORY

The genesis of health care computing can be traced as far back as the early 1950s, when only mainframes were available and only the major hospitals of G7 countries could afford to house and use these machines. In that period, even the processing of a routine batch of health-related information took a considerable amount of coordinated effort among various health professionals and computer experts. Despite the demand on expertise, the end results were mostly fraught

with mechanical and programming errors. The failures of this first era of computing in health care were due mainly to the lack of active support from hospital administrators and top management, the lack of continuing funding, and the lack of knowledge and skill in the design and use of automated systems.

A technical implementation of Columbia University's informatics for diabetes education and telemedicine (IDEATel) project has been presented (Starren et al., 2002). The focal point of the intervention is the home telemedicine unit (HTU), which provides for functions; synchronous videoconferencing over standard telephone lines, electronic transmission of fingerstick glucose and blood pressure readings, secure web-based educational materials. Providing these functions through HTU requires tight integration of six components; the HTU itself, case management software, a clinical information system, web-based educational materials, date security, and networking and telecommunications. With more than 400HTUs installed, IDEATel has demonstrated the feasibility of large-scale home telemedicine.

Furthermore, there are a very large number of patients who need specific health support at home. The deployment of broadband communication networks is making feasible the provision of homecare services with a proper quality of service. Guillen and colleagues presented a telehomecare multimedia platform that runs over integrated digital network and Internet protocol using videoconference standards H.320 and H.323, and standard TV set for patient interaction (Guillen, Arredondo et. al., 2002). This platform allows online remote monitoring of electocardiogram, heart sound, and blood pressure. Usability,

affordability, and interoperability were considered for the design and development of their hardware and software components. The evaluation of technical and usability aspects were carried forward with 52 patients of a private clinic and 10 students in the university. Their results show a high rate in the global perception of users on the equality of images, voice and feeling of virtual presence.

The terms e-health and telehealth are at times wrongly interchanged with telemedicine. Like the terms "medicine" and "health care", telemedicine often refers only to the provision of clinical services while the term telehealth can refer to clinical and non-clinical services such as medical education, administration, and research. The term e-health is often, particularly in the UK and Europe, used as an umbrella term that includes telehealth, electronic medical records, and other components of health IT.

2.4 OVERVIEW OF SOME EXISTING TELEMEDICINE SYSTEM

Telehealth, in a nutshell, includes the electronic transmission of patient data from the patient site (originating site) to a consulting site (distant site) for the provision of health care services. Consultations are possible through the transmission of radiographs, ECG's, laboratory results, echocardiograms, coronary arteriograms and ultrasounds; interactive video consultations including patient exam, stethoscopy, and medical history; and the use of store-and-forward information for second or confirmatory consultations. Telehealth is also a component of home health monitoring services when patient data related to blood pressure (BP), weight, pulse oxygen saturation, cardiac events, etc., is stored and transmitted to health care professionals who analyze, interpret, and make clinical

decisions based on the data received. An example would be cholesterol or ECG monitoring. Telehealth consultations can occur with patients to providers, patient-to-patient, providers to providers, organizations to organizations, or any combination of the aforementioned. Telehealth also includes patient accessed web-portals designed specifically for patients to access their records, make appointments, and receive information directly from their health care provider.

Disease management is a rapidly growing segment of services that can be provided via telehealth technologies. The level of interest in and knowledge about disease management is growing dramatically. The Institute of Medicine's report, entitled ``Crossing the Quality Chasm," (2001) highlights the challenge of managing chronic conditions within a system that was designed to treat acute illness. Major national organizations such as the Disease Management Association of America (DMAA) have been formed to advance the practice of disease management, and the National Committee for Quality Assurance (NCQA) has established standards for disease management programs.

Early efforts at disease management occurred mainly in managed care settings, as the plan and the providers had clear incentives to manage care and the patients were enrolled and ``locked into" a delivery system. More recently, a variety of health care organizations including physician group practices, private insurers, commercial firms, and academic medical centers, have developed programs designed to address the challenges inherent in managing chronic illnesses within the context of a fee-for-service (FFS) system oriented around episodic care.

The National Disease Management Association (NDMA), NCQA, and other organizations such as the National Pharmaceutical Council have put forward definitions of disease management that contain certain common elements. These definitions view disease management as an approach to delivering health care to persons with chronic illnesses that aim to improve patient outcomes while containing health care costs. These programs tend to target persons whose primary health problem is a specific disease, although certain co-morbid conditions are usually addressed as well. Patients with a similar level of severity of a disease tend to face similar problems and therefore receive similar treatment plans. These disease management interventions tend to be highly structured and emphasize the use of standard protocols and clinical guidelines.

Certain common features are found in all of these definitions:

i. Identification of patients and matching the intervention with need;

ii. Use of evidence-based practice guidelines;

iii. Supporting adherence to the plan of care;

iv. Supporting adherence to evidence-based medical practice guidelines by providing medical treatment guidelines to physicians and other providers, reporting on the patient's progress in compliance with protocols, and providing support services to assist the physician in monitoring the patient;

v. Services designed to enhance patient self-management and adherence to their treatment plan (e.g., patient education, monitoring/reminders, behavior modification programs aimed at encouraging lifestyle changes);

vi. Routine reporting/feedback loop (may include communication with patient, physician, health plan and ancillary providers, and practice profiling);

vii. Communication and collaboration among providers and between the patient and providers (e.g., team conferences, collaborative practice patterns, routine reporting/feedback loops, relaying information on co-morbid conditions, etc); and

viii. Collection and analysis of process and outcomes measures.

In addition to these standard features, programs may include the use of information technology such as specialized software, data registries, automated decision support tools, and callback systems. Although disease management services usually do not include actual treatment of the patient's condition, many disease management programs augment the services provided in the traditional FFS system by adding services such as comprehensive patient assessment, social services, preventive services, and necessary prescription drug and outpatient medication services. The interventions provided go beyond those services generally covered under the Medicare FFS program

2.4.1 TELECARDIOLOGY

Telecardiology is the electronic transmission of cardiac data from the patient site to a consulting site for the provision of health care services. Patient encounters and provider consultations are possible through the transmission of radiographs, ECG's, laboratory results, echocardiograms, coronary arteriograms

and ultrasounds; interactive video consultations including patient exam, stethoscopy, and medical history; and the use of store-and-forward information for second or confirmatory consultations. Telecardiology is also a component of home health services when patient cardiac data is monitored, stored, and transmitted to health care professionals who analyze, interpret, and make clinical decisions based on the data received. An example would be cholesterol or ECG monitoring. Telecardiology visits can be patient to provider, patient-to-patient, provider to provider, organization to organization, or any combination of the aforementioned. Telecardiology also includes patient accessed web-portals designed specifically for patients to access their records, make appointments, and receive information directly from their cardiologist or primary care provider.

Telecardiology is a rapidly growing segment of services that can be provided via telehealth technologies. Using diagnostic tools in the early phases of patient evaluation can result in the rapid triage, diagnosis, and intervention in acute and emergent cardiovascular conditions, particularly those that affect children. The use of real-time and store-and-forward echocardiography has revolutionized the local treatment of pediatric and adult cardiovascular patients and has led to more timely diagnosis and intervention (McConnell et al. 1999; Molinari et al. 2002 ; Scalvini and Zanelli, 2002; Shanit et al. 1996).

Assessing the need and demand for a telecardiology application requires general planning and development approaches that are applicable to the development of a telecardiology service. Reasons for the use of telecardiology for consulting providers includes the need to develop outreach services where on-site

outreach is not practical or feasible; the need to continue an outreach service where cost expenditures are greater than revenue plus added value of maintaining the current service; the need to use in-person time for new patient workups not easily done via telecardiology (and thus, seeing follow-up patients via telecardiology); or to increase productivity by decreasing travel time. An originating site (patient site) may want to use telecardiology to:

i) provide access for their local populations;

ii) bring specialty services to the local area in a collaborative fashion;

iii) decrease out migration of patients based on perception of available services and the quality of those services;

iv) decrease unnecessary transports to tertiary care facilities;

v) provide practitioner support; and

vi) increase utilization of local ancillary services.

Telecardiology is best developed as a component of an integrated health care system, it cannot stand-alone. There must be a collaborative relationship either developed or in existence that is enhanced by the use of telecardiology. The originating site must maintain control of patient referrals, optimize on-site testing and other procedures offered locally, and believe that the service being provided belongs to the community in which they exist. The consulting (distant site) providers/organizations must allow the originating site this control over the process and not take the position that the consulting provider/organization controls the originating site's program (Armstrong and Freuh, 2002; p. 171).

2.4.2 DERMATOLOGY

Dermatology is a clinical specialty well suited for the use of telehealth technologies. It is one of the more common uses of both store and forward and interactive telehealth because of the visual nature of the practice. Dermatologists can provide high quality care to patients with diseases of their skin, hair, and nails using a variety of telehealth technologies. Education about cutaneous diseases and their management for patients and health care providers in underserved areas is also possible. Teledermatology utilization has grown over the past several years. This is reflected in the 2003 survey of telehealth programs, which was conducted by the American Telemedicine Association's Special Interest Group on Teledermatology (2003 Anne E. Burdick, M.D., M.P.H. and Shasa Hu, M.D. American Telemedicine Association).

There is a shortage of dermatologists in many areas of our country and their geographic distribution is skewed toward metropolitan areas. In a 2002 report to the Board of Directors of the American Academy of Dermatology, Alexa Boer Kimball, MD and Jack Resneck, Jr., MD, reported that although the number of dermatologists per 100,000 population has grown from 1.6 in 1965 to 3.3 today, the demand for services has outpaced the supply of dermatologists (Dermatology World, October 2002.). In that report, Drs. Kimball and Resneck also suggest that telemedicine be used as a way to reach underserved populations. Some feel that the issue is more of maldistribution and not an absolute shortage. This is compounded by an accelerated growth of laser and cosmetic dermatology, which has made fewer medical dermatologists available and worsened access to

patients with routine skin problems. Logic suggests that although making dermatology services available via telemedicine means equal access to the service for those living in underserved areas; it will only increase the demand on the existing supply of dermatologists.

2.4.3 ELECTRONIC MEDICAL RECORDS FOR RURAL HEALTH SYSTEMS

EMR– electronic medical records, EHR-electronic health record, CPR - computer-based patient record, all are acronyms used to define and refer to an electronic version of a patient's record.

There are various models of EHRs today. The components are similar but they are generally used by disparate personnel and in different settings. Some of them and their uses are as follows:

- Acute Care – Used for documentation purposes for patients while they are a patient in the hospital. This model can eventually replace a paper chart. This includes documentation of nursing (vital signs, medication administration, and physical exam), respiratory therapy, physician orders and notes, nursing assistant duties, physical therapists and pharmacists.
- Ambulatory – Used within a clinic or physician office to replace the paper chart that a physician would use to document the patient findings and condition. There are many variations of adoption of this model. One is a complete paperless chart system. Another is when the physician simply uses electronic prescription writing and maintains an electronic database of an individual's prescription history. Obviously, the more the physician documents, the more complex the documentation will become. Nurses can

document phone calls, medication refills, track immunizations and vital signs. Physicians can also document the patient encounters using templates; order ancillary services electronically; and can run reports on patient populations. The more value an electronic record has, the more complicated the electronic record typically becomes. It should be noted that physicians who are not computer literate may become overwhelmed by the perceived complexity of the record.

- Long-term Care – Used within a long-term care facility or skilled nursing facility to document patient care. One of the variations of this model is to use touch screen capability. Utilizing pictures rather than words allows workers to easily document the services that could be rendered to the patient by selecting the pictures from a user friendly menu. This allows the caregiver to touch the screen showing the service that they are providing and thus documenting that the patient has received the service. This variation allows for the varying skill levels of the staff that are often problematic in this type of facility (some not being computer literate or able to read and write effectively).
- Home Health – Used to document the care of a patient while under the services of a home health professional. This is usually completed by using a laptop type of device in the patient's home while the service is being rendered. As described above there are many different models, they are often stand-alone systems that do not exchange or share information between systems. This causes a lack of continuity for the care of the

patient and may cause the ordering of repetitive tests or possibly delaying the treatment of the patient when information could have been readily available if the information was shared between systems. This calls for a new model called the integrated model. This is the model that this research work tends implementing as a telehealth project.

2.4.4 WRISTCLINIC – The all-in-one wireless remote medical monitoring revolution

WristClinic is a breakthrough in remote medical monitoring. It combines extraordinary diagnostic value with a convenient and comfortable format. WristClinic is a powerful, fully wireless, multi-parameter medical monitor that is worn on the wrist. It enables easy clinical grade monitoring at home, office or on the road. WristClinic measures and wirelessly transmits blood pressure, oxygen saturation (SpO_2), heart rate and rhythm, 1 lead ECG, breathing rate, and temperature.

Telcomed is focused on a simple vision: that healthcare can and must be made dramatically more cost-effective and patient-friendly by leveraging recent technology advances.

Telcomed achieves this vision by introducing a new level of telemedicine solutions to the healthcare marketplace

CHAPTER THREE

SYSTEM ANALYSIS AND DESIGN

3.1 TELEMEDICINE SYSTEM

The telemedicine system will provide a solution to the problem of accessing healthcare, especially for the rural healthcare workers, it enable the sending of the patient's demographic and clinical data, X-rays and ultrasound images through the telemedicine network system for diagnosis of any patient's illness. This allows for circumstance for patient's loss of quality of healthcare, increase the access to expert-supported healthcare services based in hospitals located in larger cities and mitigates the isolation of rural health workers by bringing them in regular contact with the physicians in the urban city hospitals.

3.2 TELEMEDICINE SYSTEM ARCHITECTURE

The main factor being put into consideration while designing the telemedicine system are Interoperability and multiple accessibility with minimum requirements on the user's side. Thus due to large flow of information delivery over the Internet, the system is implemented as a standard Internet application. The client side requires no more than standard Internet browser installed on the local computer, while the main application functionality is assured by the server side. Figure 3.1 depicts network application architecture of the telemedicine system. This includes, user interface made up of access services points (shown as client system below) at the remote site, a high – speed, highly reliable and scalable regional network and content management gateway with database server. This architecture allow users to access the system via the Internet using hypertext

transfer protocol and the user request is transformed into a structured query language using a PHP common content management gateway, which in turn passes it to the appropriate backend system. The common content management gateway provides a single point entry to the system.

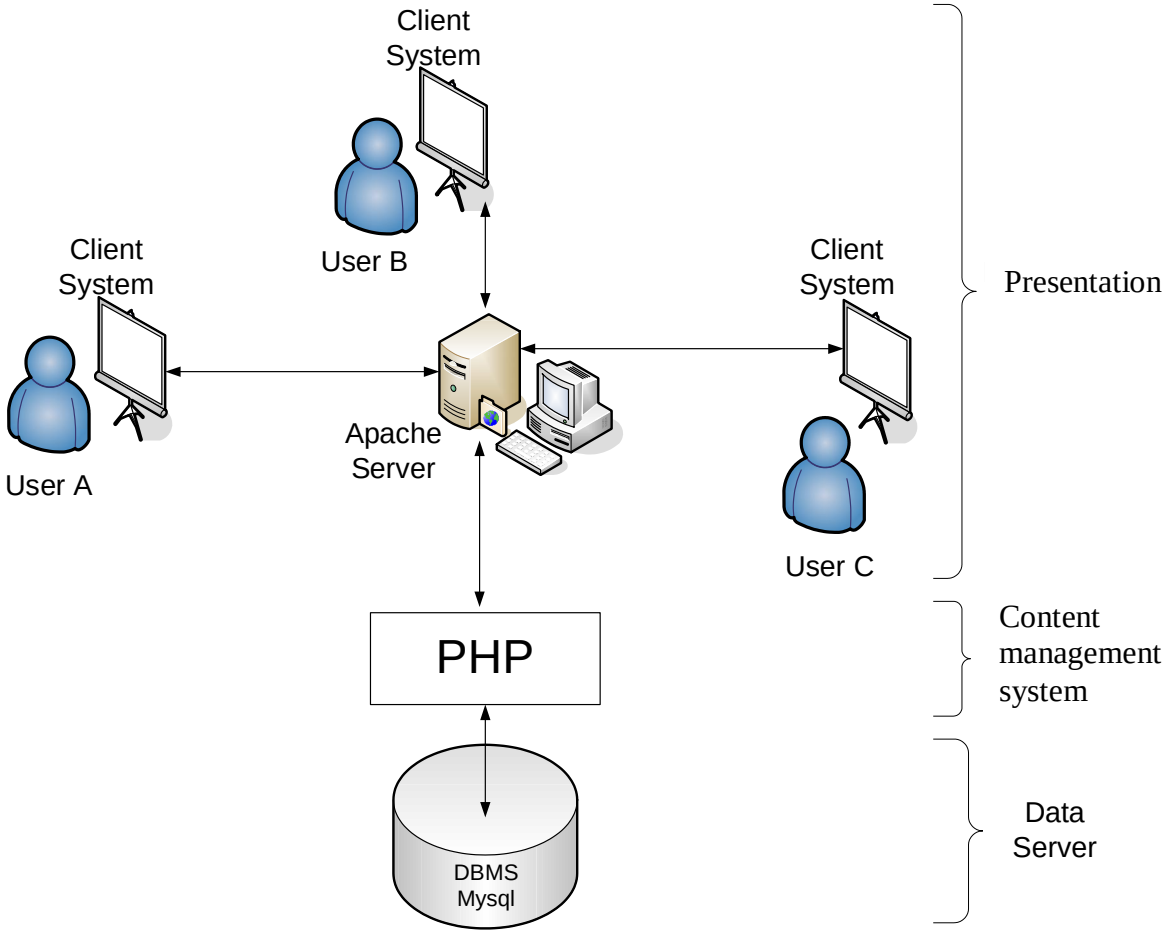


Fig 3.1 Network Application Architecture of Telemedicine system

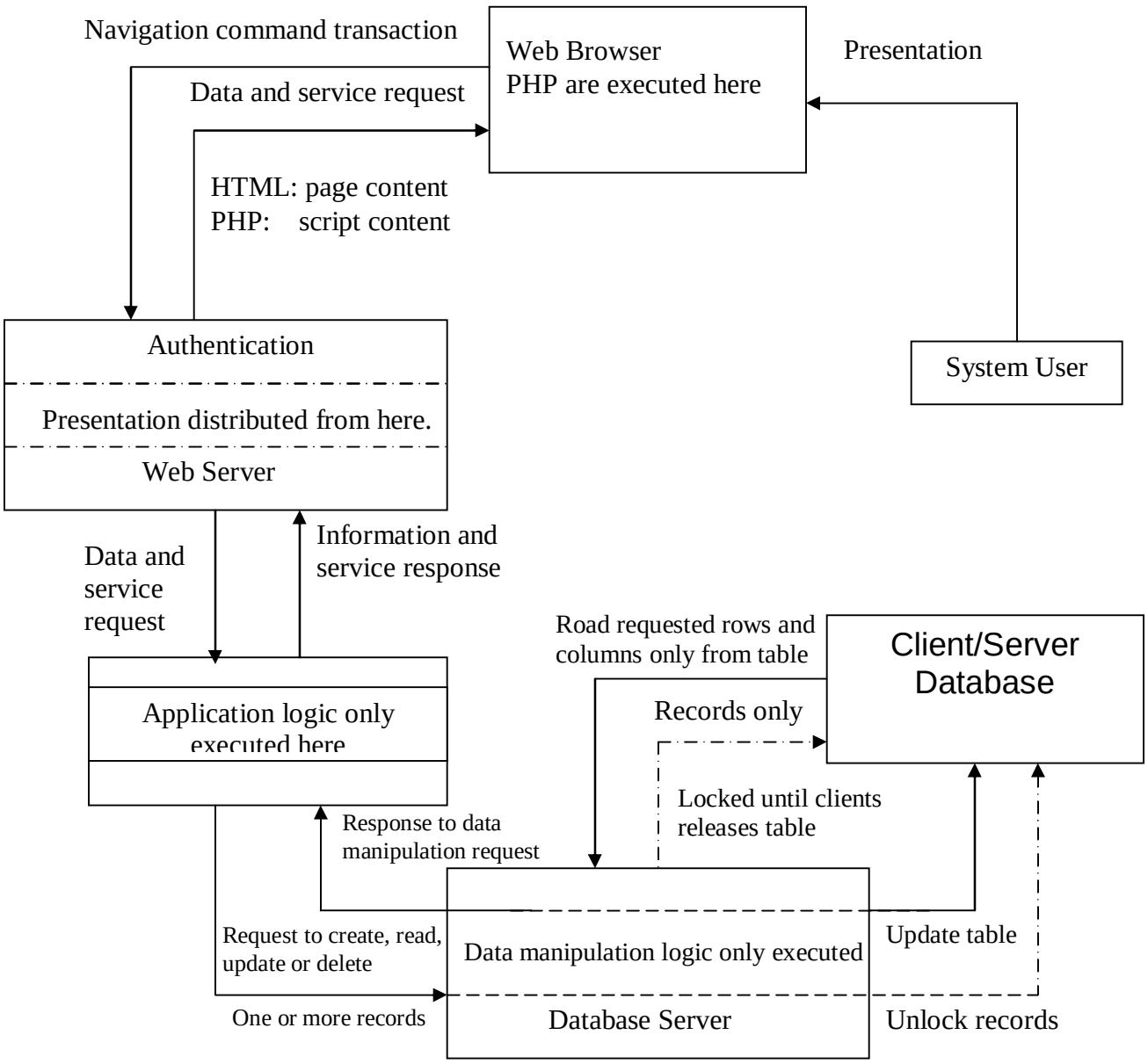


Fig 3.2 Network Operation of Telemedicine System Application

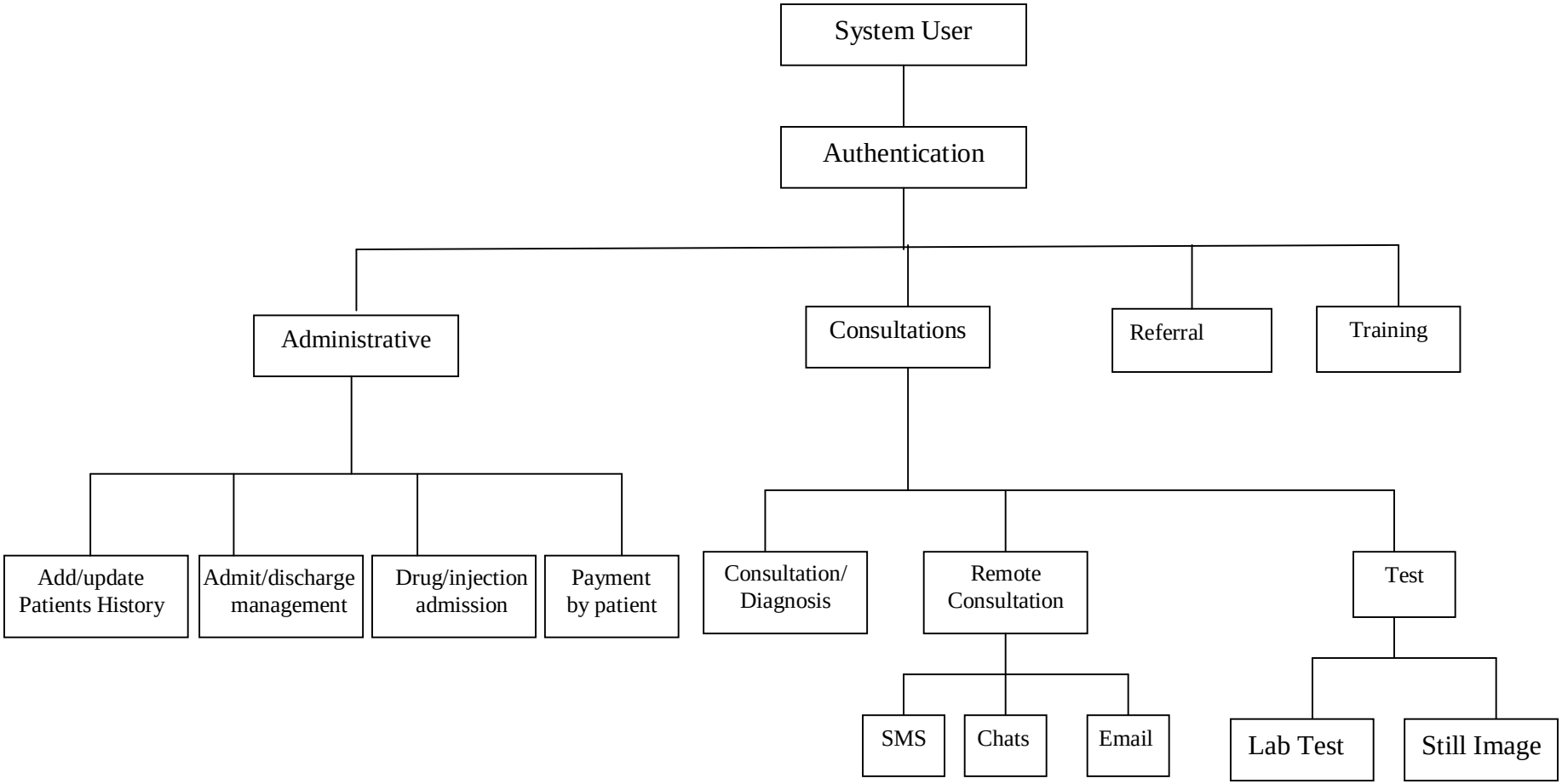


Fig 3.3 Telemedicine System Structural Chart

3.3 IMPLEMENTED SYSTEM DESCRIPTION

The system consists of four major modules. These are Administrative, Consultations, Referral and Training modules.

Entry point to some of the above modules requires that user is authenticated. Since users access these modules remotely therefore a built-in security system forces user to first login.

There are several alternatives to users' authentication. Theses alternatives include HTTP basic authentication and PHP session schemes. In implementing HTTP basic authentication one either has to properly configure it through the web server such as using .htaccess file on an apache server or duplicate the functionality through the use of the PHP Header function. Although the HTTP mechanism is acceptable, even with a proper setup, HTTP authentication has many shortcomings such as lack of security features (inactivity timeout); and developer-friendly benefits (the ability to display secure/non-secure data easily on the same page).

As a result of the mentioned shortcomings, a PHP session authentication is used the module to control access to most of the systems' sensitive areas while at the same time providing a more useful and clean implementation. Sessions are a mechanism that allows PHP to preserve state between executions or allow system to store variables from one page and use them on another.

The basic mechanism of this session works as follows:- first PHP generates a unique, thirty-two character string to identify the session. It then passes the value to the browser, simultaneously, it creates a file on the server and includes the session ID in the filename. There are two methods by which PHP

can inform a browser of its session ID: by adding the id to the query string of all relative links on the page, or by sending it as a cookie (a small piece of information that PHP script can store on a client-side machine). When the browser makes a request for another page, it tells PHP which session it was assigned via a MySQl query string or by returning the cookies. PHP then looks up the file it created when the session was started, and so has access to the data stored within the session.

Once the session has been established, it will continue until it is specifically destroyed by PHP in response to a clicking “Logout”, for example or the session has been inactive for longer than a given period of time (twenty-four minutes by default), at which point it becomes flagged for garbaged collection and will be deleted by the next PHP checks outdated sessions.

The basic steps of using sessions are: starting a session, registering session variables, using session variables and deregistering variables and destroying the session.

Because we want to tie a user to a session, each user (technologist) is assigned a unique username and password and these are stored in a MySQL database table. User’s username and password will then be authenticated against the entries stored in the database table. There are four main elements in the user authentication module: user registration, login and logout, changing password and resetting passwords (Fig. 3.4). A valid technologist could perform each of these elements.

Enter Valid User Name and Password		
User Name		
Password		
	Login	**New User**

Create New User Account		
User Name		
Confirm User Name		
User Password		
Confirm User Password		
	Submit	**Logout**

Fig. 3.4– User authentication

The Authentication page consists of a dedicated script trigger and is handle using simple html for, which allows system user input their user name and password on loading of the home page. The security process is ensured by the use of personal identification number. Also role-based authentication is employed to specify access rights to the entire system database information.

To register a user, the user supplies his identification number, and the *preferred username*, *password* and *password confirmation* via an html form, and if the patron identification number is found in the table and both password and password confirmation are the same, it then registers the username and password

in the user table otherwise it reports error messages. Registered users can now login by supplying his username and password details into an html form and submit it, the entries will be processed and the user will be logged on if the authentication is successful. Users are also allowed to change their passwords and in addition to this, the system also deals with the common situation in which a user has forgotten his password.

3.4.1 ADMINISTRATIVE MODULE

This module consists of four sub-modules, which allow nurses to add/update patient demographic data, admit/discharge management, admission of drugs/injection for the patient and adds payment made by the patients. Solely the physicians and the remote rural health workers handle the addition/update of patient's multimedia information sub-module.

The major objective of this module is to improve the workflow of healthcare practitioners, both clinically and administratively. In essence, this will provide support for clinical and administrative services, investigation of request, result retrieval, diagnosis, treatment, drug prescriptions, etc. All the functions of this module will contribute directly towards on-the-ground support of medical practitioners, thereby allowing more accurate and informed diagnosis, more effective treatment and enhanced level of healthcare. The need for the transformation of patient data into an electronic format is driven by the necessity of obtaining patient's medical history during contact with a medical professional. This process often consumes a substantial portion of the practitioner's time, especially during episodic encounters with patients possessing a potentially complex case history.

Patient data concerns information related to the patient and can be distinguished in three types: demographic, clinic and nuclear medicine (NMI) data. Demographic data concerns information such as patient's age, sex etc. clinical data is further distinguished in physical findings and laboratory results. Physical findings are those detected by a physical examination of the patient, like e.g. the existence and the kind of a pain etc. Laboratory results are those detected via laboratory test, like e.g. blood tests etc. NMI data is that extracted from scintigraphic images. The images are acquires by a digital camera.

New information must also be recorded and integrated in an organized manner before an appropriate diagnosis can be attained and treatment administered. Ensuring the availability, accuracy and completeness of medical records will therefore be of great value to medical professionals.

3.4.2 CONSULTATION MODULE

The module is divided into three sub module:- consultation/diagnosis, remote consultation and lab test sub module.

3.4.2.1 CONSULTATION/DIAGNOSIS

The consultation/Diagnosis module is to be used by the attending physician to create and store a daily transaction carried out for each of the visiting patients in the clinical_table according to the clinical problem presented. The basic structure of the clinical_table data set is described by the tuple of CT (SNO, PIN, HSN, TEST, S, R, LT, ST, ID), where SNO is the serial number and it's increasing in the order of step one for each patients record in the clinical_table, PIN stands for personal identification number which has a unique attribute for all patients input or data, HSN is a unique number of the clinical problem and T is the patients visit date, TEST is a field that indicates whether a patients is required

to undergo a laboratory test, or still image test, or both for diagnosing his/her illness. This field could either be NULL (meaning no laboratory test or still images required), L (laboratory test required), SI (still images required) or B (both). In order to trace the progress of therapies, the clinical_table uses S property to describe the processing state and R property as a reference link to the previous record in the clinical_table.

The S property has different states to describe the progress of therapy. These include S (beginning) state, A (admission) state, C (check up) state, P (changing clinical case identification number) state, R (referred) state, and E (closed and ending) state. R is the value of the previous related SNO. When a new case occurs in a visit, the state is automatically set to B. Its R value is set to NULL and can be signified by the tuple of CT (SNO, PIN, HSN, T, TEST, B, NULL, , ST_ID). If a new or old problem is not yet solved, the attending physician generates a C state. The R value of the C state is NULL in case of a visit otherwise it is the SNO value of the last CT with the same clinical problems. Its general form is expressed by the tuple CT (SNO_x, PIN_y,HSN_z,T,TEST,S,R_m, ,ST_ID) where R_m = {max(SNO)/PIN=$PIN_{problem\ pin}$ and HSN=$HSN_{same\ problem}$} for every CT(SNO,PIN,HSN,T,TEST,S,R, ,ST_ID). Therefore if a new or an old problem is not yet solved but requires a laboratory test or still images or both to determine the more on how to handle the patient's condition best, the attending physician generates a C state and also set TEST to either L or SI or B and in case of a new visit, the value is automatically set to NULL otherwise it is set to the SNO values of the last CT with the same clinical problem. On the availability of the required test results, the S could be either C, A, P, R, E or a new diagnostic test could be required which set S to C automatically. When an old problem is solved in this visit, an E state CT (SNO_x, PIN_y, HSN_z, T, TEST, X, R_m, ,ST_ID)

is generated. If an old problem turns to be complex or a new diagnostic test is recommended, a P, A, or R state is created. Both P state and S state are applied to designate new clinical problem; the R value of P state is not NULL. Its value is the value of the related CT in this clinical visit. It is represented by the tuple of CT(SNO_x, PIN_y, HSN_z, T, TEST, S, R_m, ,ST_ID) where R_m = {SNO_x / PIN=$PIN_{same\ PIN}$ and HSN=$HSN_{related\ problem}$ in this visit}. Fig 3.6 shows CT's associated with two patients and each patient associated mutual relationship. For patients with SNO one, CT (4, 1, 2, T2, B, P, 3, 1) and CT (9, 1, 4, T4, B, P, 8, ,1) are P state CTs inherited from CT(3, 1, 1, T2, NULL, C, 1, ,1) and CT(8, 1, 3, T4, NULL, C, 7, ,1) respectively.

From Fig 3.1, it is possible to collect a combine set of patients' medical history by combining the CTs, S and R values to obtain the complete set of the patients medical history. Fourteen CTs[CT(1, 1, T1, NULL, B, NULL, R, ,1) ~ CT(14, 1, 6, T7, NULL, R, 13, ,1)] are generated during the various visit of the patients. These medical histories can help physician obtain information not only on the diagnosis result of each visit, but also on the relationship between patients' history.

SNO	PIN	HSN	DATE	TEST	S	L	ST_ID
1	1	1	T1	NULL	B	NULL	1
2	1	3	T1	NULL	B	NULL	1
3	1	1	T2	NULL	C	1	1
4	1	2	T2	B	P	3	1
5	1	3	T2	NULL	C	2	3
6	1	2	T3	NULL	E	4	1
7	1	3	T3	NULL	C	5	1
8	1	3	T4	NULL	C	7	2
9	1	4	T4	B	P	8	1
10	1	5	T4	B	B	NULL	1
11	1	4	T5	NULL	C	9	5
12	1	4	T6	NULL	E	11	1
13	1	5	T6	L	C	10	1
14	1	6	T7	NULL	R	13	1
1	2	6	T2	NULL	B	NULL	3
2	2	6	T5	L	A	1	3
3	2	6	T9	NULL	E	2	5

Table 3.1 Clinical Table (CT) – Associated with two Patients

3.4.2.2 REMOTE CONSULTATION

The remote consultation module make available many people's healthcare routine across the world, home-bound patients communicates daily with specialist. The internet-based telemedicine system has the capability to support a very large number of patients who need specific health support locally. This is achieved by sending SMS through the net, with a terminal setup in a patient's home and connected or on internet, or the use of instant chatting messages or by sending Emails all through the net.

Bringing the benefits of the expertise of hospitals-based specialists to the rural populace has been the goal of telemedicine systems. This system provides a store-and-forward approach mechanism via e-mail to enable consultation between the remote health workers and the specialists on any particular patient's cases.

Most people are familiar with the term e-mail in this day and age. E-mail is a computer-based method of sending messages from one computer user to another. These messages usually consist of individual pieces of text which one sends to another computer user even if the other user is not logged in, that is, using the computer at the time the message is sent. The message can then be read at a later time. This procedure is analogous to sending and receiving a letter. Originally, e-mail messages were restricted to simple text, but now many systems can handle more complicated formats, such as graphics and word processed documents. When mail is received on a computer system, it is usually stored in an electronic mailbox for the recipient to read later. Electronic mailboxes are usually special files on a computer which can be accessed using various commands. Each user normally has their individual mailbox. It is straightforward

to send e-mail between users of different computer systems which are connected to major networks. Most major academic and research institutions and companies throughout the world can now be reached by e-mail. In addition, a growing number of individuals can be contacted in this way.

One common misconception with e-mail is that messages will always arrive immediately or at least very quickly, that is, within minutes. Whilst this is often the case, any e-mail relies on many computers and networks to be working, therefore e-mails are at risk of delays at any stage. However, sending messages within one system should be immediate.

More and more often these days, sites want to offer web-based e-mail to their users. Ask a technologist e-mail option is a web-based e-mail system. A web-based e-mail system is sometimes referred to as a webmail system. Two popular examples of such systems are yahoo mail and hotmail. Webmail is a class of web applications that allow users to read and write e-mail using a web browser, or in a more general sense, an e-mail account accessed through such an application. Historically, the first webmail service was hotmail created in 1995. Many universities take advantage of webmail server to provide students and staff with university webmail.

This approach is typically for non-emergent situation, when a consultation and diagnosis may be made in the next 24-28 hours and sent back. This makes use of check boxes to include pertinent patient data such as a subset of his health history, clinical data, X-rays and ultrasound images which the rural health worker wants to transmit over the intenet to the queue server where the specialist could have them and respond accordingly. The rural health worker uses the check box

of the consultation form to attach the patient's data to be forwarded to the appropriate specialist in the urban city. The consultation could also be between general physicians and specialists in the urban cities on any complex situations. This is done with the objective of enhancing and extending basic work processes.

Apart from the stored-and-forward approach as stated above, an interactive two-way remote consultation and diagnosis between the patients in the rural areas, remote rural health workers and specialists in the urban cities is supported by using charting approach over an internet network. Using videoconferencing technology and specially adapted medical tools and devices interfaced to the computer, the remote specialist can see his patient, talk with the remote rural health worker, hear heartbeat through remote stethoscope, see images from ear through stethoscope, nose, and throat or skin conditions or make some other remote measurements of vital signs through a device such as Tandberg's HealthCare System III (Tandberg, 2003). The interactive two-way remote consultation and diagnosis videoconferencing terminal is made up of a digital camera (to capture local live video), a display unit (to display remote video), a microphone (to capture local audio), and speakers (to play remote audio). In addition to these obvious components, a videoconferencing terminal also includes medical digital devices, a codec, a user interface (a videoconferencing application software) and a computer to run on. Both the video coded and medical digital device are connected through the computer to the wireless telemedicine network.

Multimedia data is transported over the wireless telemedicine network from remote rural location to the specialist in the urban cities in a real-time manner for consultation and diagnosis and the result of diagnosis is forwarded

back in a real-time manner with prescriptions and the rest. The system is easy to follow, and provides step-by-step instructions for the medical health workers. The system does require the medical workers have minimal competence to use the system and this will be achievable through an intensive training.

Public telemedicine centers could be located within urban cities, where full interactive two-way remote consultation and diagnosis between remote patients in the public telemedicine centers and the specialists happen, to take care of immediate and emergency healthcare cases. The videoconferencing terminals are the same as the above. This approach also could be initiated in correctional institutions, where the costs and danger of transporting patients to the hospitals can be avoided. However, the system is very patient—ready, easy to follow, and provides step-by-step instructions for the patient and does require that the patient to have minimal competence to use the system and in handling the medical equipment at his disposal.

The internet's e-mail framework consists of agents, mailstores, and standards. The software programs that handle internet messages are called agents. There are three types of internet messaging agents: the mail transport agent, mail delivery agent and mail user agents. Fig. 3.6 shows how the agents, mailstores and standards work together.

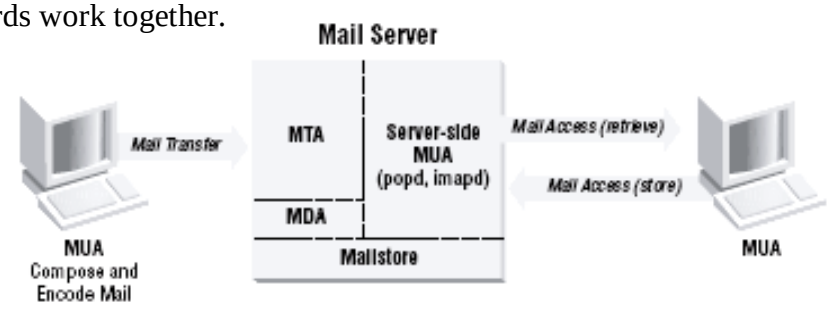


Fig. 3.5 – E-mail framework

Postfix e-mail server is used by the telemedicine system to receive email and deliver it to the user's inbox, but additional software is required to read it with ease. There are two standards for retrieval of e-mail from a host. The first is called POP (Post Office Protocol). POP3 is most commonly used. This is normally used to read e-mail from the server, store it in a client application, and remove the email from the server. This is often used by ISPs. The e-mail is subsequently manipulated by the client application, for example Outlook Express or Mozilla Thunderbird.

The second protocol is called IMAP (Internet Message Access Protocol). The IMAP system is usually used when the e-mail is to stay on the server. IMAP allows users to create folders for e-mail and to move or copy e-mails between the folders. The client application accesses the e-mail on the server, but does not have to store it on the client machine. The e-mail server must be able to store all of the e-mail for all of its users, and the amount of data is expected to grow constantly as users rarely delete e-mail.

The main difference between these two is that POP is intended for, and usually used by, people who connect to a network for a short time to download and their mail from a server. IMAP is intended for online use, to interact with mail permanently kept on the remote server.

IMAP is more frequently used in large organisations with centralised information technology facilities. Therefore, ask a Technologist e-mail option is a web-based IMAP e-mail client that would enable system to be provided with more timely and cost-effective research quality information. This option would

also enable system and technologist to communicate and connect to their IMAP e-mail servers.

IMAP is a way of accessing e-mail that is stored on a central server. Certainly, this statement is true, but there's more to it than that. More precisely, IMAP is a way to retrieve messages from one or more mailboxes on a central server, without ever having to download a single message to local hard disk. The messages remain on the server at all times.

By design, IMAP was intended to provide the same level of functionality for mailbox and message access and management that exists with a mailbox located on a local hard drive. Consequently, IMAP has server operations, such as search for messages matching such and such criteria that are normally associated with mail clients.

The advantages of IMAP could be seen very clearly as it is possible to work from several computers, for instance, home computer, office computer, and laptop. With the right IMAP client, you can do all of the following: learn when new messages arrive in any of your mailboxes; share your mailboxes with anyone or everyone; move messages from one mailbox to another; and mark messages with flags (such as *important*) that are preserved between IMAP sessions

Another distinguishing feature of IMAP is that, not only is inbox stored in a central location, but *mail folders* (mailboxes, in IMAP parlance) are stored in a central location on the IMAP server as well. As long as there is a right IMAP client software not only can one reads his incoming e-mail from just about anywhere on the net, but one can access all the mail one archived in his mailboxes, too.

One feature that sets IMAP apart is that it supports not one, but *three* interaction models. These interaction models include online model, a situation where e-mail is never downloaded into the client host's hard disk but manipulated remotely by the mail client programs. The mail client maintains an open connection to the server for the duration of the session, that is, until the user decides to end the session. Next is off-line model, a situation where e-mail is downloaded in the client's hard disk and deleted from the server, that is, POP3-style, and disconnected, model a situation where an e-mail is kept synchronised on server and client's host.

For a patron to read his mail, the system needs to get server and account details. Rather than getting these details from the system every time, a database is set up to store the technologist's username and password details. The general flow of the telemedicine web-based e-mail system is shown in Fig. 3.7.

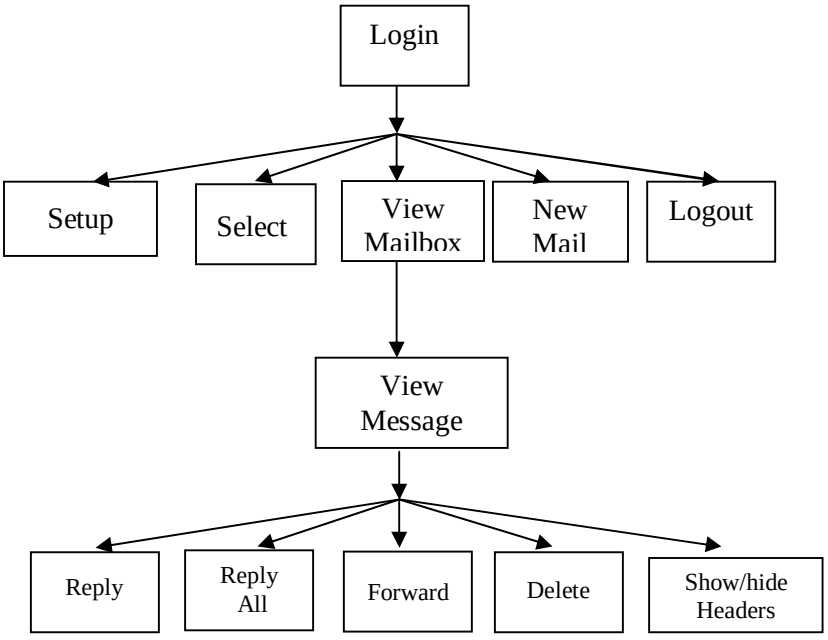


Fig. 3.6 – Telemedicine web-based e-mail system

The Telemedicine e-mail system first requires patron to login and then gives him a choice of options. He will be able to setup a new mail account or select one of his existing accounts for use. He will also be able to view his incoming mail, responding to, forwarding or deleting it and send new mail. The e-mail system also gives technologist the option of viewing detailed headers for a particular message. Viewing the complete headers can tell a lot about a message.

When a user first starts using the web-based IMAP e-mail client, he will need to set up some e-mail accounts details before he can read his e-mail. If he clicks on the *Account Setup* button Fig. 3.8 is displayed so as to supply all the necessary details.

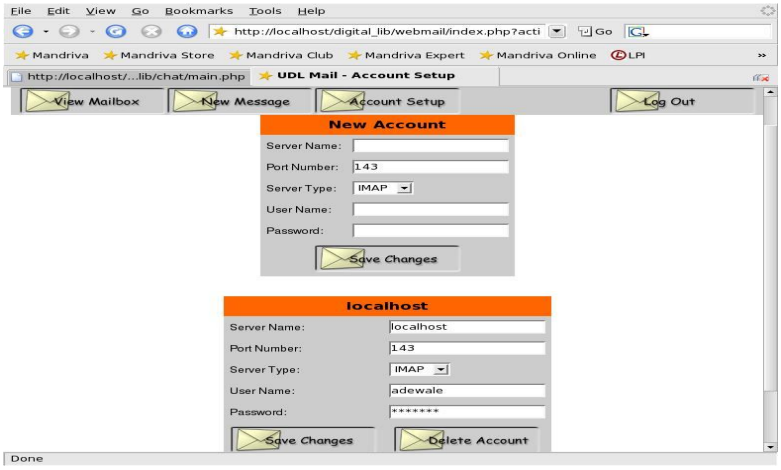


Fig 3.7 – Account setup

When ask a system e-mail option is clicked from the home page, technologist's authentication will be performed. After a successfully login, user can begin using available options such as viewing mailbox contents, reading mail, viewing mail header, deleting mail and sending mail.

After the technologist has setup some account details, he chooses which account to connect to so that he can read his mails. The system also allows for

modification of existing accounts in a similar way to setting up new accounts. Technologist can change his account details and click the save changes button. To delete an account, he clicks the *Delete Account* button that is shown under his account listing.

There are a few ways to sending mail. Technologist chooses this option by clicking the *New Message* button. He can send a new message, reply to, or forward mail Fig. 3.9.

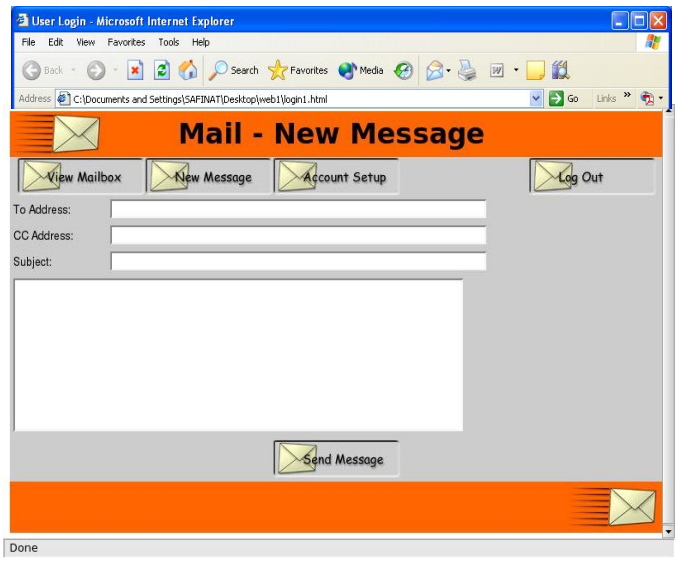


Fig 3.8 – New message

The *Reply*, *Reply All*, and *Forward* functions all send mail the same way that New Message does. The difference in how they work is that they fill in parts of the new message form before showing it to the technologist. The message Technologist wishes to forward has been indented with the > symbol, and the Subject line prefaced with *To*. Similarly, the *Reply* and *Reply All* options will fill in the recipients, subject line, and indented message Fig. 3.10.

To send e-mail messages to the system only the Technologist's e-mail address is required and will be made available to users. Messages can either be like formal letters or increasingly they are much more *conversational* where the

emotions of the writer are expressed as *emoticons*. users will be given e-mail accounts where they can compose their questions and receive answers from the technologist.

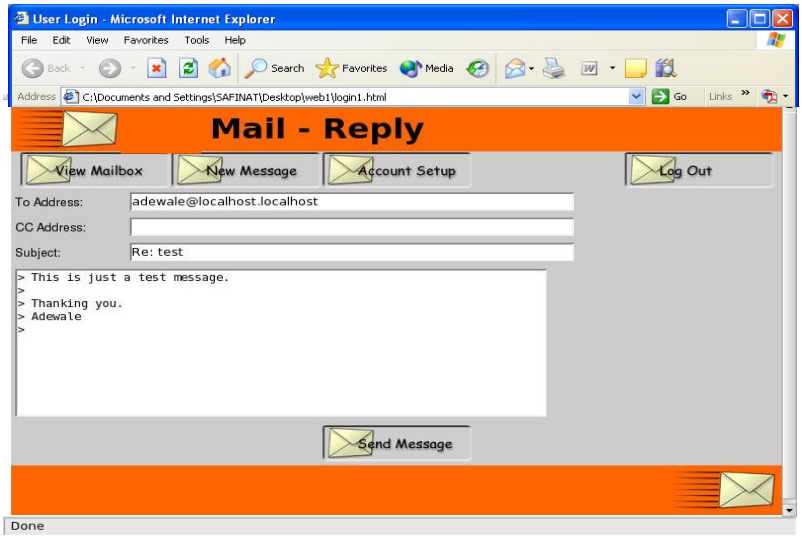


Fig 3.9 – Reply

The internet also enables a group of people to communicate together in a kind of a meeting in which the participants may be anywhere in the world. This group communication can be by text on the screen, by voice, or by video, and messages and responses can be exchanged "live," or they may be read and responded to later. All of these types of online communication are called *online chat* or *online conferencing*. In some types of chatting and conferencing, messages are sent immediately after they are complete, that is, as soon as enter key is pressed after typing a message. This type of communication is called *real-time communication*. Consultation/diagnosis module's *live chat* is a real-time communication and works like instant messaging and could be used to ask librarian questions.

Chat systems come in a variety of flavours ranging from text only messaging systems to fully immersive 3D environments. By far the most common form in recent times is instant messaging. The oldest form of true chat rooms is the text-based variety. The most popular of this kind of chat room is Internet Relay Chat (IRC). However, there are also talkers, bulletin board systems, and havens. The popularity of many these kinds of chat rooms have waned over the years, but IRC's popularity still remains strong.

At the next level are the 2D visual chat rooms. These are characterised by using a graphic representation of the user (avatar) that can be moved about a graphic background of the "room". Two examples of this type of chat room are The Palace and more recently The Manor. These environments are capable of incorporating elements such as games and educational material most often developed by individual site owners, who in general are simply more advanced users of the systems. Some visual chat rooms also incorporate audio and video communications, so that users may actually see and hear each other. This is particularly popular with those keeping in touch with far-flung family members.

Finally, there are the 3D chat rooms. These are similar to the 2D variety except that they utilise 3D graphics. This allows a user a more realistic interaction with the environment. The most popular environments allow users to create or "build" their own spaces. However, some find these types of environments cumbersome to use and actually an impediment to chatting. Three examples of this type of chat are There, Second Life, and Activeworlds.

Ask a technologist live chat is a multilanguage software support that allows online conversation between multiple users and technologist in a real-time

mode. Using full power of MySQL and DOM (Document Object Model), this live chat offers outstanding features and qualities. The live chat features include active links; user profiles with real name, location, e-mail and the like; private messages in separate pop-up windows; save traffic (only new information will be transferred between client and server; guest login, registration and lost password features; multiple user levels with clear rights system; advanced admin panel; and much more. Fig. 3.11 shows a sample of the live chat system. Currently, there is a browser flicker between message translations. This problem will be dealt with in the future.

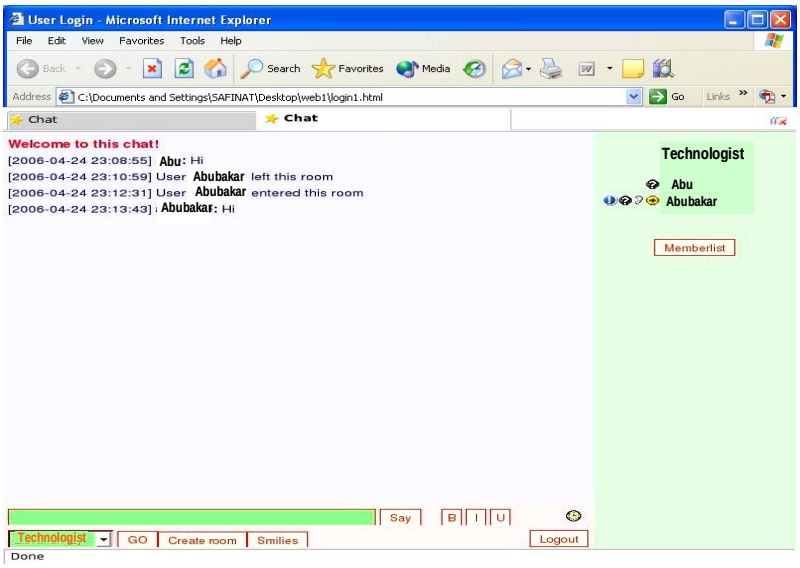


Fig. 3.10 – Live chat interface

Finally, ask a technologist phone option displays phone numbers of the library staff that could be used by uses to talk to staff on their needs. In the future, *skype*, a free internet telephony software may be incorporated to exchange calls between system and technologist staff.

Using videoconferencing techniques, it is possible to obtain a patient's medical history, diagnose patient, educate patient, and make prescriptions among

others. The above scenarios mean that that the patient does not have to travel to urban cities to see specialist, and in many cases, receive access to specialist care where none has been available previously. This also opens up new possibilities for continuing education for isolated or rural health professionals, who may not be able to leave a rural practice to take part in professional meetings or educational opportunities.

Home healthcare is common to many people's healthcare routine across the world, a situation whereby homebound patients could communicate daily with specialists. An internet-based telemedicine system in Nigeria has the capability to support a very large number of patients who may need specific health support at home. This is achievable through an interactive two-way videoconferencing that runs over Internet protocol using videoconferencing and a TV for patient's interaction. The videoconferencing terminal setup in a patient's home consists of patient's existing TV set and remote control, an interface to TV, which also housed conferencing application software, and medical digital equipment. The multimedia data is transmitted through USB and RS323 ports to the telemedicine network. The video screens are very patient-ready, easy to follow, and provide step-by-step instructions for the patient. The system does require the patient to have minimal competence to used the system and in handling the medical equipment at his disposal. Using this approach, it is possible to obtain patient's medical history, examine the patient for immediate healthcare, make remote measurements of vital signs, educate the patients and make some prescription if need be.



Fig 3.11 mobile phone devices used for remote measurement and signs detection

3.4.2.3 TEST MODULE

The test module allows the technicians to record the result of the medical examination and still images of any patient into the lab test table and the still image table in the database respectively. The physician thereafter loads the result from the database and uses it to diagnose the patients in question.

3.4.3 REFERRAL MODULE

Referring a patient to another physician or another hospital is one of the most common transactions in healthcare. When a patient is referred, a subset of his record that is pertinent to that referral is transmitted to the appropriate specialists or hospitals through the telemedicine network. This system provides a mechanism by which physicians can compose a package of referral queue. The process automatically processes the submission in order to select the appropriate specialists or hospital for the patient's condition based upon the information available.

The basic component of the Internet-based healthcare system's infrastructure is presented in Fig 3.2. This includes a user interface made of access devices at the remote rural areas and urban cities, a high-speed, highly reliable and scalable regional network and content management gateway. This approach allows users to access the system through the Internet and a common

content management gateway, which in turn takes request for any services from the users (physicians and other health professionals) and passes it to the appropriate backend systems.

The common content management gateway provides a single point entry to the system via internet. Once a user logged on, the browser presents the main module of the system to the user. Based on the user's selection and successful authentication, the browser presentation logic redirects the user to sub-modules or forms to perform the task selected by the user. Furthermore, a procedure provides the presentation logic for processing the service request, for example, submission of a form to register a new patient or update an already existing patient health history. This is invoked by the action of the user. It uses MySQL Transform's methods to convert the HTML form data into MySQL documents. This conversion provides for structured data format that would be recognized by the backend systems in the hospitals.

After the data conversion, the application then invokes the Database. The Database provides a set of operations for the server and procedure to use when accessing the system. The application invokes, for example, the add/update method of the Database to add/update patient data into the appropriate backend system. In case a patient is to be referred, a form where the physician will specify the referral information from the patient data and others is presented. After the submission of the completed form, an application is invoked and it converts the HTML form data into MySQL document. This in turn invokes the Database referral methods to transmit and queue up the patient information into the appropriate queue server where the appropriate physician could have access to

them. In both cases, it dynamically creates and returns to HTML page with the results of operation specified by the user to the browser.

3.4.4 TRAINING MODULE

Some digital medical material on the system for the use of medical practitioner major for the remote rural health workers is available.

Through Nigerian Telemedicine System the academic professionals from major Nigerian Medical Academic Institutions will extend their educational capabilities to healthcare professionals throughout the rural communities of Nigeria without having to provide facilities and teachers in every rural location. The academic institutions will electronically provide clinical practical training to young doctors and help them obtain advanced medical professional credits. A National Clinical Grand Rounds will be conducted regularly for sharing of information and decision making regarding diagnosis and management of specific complex Nigerian clinical cases. By attracting primary healthcare providers to rural areas of the country the telemedicine system will reinforce the policy of promoting primary healthcare delivery to undeserved Nigerian communities.

One of Nigeria's healthcare challenges is the drain of medical doctors from the less developed rural communities to the more developed urban areas. It is difficult to attract and retain doctors in rural communities because of professional isolation from their peers, lack of continued medical opportunities, low patient volume and loss of continuity when patients are ferred to hospitals in larger urban centres. The recruitment and retention of rural medical doctors will be one of the main deliverables of the Nigeria Telemedicine System. Through telemedicine technology the medical doctors in underdeveloped communities will

find their practice less isolating because the system will facilitate frequent contact with distant colleagues in more developed centres who share their interests. Such interaction will simulate the professional associations that are commonplace in developed urban areas.

3.5 DESIGNING TELEMEDICINE SYSTEM DATABASE

It is extremely important to create a 'blueprint' or 'conceptual model' of the new system database before designing it. Hence the model is design such that the database satisfies the current, and future information needs of the proposed system.

In designing a database of such, the conceptual model does not actually depend on the database model (hierarchical, network, or relational). More so the model is independent of the application, software, and hardware used to build the system; this is to ensure that the required and correct information entered by an end user is properly stored in the database.

There are several approaches to database design. But here we will design our database on the Entity Relationship (ER) model, in which an ER diagram depicted below in fig 3.13 represent the conceptual model of the database. The importance of this step taken is that at the end of the design process we will be able to identify the various tables, the fields in each table, and the relationships between different tables. The ER Model depicts the database design. The ER Model views the entire system as composed of entities that are related to one another.

Before we proceed further, we need to familiarize ourselves with the components of the ER Model. These components are explained bellow:

- Entities

  An entity is a person, place, thing, object, event, or even a concept, which can be distinctly identified. This term covers a very broad spectrum. Take for example, a medical patients 'Mariam Yisah' whose hospital admission or card number is 'ABUTH10987354/08'. She is admitted for typhoid fever case in clinical ward code FW/RM110/BD20 (female ward/room 110/bed number 20) at a hospital called ABUTH (Ahmadu Bello University Samaru, Zaria). Patients and Hospital are all examples of entities.

- Attributes

  Each entity has a set of properties or characteristics. For example, the hospital card number and the name of the hospital are attributes of the entity Hospital, as they defined the entity. Each attribute could further have properties attached to it. For example the hospital card number could be assigned the 'Not Null' and 'UNIQUE' properties. This would imply that the hospital card number is mandatory, and must be unique.

- Relationship

  A relationship can be defined as an association among entities. For example, 'Mariam was admitted in the Hospital' is an association between Mariam, Admitted and Hospital.

To understand this model and its components a little better, let us consider a patient on admission case study. A patient is admitted in the hospital. The

patient is first issued a hospital card and patient medical history taken. Then the case is being attended to by a physician accordingly.

The nouns in the above-mentioned scenario form the entities. Thus, Patient, card, history and physician are entities.

The patient would have a *Hospital Card*, a *name*, and perhaps an *age* and *address*. These comprise the attributes or properties of the entity *Patient.* There could be many more attributes, such as the patient's *sex, tribe, and unit number* and so on. The database designer and the ender user thus decide which of these attributes are required.

In 'Patient on admission in a hospital', 'on admission' is the relationship between the entities *Patient* and *Hospital*. Similarly, in 'A *hospital*, service is by *card*', 'consist of' is the relationship between *Hospital* and *card.*

3.5.1 ENTITY RELATIONSHIP DIAGRAM (ERD)

Entity relationship diagrams graphically represent the entities, the attributes of an entity, and the relationships between these entities. The ERD is the culmination of the database design process. Once this is done, then we can start creating our database tables.

In the previous case study, Patient, Hospital and Card are the entities. These entities, along with their attributes, are listed bellow:

Entity	**Attributes**
Patient	Patient name, patient sex, patient age, patient tribe, patient occupation
Hospital	Hospital name, Hospital Code, Hospital Capacity, Hospital Location,
Card	Card Number, Card Name, Card Date, Card Age, Card Unit

Table 3.2 Entity Relationship Table

The relationships between entities can be described as follows:

- A '*Patient* admitted in a *Hospital*'
- In 'A *Hospita*l access is by *Card* '

With the above outline, we can then proceed to create an ERD. To start with let us depict the Patient and Hospital entities, along with their attributes and relationships.

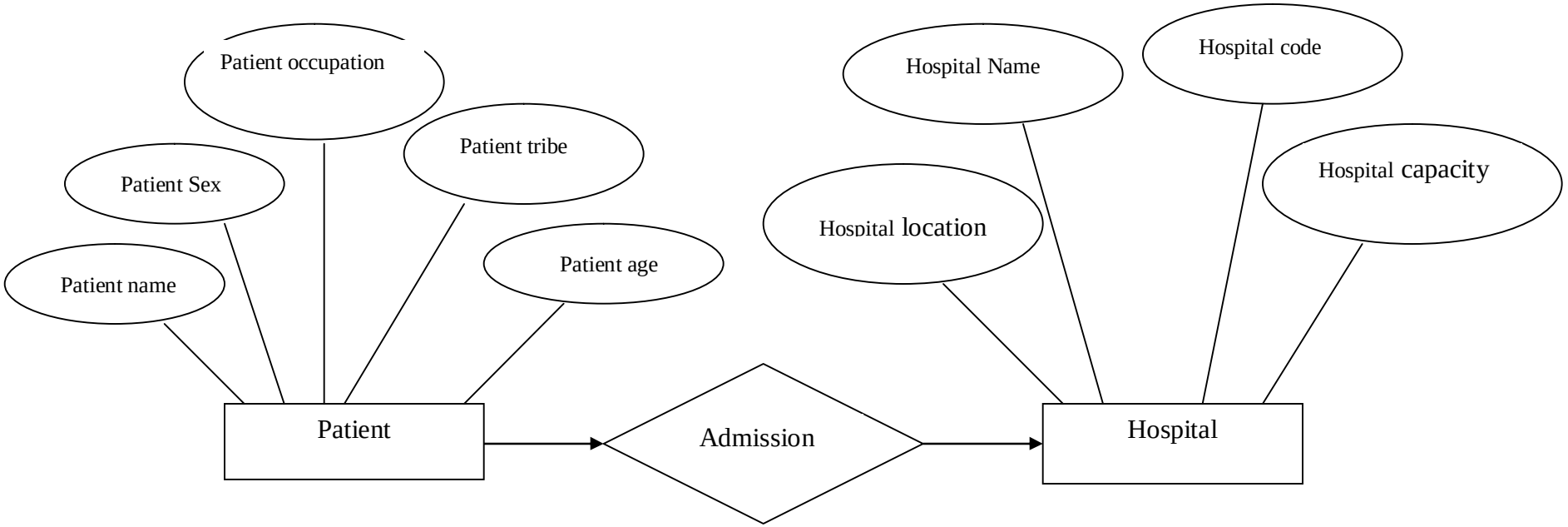


Fig 3.12 Entity Relationship Diagram for Patient and Hospital

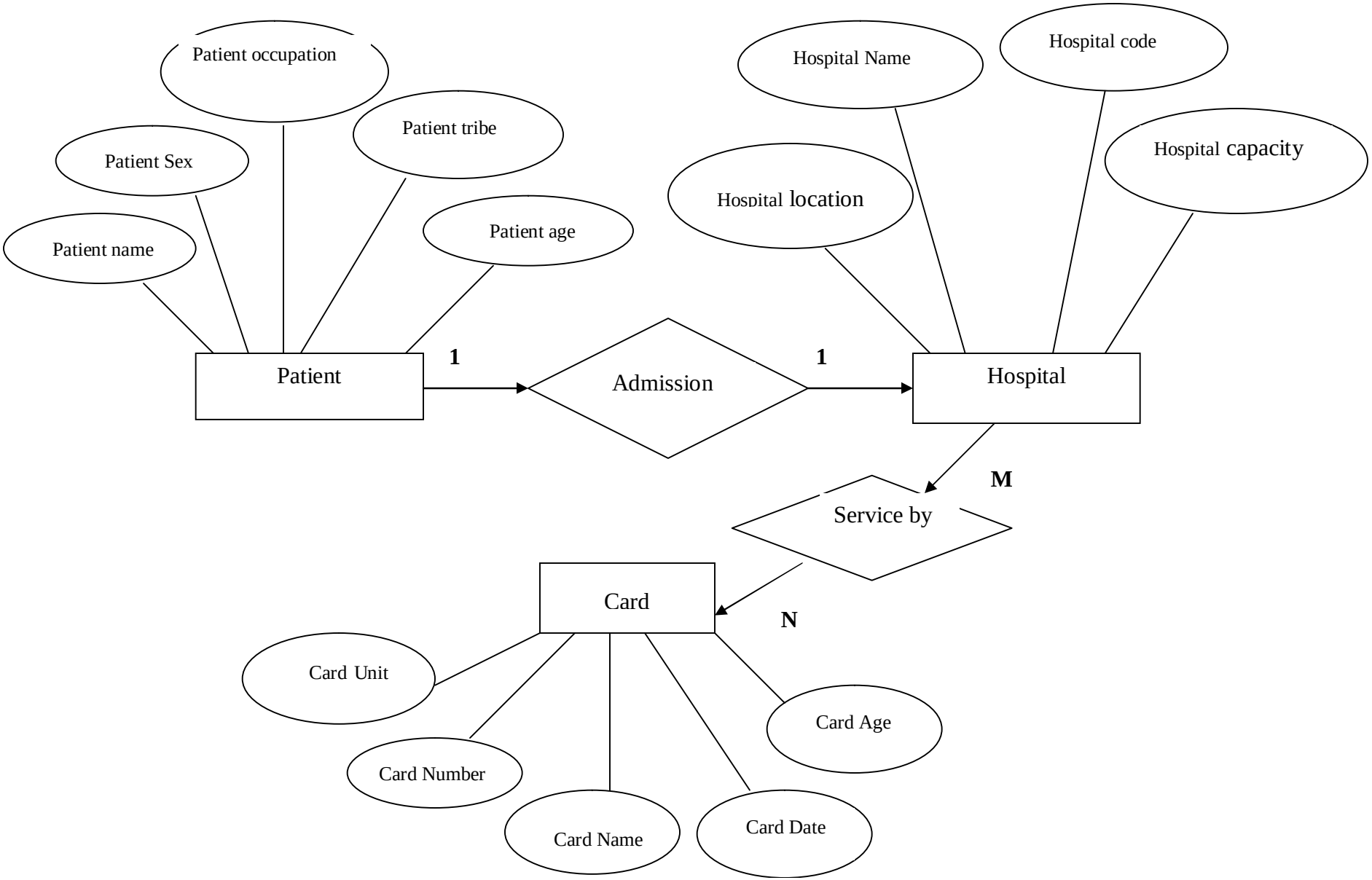


Fig 3.13 Entity Relationship Diagram for Patient, Hospital and Card

A patient can only be admitted in a hospital at a time, a hospital can admit more than one patient at a time, and a patient can only own a card for a particular hospital. Hence the relationship between patient and hospital is of the 'One to One' type. Similarly the relationship between Hospital and Card is 'Many to Many' relationship. In this case, one hospital can have as many cards as possible for many patients.

Relationships can be of three types.

- One to One (represented in the ERDs above as 1:1)
- One to Many, ore Many to One (represented in the ERDs above as 1:N)
- Many to Many relationship

Now that the ERD has been drawn we can now create our tables with easy.

3.6 DESIGNING THE HEALTHCARE ENTERPRISE MEMORY

The Healthcare Enterprise Memory (HEM) can be characterized as a conglomerate Knowledge Memory architecture comprising functionally independent computing systems that provides the functionality to acquire, share, reuse and operationalise the various modalities of healthcare knowledge (example practitioners, healthcare related documents, data, processes, workflows, experiences and lessons learnt). The technical realization of Healthcare Enterprise Memory involves a confluence of data, information and knowledge management technology that in unison aim to operationalise healthcare knowledge so as to realize a suite of strategic healthcare decision-support service. In summary, the healthcare knowledge base are to be populated by the abstraction of internal and external healthcare information/knowledge based on certain content identification criteria. Finally the emergent knowledge base

undergoes a process of review or update to ensure the validity and consistency of the extracted knowledge (see figure 3.14).

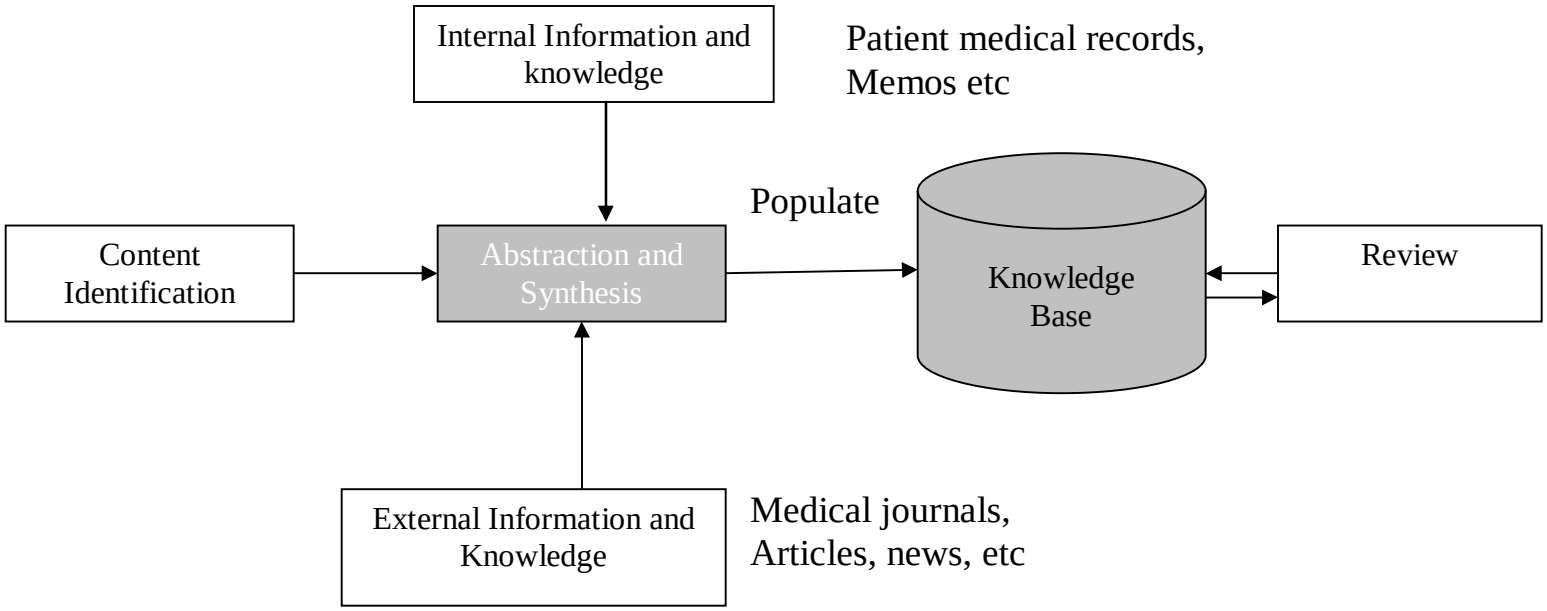


Fig 3.14 A Knowledge Base Creation Environment (Source: Cheah and Abidi, 2000)

The Enterprise Memory comprises of four functionally distinct layers (see figure 3.16):

- Objective Layer: Consist of various healthcare information and knowledge sources such as data, document, knowledge and scenario bases. The sources may have both formal (mechanical-readable) or informal (human-readable) representations.
- Knowledge Description Layer: Enables uniform and intelligent access to object-level resources. The main purpose of this layer is to facilitate accurate specification and selection of relevant healthcare knowledge pertaining to the context. For this purpose, ontologies need to reside at this layer to maintain a standard vocabulary to describe concept and relationships between entities that attempt to share knowledge.
- Application Layer: Models and executes processes and tasks. The Enterprise Memory's service can be realized in different ways, ranging from dedicated programs (which perform a well-defined task) to flexible query interfaces. These include medical protocol models and healthcare work processes management systems.
- Service Layer: provides specialized services to healthcare professionals or the public through the use of devices applications. For instance, forecasting, knowledge and trend analysis, and best practice reporting services.

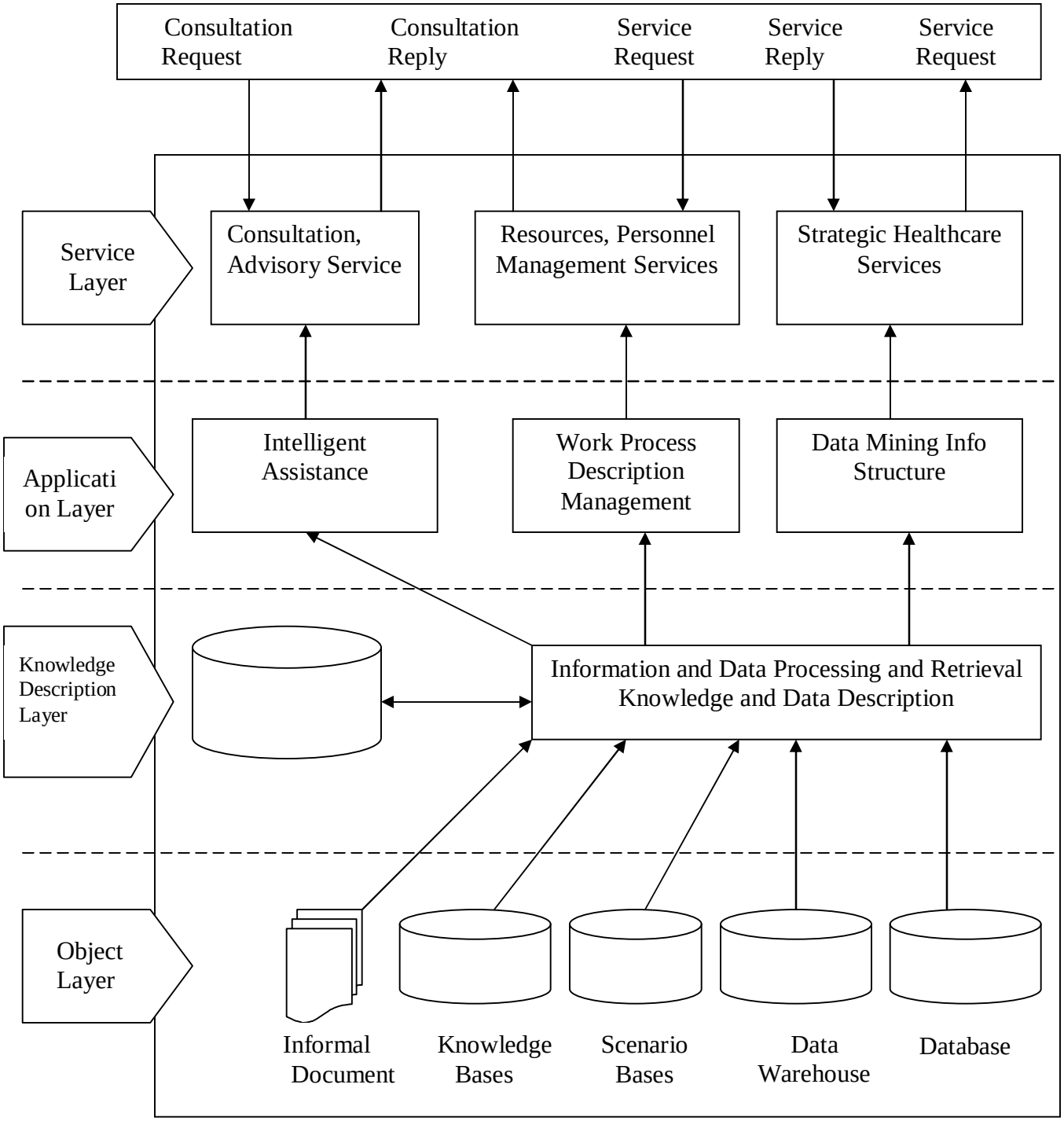


Fig 3.15. The Healthcare Enterprise Memory Model (Source: Cheah and Abidi, 2000)

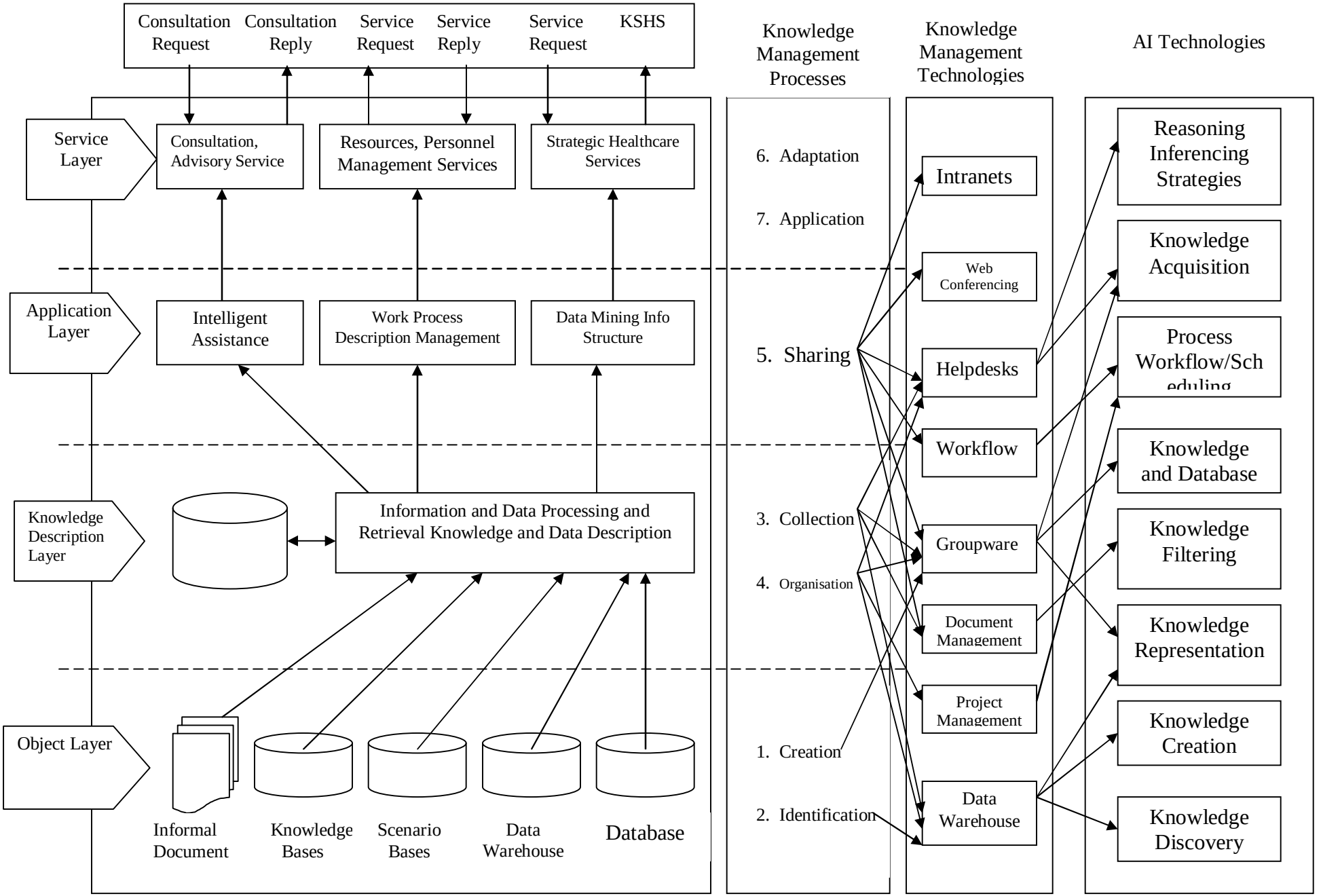


Fig 3.16: **The figure above depict the system proposed Enterprise Memory, showing the mapping of the four-layers to Knowledge Memory Processes to Knowledge Memory Technologies and finally to AI Technologies (Source: Cheah and Abidi, 2000)**

3.7 STRATEGIC HEALTHCARE DECISION-SUPPORT SERVICES

The effective delivery of healthcare services hinges on the ability to deliver appropriate, proactive and value-added services to different client segments on a timely basis. In general, healthcare services need to be systematically determined based on needs; packaged according to usage patterns, demographics and behavioural psychographics; and delivered in a ubiquitous, proactive and continuous manner. These mutually inter-related constraints are hard to formulate, let alone satisfy, using conventional strategic planning techniques. Henceforth, for enhanced healthcare services efficiency and informed strategic planning and management, there is an imminent need to model and measure healthcare processes using definitive healthcare process models that are inductively derived from the collected healthcare data. It is therefore important to propose that the controlled simulations of data-derived healthcare process models can be effectively used to derive 'knowledgeable' (strategic) insights about the intrinsic behaviour of the healthcare enterprise. The rational of the approach is that by understanding what worked or did not healthcare parishioners can identify areas for improvement and/or capitalize on past successful methods.

Strategic healthcare decision-support provided for the proposed system usage can best be seen as a suite of incorporated knowledge/data driven, strategic, decision-support services derived from both healthcare data and the healthcare enterprise's knowledge base, with the objective to improve the delivery of quality healthcare services. Typically speaking SHDS may include: trend analysis of disease/epidemic, treatment patterns, hospital admissions, drug patterns and so on.

Main SHDS	Specific SHDS
1. Analyzing trends in hospital admission	▪ Spectrum of disease ▪ Seasonality in disease pattern ▪ Intervention measure to be instituted
2. Analyzing treatment pattern	▪ Comparison between hospitals and within hospitals ▪ Criteria for admission ▪ Investigations ▪ Therapeutic intervention
3. Analyzing outcomes of treatment	▪ Gauge standard and quality of care ▪ Highlight aberrations in treatment outcomes
4. Analyzing cost-effectiveness of healthcare	▪ Audit expenditure and income ▪ Highlight areas of interest
5. Planning out-of hospital (ambulatory) care	▪ Assessing client (patient's and relative's satisfaction) ▪ Allows plan of care after discharge to be made ▪ Monitor treatment after discharge and out patient's management
6. Forecasting 'new disease' and strategizing appropriate preventive measures	▪ Allow appropriate preventive strategies to be recommended at community level ▪ Better public education strategies
7. Forecasting complications of treatment	▪ Hospital acquired infection ▪ Drug resistance pattern ▪ Latrogenic diseases
8. Forecasting the spread of infectious diseases	

Table 3.3 A Synopsis of the System SHDS

3.8 IMPLEMENTING THE SYSTEM DATABASE

The sole aim of designing a physical database schema is to prepare technical design specifications for a database that will be adaptable to future requirements and expansions. The deliverability of this task includes the resulting database schema shown in Fig 3.13 below. A database schema is the structural model for a database. It is a picture or map of the record that depicts relationships to be implemented by the database in view.

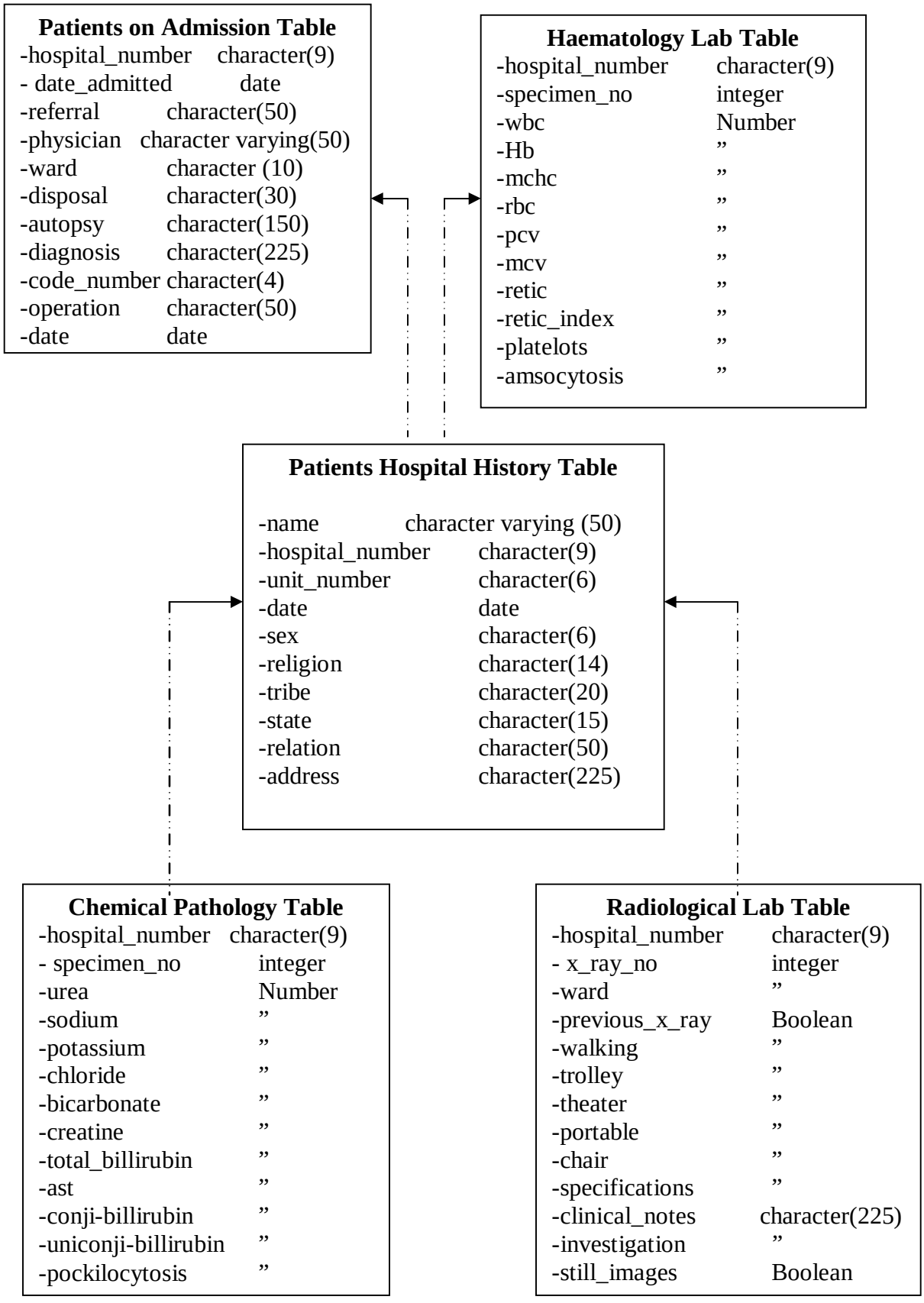


Fig 3.17 Physical Database Schema

The Patients Hospital History Table is the parent table. The main goal of figure 3.12 above is to show the relationships existing between the various tables in the teleconsultation database and their implementation respectively. Each time a request is placed on the child table with respect to the parent table, a join operator occurs. The join operator builds a relation from two specified relation. This relation consists of all possible combinations of tuples, one from each relation that satisfies the condition.

W1	Q1
W2	Q2
W3	Q3

Table 3.2a

Q1	R1
Q2	R2
Q3	R3

Table 3.3a

JOIN of Table 3.2 and Table 3.3

W1	Q1	R1
W2	Q2	R2
W3	Q3	R3

Table 3.4

For example, we assume that there are two tables 3.5 and 3.6. Table 3.5 contains patients name, age, hospital number and sex. Table 3.6 contains the patients' date of admission, code number, physician, and hospital number. Here, a system user might need to know those patients that were attended to by the following physicians Muhammad Bello, Peter Adams, and Moses John on a given date. The result obtained is as depicted below.

Name	Hospital_number	Age	Sex
Farida Usman	TL0001990	89	F
Peter Adams	TL0007689	45	M
Moses John	TL0005554	23	M

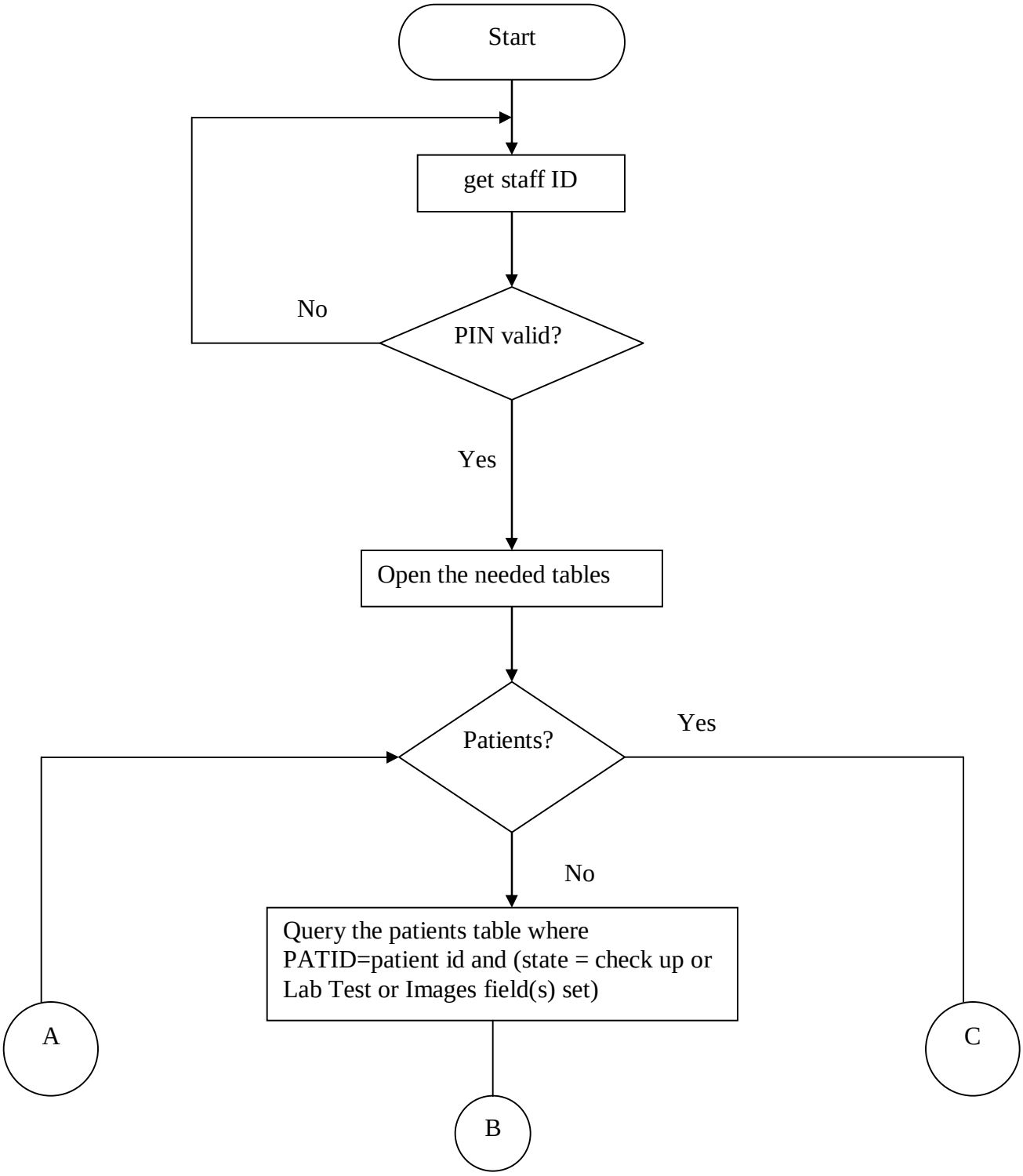
Table 3.5

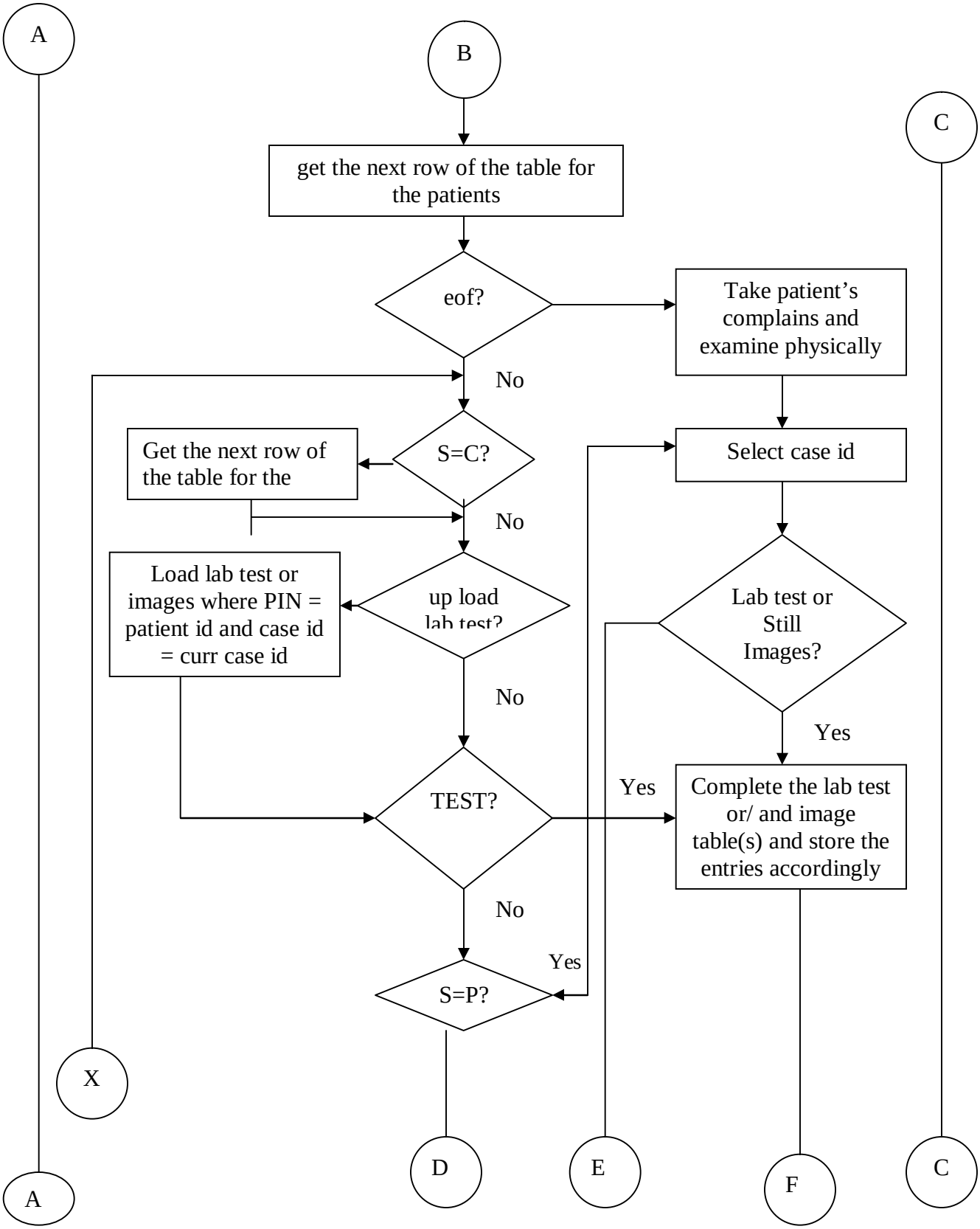
Hospital_number	Code_number	physician	Admission_date
TL0001990	PH078	Musa Bello	09/11/2007
TL0007689	TN345	Peter Adams	12/08/2006
TL0005554	MD897	Moses John	04/12/2003

Table 3.6

Name	Hospital_number	Code_number	Age	Sex	Admission_date	Physician
Farida Usman	TL0001990	PH078	89	F	09/11/2007	Musa Bello
Peter Adams	TL0007689	TN345	45	M	12/08/2006	Peter Adams
Moses John	TL0005554	MD897	23	M	04/12/2003	Moses John

Table 3.7: Relation obtained from table 3.5 and 3.6


Start
get staff ID
No
PIN valid?
Yes
Open the needed tables
Patients?
Yes
No
Query the patients table where PATID=patient id and (state = check up or Lab Test or Images field(s) set)
A
B
C


A
B
C
get the next row of the table for the patients
eof?
Take patient's complains and examine physically
No
Get the next row of the table for the
S=C?
Select case id
No
Load lab test or images where PIN = patient id and case id = curr case id
up load lab test?
Lab test or Still Images?
No
Yes
TEST?
Yes
Complete the lab test or/ and image table(s) and store the entries accordingly
No
Yes
S=P?
X
D
E
F
C
A

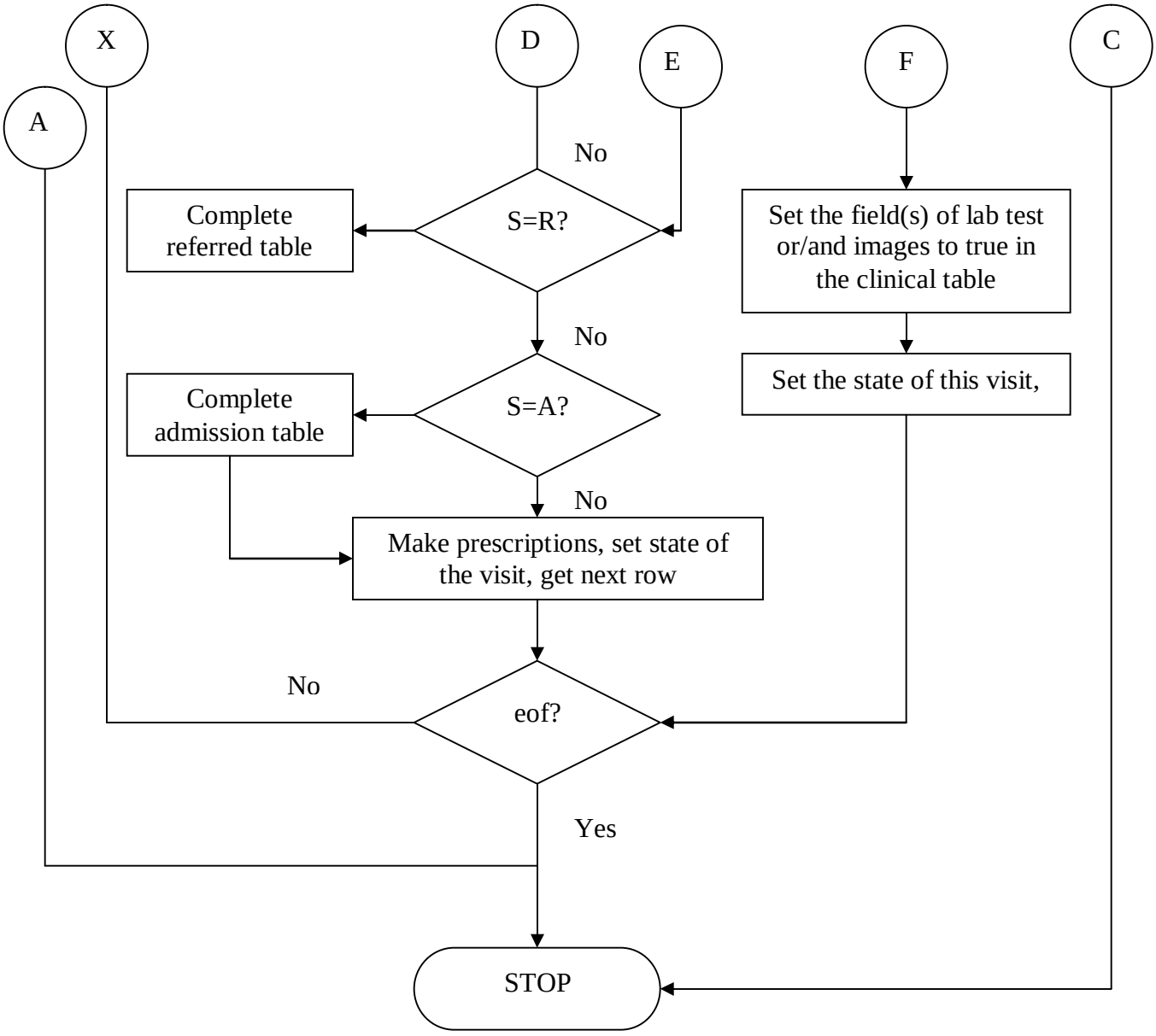


Fig 3.18 Transaction Diagram for Consultation/Diagnosis Module

CHAPTER FOUR

SYSTEM IMPLEMENTATION AND PERFORMANCE ANALYSIS

4.1 SYSTEM IMPLEMENTATION

The system was implemented in four units: the initial unit, which covers security and privacy as regards to administrative authentication rights and the confidentiality of the patient's electronic health record, the second and third units implement the end-user working sheets or interface for healthcare professionals and rural health workers alike and the fourth unit that construct the database.

4.1.1 SYSTEM SECURITY AND PRIVACY

Developing an Internet-based system allows the exchange of patient's data electronically among physicians and hospitals. This exchange makes security one of the highest priorities, that is, allowing healthcare professionals have access to patient's data while also ensuring their privacy becomes a necessity. Security and privacy have different implications. Privacy is a matter of policy decision, while security has to do with the tools to implement the policy. Internet security involves the applications of both non-technical and technical counter-measures. The non-technical measures for issuing Internet security include formulating a corporate security policy and educating and training users about that policy. On the other hand, major technical measures consist of access controls, authentication, data encryption, firewall, audit, anti-virus tools, and self-assessment. In recognition of the sensitivity of the patient data contained in the system, communication and the public network are protected with open_ssl

library for data encryption and role-based authorization is built into the system to specify access right to the database system.

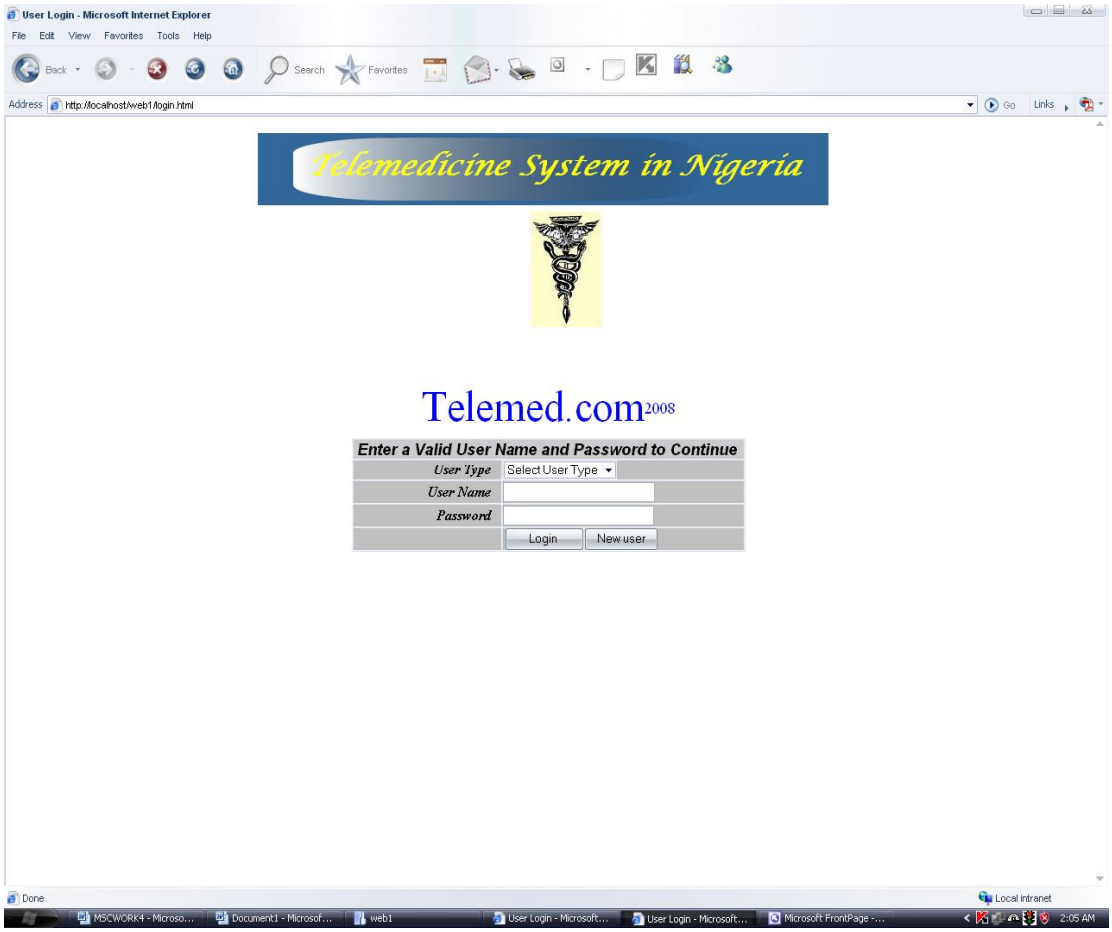


Fig. 4.1 User Login

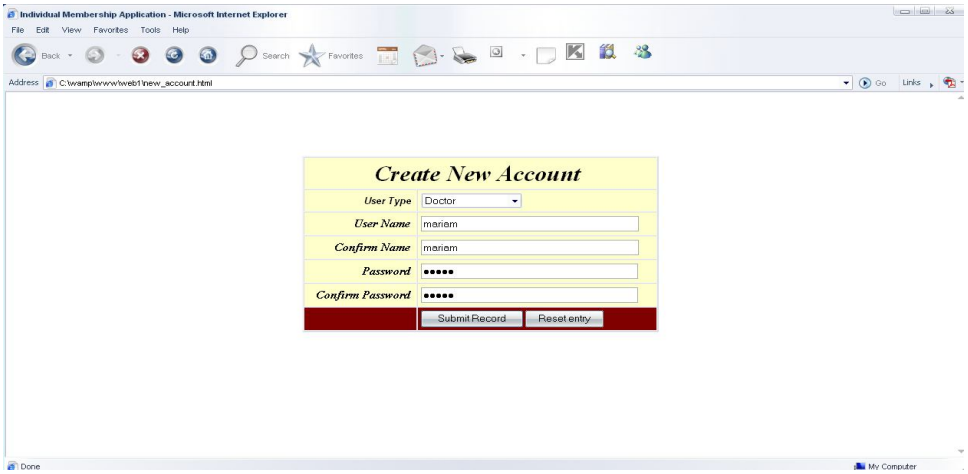


Fig 4.2 Creating a New User Account

4.1.2 SYSTEM INTERFACE

A web-based system contains patient-centric, electrically maintained information about an individual's health status and care, focusing on tasks and events related to patient care and optimized for use by clinicians. When designed correctly, it meets all of an organisation's clinical, legal and administrative requirements for the clinical process. The system's key role is to improve the delivery of healthcare services and quality outcomes by supporting physician's needs. It is implemented in steps, based on the return on investment that can be achieved within an organization. Components include clinical workstations, data entry system, templates or forms, communication (wireless, hard-wired and/or Internet-enable), security, master patient index (MPI), order entry results reporting and decision support.



Fig 4.3 Telemedicine System Home Page

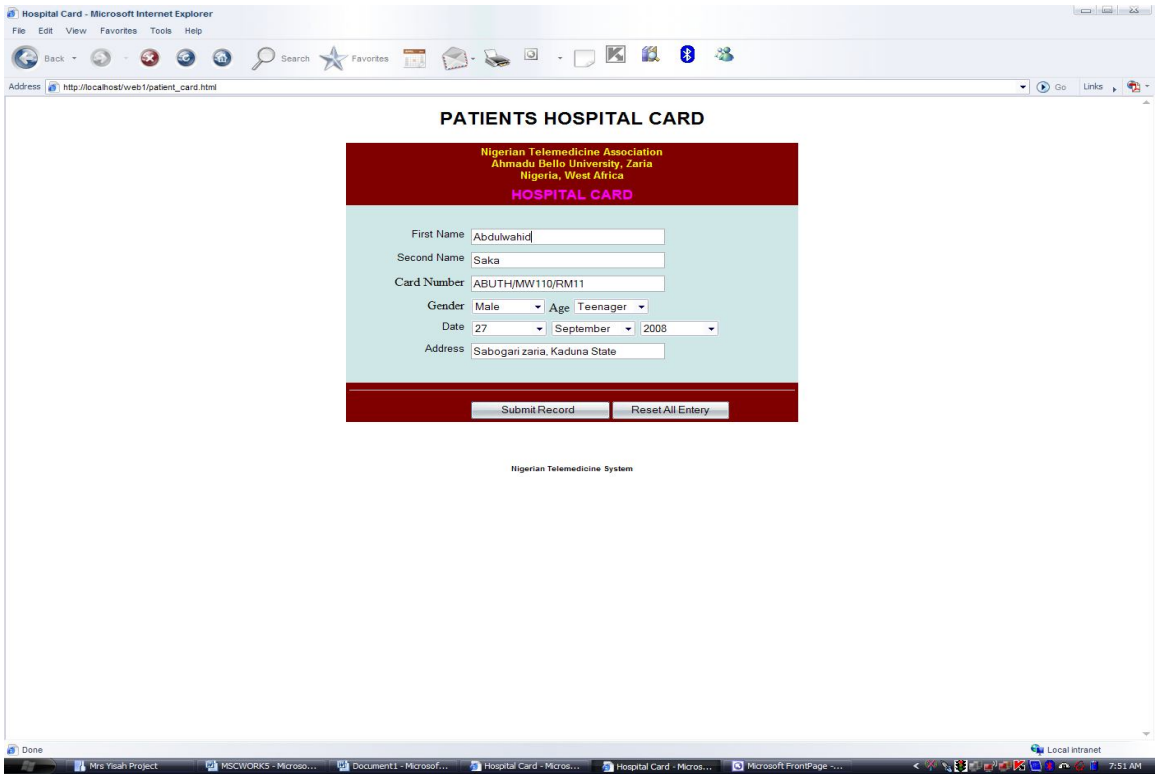


Fig 4.4 Patient Electronic Card

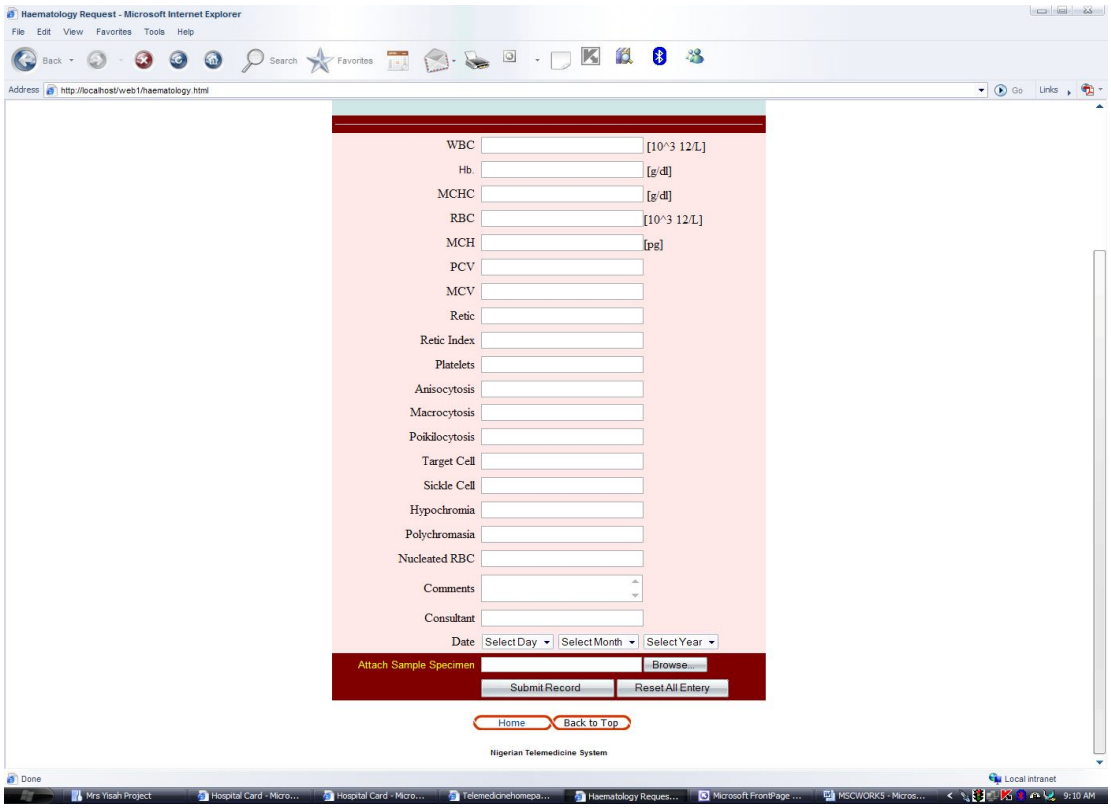


Fig 4.5 Haematology Request Form

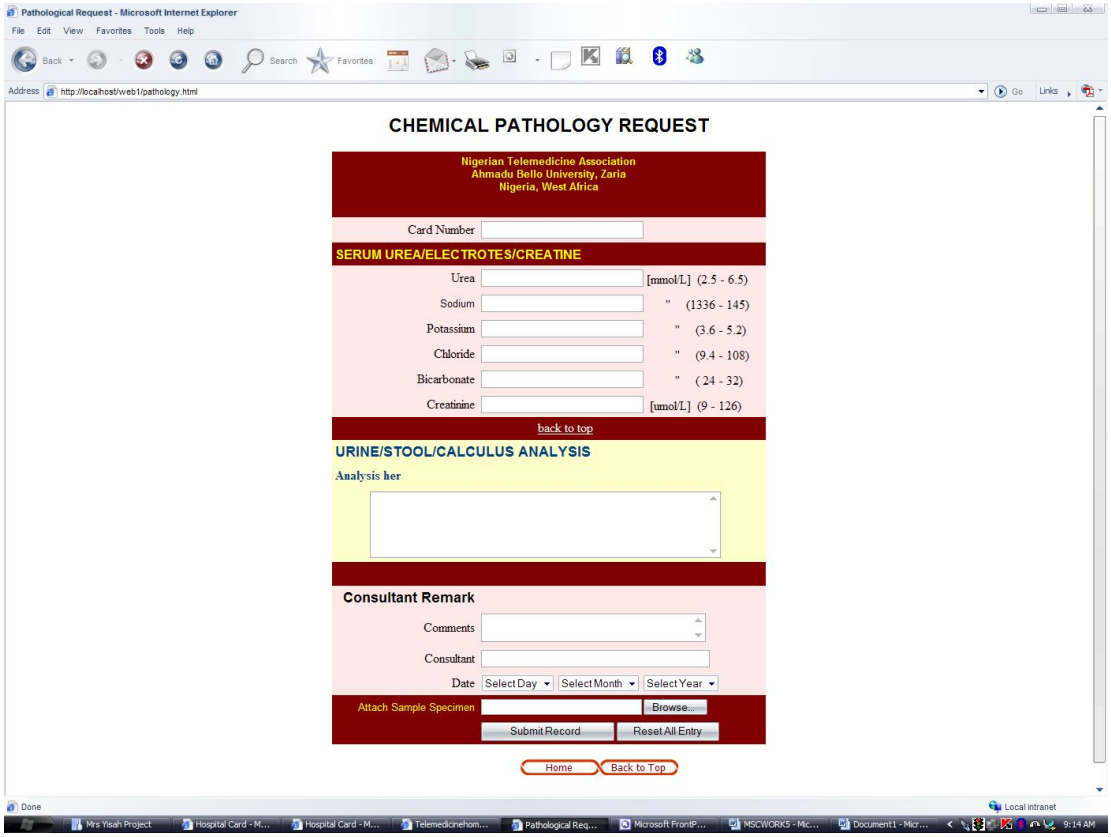


Fig 4.6 Chemical Pathology Request Form

4.1.3 TELECONSULTATION DATABASE RESULT

The consultation application database was designed to contain a wider range of medical records for the patient population it was meant to serve. To date it contains more than ten years of information ranging from laboratory, pathology, and radiology result and images, echo cardiology reports, cardiac catherization lab studies, nursing documentation of patient assessments and histories, discharge summaries, operative reports, history and physicals, medication lists, patient demographics, and electronic record documentation. The target of this research work is to make this information available via a web portal for all physicians and remote rural health workers.

4.2 PERFORMANCE ANALYSIS

First and foremost it is crucial to realize that this type of computarisation is often the most complex, costly and difficult that any healthcare organization can deploy. It is often met with great resistance because of the nature and level of change that was required. It can take many years to fully implement. Needless to say, without vision and leadership by a senior executive and medical staff leader of the organization, a project like this nature can easily fail. It is also one of the most, if not the most important clinical computerization projects that an organization can implement.

4.2.1 SOFTWARE ANALYSIS

Software (functionality that is required) is one of the first things that must be considered when implementing an electronic health record. Electronic health record software is usually very complex and must be constantly maintained and updated. In many rural communities hospitals and/or healthcare providers have

difficult time recruiting and retraining talented information technology staff. Therefore, the new system implements within it some standard modules liken to those found in a vendor-developed product. Some of these modules are:

- Results (a radiology report or laboratory values).
- Ambulatory medical record (physician office record that contains chart notes, medications, patient problem list, history).
- Scanning (the scanning of various non-computerized documents into the software).
- Documentation (the ability to type various types of notes and or template notes).
- Nursing (this could include items like Health History, Nursing assessments, progress notes.).
- Other care provider (charting from areas like physical therapy, social services, dietary).
- Physicians (this could include physician order entry, inpatient consults, progress notes, etc.).
- Pharmacy Information, such as electronic prescribing, pharmacy profiles, decision-support tools, adverse drug-drug, drug-allergy, drug-food and drug-disease-checking modules, bar coding and drug administration.
- Applications that allow access via the Web are becoming more and more popular and are considered easier to implement both from a technology standpoint as well as from the end-user training perspective.

4.2.2 HARDWARE ANALYSIS

Hardware is a major implementation investment and can be dependent on the product that is implemented. It is very important to work with the vendor when selecting hardware. Many times hardware selected that a layperson would consider the same, will not offer the same functionality as the hardware used/recommended by the vendor. The following are several options for use with a teleconsultation system:

- Client Server applications normally use a personal computer as the interface for the end user. These types of systems can be cumbersome to support and maintain if the client device requires frequent updates. Again, each system is specific to vendor requirements and may or may not require extensive support and maintenance.
- Terminal Based - For the most part, these types of systems are considered legacy systems that use dumb terminals. These are the least attractive to install today and have severe limitations for end-users. However, on the positive side, most of them work really well and once the user is accustomed to using the device and the system the learning curve diminishes significantly.
- Handhelds personal digital assistants (PDA) are becoming more and more popular. PDA is best used in a situation where a great deal of data does not need to be viewed on the device. Because of the limitations of the screen display, a good use for a device such as a PDA would be the entry of patient's vital signs.

- Wireless devices – Laptops and other types of computers can be deployed via a wireless network. This can be a large expense for the organization but can also have a rapid payback by creating an environment whereby the physician has the ability to document and review the patient information at the bedside.

4.2.3 TECHNICAL ANALYSIS

Technologies used in the implementation of teleconsultation system are similar to those used in any other specialty that relies on clinical physical exam to diagnose and treat patients delivered via telehealth. Transmission technologies are adequate if delivered at 128, 256, or 384 kbps. Full T-1 bandwidth interactive video is not required to provide consultations. In fact, many consultations are provided via low-bandwidth technologies due to the lower cost and wide-spread availability. In an activity based cost analysis of telehealth, a T-1 line may not be feasible from a cost perspective unless shared by other services that produce higher utilization/revenue per case/value added expense reduction. The degree of physical exam becomes more difficult at the lower transmission speed but with digital capture and rebuild built into many of the current transmission technologies as well as cameras, lower frame rates are not a barrier to telehealth. Equipment is specific to the services provided.

4.2.4 INTEROPERABILITY

A key to interoperability is the use and adoption of standards. Interoperability is the ability to “talk” from one information system to another and to share data. As more and more clinical information system are installed in

healthcare organization across the country, it will be necessary for the system to talk to one another and to share data to provide the best in patient care. This is the standard communication network protocol by which the proposed system is built upon and expected to perform more effectively.

4.3 CHALLENGES AND IMPLEMENTATION BOTTLENECK

While Internet-based teleconsultation system in Nigerian certainly has promises, there are a number of challenges and implementation bottlenecks, which may hinder it to deliver its promise to the citizenry. Therefore, to successfully implement and deploy the above system, the following challenges and bottlenecks must be addressed.

4.3.1 ORGANISATIONAL AND CULTURAL INERTIA

Most government entities are not known for their efficiency or willingness to adopt changes. Organizational bureaucracy and lack of clear communication channels or collaboration culture are some of the difficult problems to resolve in which the system can become successful. Government at federal, state and local levels are known for being irresponsive, closed, secretive, arrogant, bureaucratie, and resistant-to-change. Organizational and cultural changes often are more difficult than technological change.

4.3.2 TECHNOLOGY AND INFORMATION CHANGE

Most government entities are not taking advantages of adjusting information technology opportunities and most existing information systems are inadequate to meeting the requirements of the new models of health being deployed in the content of health form initiatives. Beside the common perception

among physicians that health information systems are mostly a source for scientific and technical information, often public health workers have a view of clinical administrative information system that is obsolete and frozen “a statistical-epidemiological” archetype, designed for the collection of numerical data representing the counts of event and mostly generating only highly-aggregated statistical data and time series related to mortality, morbidity, and to service utilization and coverage. Those information systems have very little practical interest to healthcare professional and unit managers and far behind in providing the logistical and longitudinal individual client-based data required to operate and manage the sort of healthcare models developed in many countries.

Worse still, most public health authorities are totally oblivious to the broad variety of possibilities offered by modern information and communication technologies to manage client-based data, support operations, and mine large database. Indeed, the health sector has not applied the range of options provided by information and telecommunication technologies effectively and health has been conspicuously underrepresented in national technology-development policies and plans.

4.3.3 LACK OF IT FUNDING AND HUMAN RESOURCES

Some government bodies (local, state and federal) are affluent, but most are not. IT spending often is much a priority and one of the most significant barriers to telemedicine implementation is cost. The maintenance costs for telemedicine in per-unit cost over the last years, start-up investment and maintenance costs of a telemedicine network are still high. As well, technology becomes obsolete quickly. Pressure on the appropriate government will surely

increase as more people realize the benefits of teleconsulation system. This will prompt to set aside a large sum of money for the implementation of the system. In addition, public teleconsultation centres could be located within urban cities where remote consultation and diagnosis between remote patients in the public telemedicine centre and the specialists to take care of immediate and emergency healthcare cases. This approach also could be initiated in the Nigeria higher institutions in order to argument institution's healthcare delivered by allowing nurses in these institutions to consult with specialists. The system could also be initiated in correctional institutions, where the cost and danger of transporting prisoners to the hospitals can be avoided. However, the system are very patient-ready, easy to follow and provide step-by-step instructions for the patient and does require the patients have little competence to use the system and in handling the medical equipment at his disposal.

4.4 TRAINING:

One of the most important issues in implementation of Teleconsultation system is training.

Research has found many health workers to be very computer literate and just as many that have never used a computer before. When migrating to a personal computer based system, it is important to evaluate what percentage of your users will need computer training before you can begin to implement the training for the Teleconsultation system. Local high schools, colleges or universities are excellent partners for basic computer training because of their access to large training rooms with multiple computers and pre-designed introduction courses. Training sessions should be designed to meet the users, with

a list of objectives and adherence to the time schedule, the sessions should be held during times and in places that the trainees would be able to attend. For example, it would be counterproductive to hold a training session for physicians at 10 AM – a time when most physicians are seeing patients in the office or attending to other patients care needs.

4.4.1 PRO AND CONS TRAINING METHODS

- One-on-one training

  Users at a basic computer skill level usually learn better in a one-on-one training opportunity. For those who are computer literate, sitting in front of a computer can be quite intimidating. This type of training allows for the training to proceed at a speed that is comfortable for the trainees. Physicians or executives who are not computer literate are excellent candidates for this type of training. This type of training is very time and resource intensive for the success of the program this type of training should be considered. When implementing a system that requires little training and oversight, it is useful to have the training group make rounds. The group visits the user areas – such as a nursing floor – and trains the physicians, as they are available.

- Classes for users with essentially the same skill level, classes can be the most effective. It is very effective to do some pre-screening or testing of the user in advance to place students with similar skills in the same class. A trainer-to-trainee ratio of 1-2: 7-10 works best, at a bank computer. The hands-on training is very important, as it allows users to make mistake and to explore the program at their own peace. Classes usually contain trainees at a range of skill levels. If at all possible it is helpful to have the trainees

grouped by skill level, but because of limited training sessions this might be difficult to arrange. Less skilled user should be asked to identify themselves early in the class, so they can obtain some individual help as needed.

- Conferences: Training a large user group, such as physician, in a short period of time is one of the most challenging obstacle when implementing an teleconsultation system. Research has found that all-day training sessions during a conference to be most effective. There are some coporate bodies that offer Continuing Medical Education(CME) credits, speakers on related topics and a schedule that repeats all day long in a location that is off the hospital campus. This method is very staff intensive, from planning to fund raising and requires a team to plan and staff the conference. This model also works well for large groups of nurses or other large groups who need to be trained.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

This project involved the development of a pilot internet and communication technology-based telemedicine system for primary community health care in urban and rural areas of Nigeria.

The research work describes a telemedicine environment that could be used to provide tools for overcoming the unequal distribution of medical experts, establishing meaningful consultation between remote rural healthcare practitioners and specialist typically located in the urban medical centers. It also provides opportunities for the healthcare practitioners to obtain access to information that can aid in the diagnosis of patient's health conditions or the development of suitable treatment plans and for the patients to enjoy an enhanced level of healthcare service in the remote rural areas. The system could as well be used in the urban medical centers as an underground support for medical practitioners, thereby allowing more accurate diagnosis, more effective treatment and enhanced level of healthcare services.

The proposed system is at its maturity stage and more contributions are still required from either private or government healthcare institutions in other to make the system feet and robust towards meeting the demand for quality healthcare from all ramification of healthcare services. Apart from the stored and forward approach as stated above an interactive two-way remote consultation and diagnosis between the patients in the remote rural areas, remote rural health workers and specialist in the urban cities could be supported using H.323 standard

over a network in the future. Using video conferencing technology and specially adapted medical tools and devices interfaced to the computer, the remote specialist can see his patient, talk with the remote rural health worker, hear heartbeat through remote stethoscope, see images from ear through stethoscope, nose, and throat or skin conditions or make some other remote measurements of vital signs through a device such as Tandberg's Healthcare system III. Other area to be expected is the possible addition of data mining technique to the system. This would allow the formulation of diagnostic behaviours and the building of a knowledge based system to assist in medical diagnosis and treatment.

5.2 RECOMMENDATION

The target of this research work is to make this information available via a web portal for all physicians and remote rural health workers. Based on this the following recommendations are made:

- Government should try and adopt changes and define a communication channel.
- With the aspect of privacy, government has to make strong policy decisions to support privacy.
- Majority of areas in Nigeria especially the rural areas have no electricity supply, for the system to be established in Nigeria electricity must be provided.
- Internet facilities have to be extended to the rural areas.
- An Internet-based distance learning system should be developed to extend educational capabilities to healthcare professionals throughout the rural

communities of Nigeria without having to provide facilities and teachers in every rural location.

5.3 AREA OF FURTHER RESEARCH

Some components of the proposed system are still under development; in particular the focus of the on-going work is the acquisition of tacit knowledge and the creation of a variety of medical knowledge bases. Put simply, the implementation of this system is non-trivial and perpetual activity that involves the active participation of a variety of player, more importantly a team of knowledge memory and healthcare practitioners. Other areas to exploit may be possible addition of data mining technique to the system. This would allow the formulation of diagnostic behaviours and build an expert system that will assist in medical diagnosis.

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www.healthmgttech.com

www.healthdatamanagement.com

www.healthcareinformatics.com

APPENDIX A

Source Code Listing

// User Login Code

```
<?php
$usertype=$_POST['usertype'];
$usernames=$_POST['username'];
$userpassword=$_POST['userpassword'];
include("connect.php");
 $queryuser="SELECT * FROM usertb
  WHERE (usertb.username='$usernames' AND userpassword='$userpassword' AND
usertype='$usertype')";
  $user_result=mysql_query($queryuser);
  $nrowsuser=mysql_numrows($user_result);
mysql_close();
if ($nrowsuser==0):
//print"<script language=javascript>alert('wrong user name')</script>";

include("login.html");
print"<center><font color=#FF0000 size=7>Wronge User Name Or Password</font></center>";
else:
include("home.html");
endif;
?>
```

// Create User Account Code

```
<?php
$usertype=$_POST['usertype'];
$username=$_POST['username'];
$userpassword=$_POST['userpassword'];
$usertype=trim($usertype);
$username=trim($username);
$userpassword=trim($userpassword);
//print"$usertype,$username,$userpassword";
//die();
include ("connect.php");
$queryuser="INSERT INTO usertb
  VALUES ('','$usertype','$username','$userpassword')";
  $resultuser=mysql_query($queryuser);
  if (mysql_affected_rows()>0)
  {
        print"<B> User successfully created</B>";
    include("new_account.html");
  }
else
{print"<B>Account creation Fail! User $username already exist. Duplication of Name not allowed
please</B>";
include("new_account.html");}
?>
```

// Connect to Database Code

```
<?php
```

```
$username='root';
$database='telemedicinedb';
mysql_connect(localhost,'root','') or die("Access to server not granted");
mysql_select_db($database) or die ("Access to telemedicine database not granted");
?>
```

// **Form Entry Validation Code**

```
function checkrequired(which) {
var strErrMsg = ''
if(!which.FirstName.value){
    strErrMsg += 'Please enter a First Name.\n';
 }
if(!which.LastName.value){
    strErrMsg += 'Please enter a Last Name.\n';
 }
 if(!which.MiddleName.value){
    strErrMsg += 'Please enter a Middle Name.\n';
 }
 if(!which.HoptNumber.value){
    strErrMsg += 'Please enter a Hopital Number.\n';
 }

if(!which.day.value){
    strErrMsg += 'Please select a day.\n';
 }
if(!which.month.value){
    strErrMsg += 'Please select a month.\n';
 }
if(!which.year.value){
    strErrMsg += 'Please select a year.\n';
 }
if(!which.gender.value){
    strErrMsg += 'Please select gender.\n';
 }
if(!which.ocupation.value){
    strErrMsg += 'Please enter a occupation.\n';
 }
if(!which.religion.value){
    strErrMsg += 'Please enter a religion.\n';
 }
if(!which.tribe.value){
    strErrMsg += 'Please select a tribe.\n';
 }
if(!which.state0.value){
    strErrMsg += 'Please select a state.\n';
 }
if(!which.lgovment.value){
    strErrMsg += 'Please select gender.\n';
 }
if(!which.zip.value){
    strErrMsg += 'Please select gender.\n';
 }
if(!which.country0.value){
    strErrMsg += 'Please select country .\n';
 }
if(!which.country1.value){
```

```
    strErrMsg += 'Please select country of next of kin.\n';
 }

 if(!which.address1.value){
    strErrMsg += 'Please enter first address.\n';
 }
 if(!which.address2.value){
    strErrMsg += 'Please enter second address.\n';
 }

if(!which.Subscrcity.value){
    strErrMsg += 'Please enter a city.\n';
 }
if(!which.state1.value){
    strErrMsg += 'Please enter a state.\n';
 }
if(!which.zip.value){
    strErrMsg += 'Please enter a zip.\n';
 }
if(!which.phone.value){
    strErrMsg += 'Please enter a phone.\n';
 }
 if(!which.fax.value){
    strErrMsg += 'Please enter a fax.\n';
 }

if (!validEmail(which.Email.value)) {
            strErrMsg += 'Please enter a valid Email.\n';
            boolSubmit=0;
            }
if(!which.EmailConfirm.value){
    strErrMsg += 'Please enter a EmailConfirm.\n';
             }
else {
            if (!(which.Email.value==which.EmailConfirm.value)) {
                strErrMsg += 'Email and EmailConfirm must match.\n';
            }
}
if(!which.nextfname.value){
    strErrMsg += 'Please enter next of kin first name.\n';
 }
 if(!which.nextLname.value){
    strErrMsg += 'Please enter next of kin last name.\n';
 }
if(!which.relationship.value){
    strErrMsg += 'Please enter relationship.\n';
 }
if(!which.nextaddress1.value){
    strErrMsg += 'Please enter first address of next of kin.\n';
 }
if(!which.nextaddress2.value){
    strErrMsg += 'Please enter second address of next of kin.\n';
 }
if(!which.state1.value){
    strErrMsg += 'Please enter a state of next of kin.\n';
 }
if(!which.Subscrzip.value){
```

```
    strErrMsg += 'Please enter a zip.\n';
 }

// hospital history code

if(!which.day0.value){
    strErrMsg += 'Please select a day of history.\n';
 }
if(!which.month0.value){
    strErrMsg += 'Please select a month of history.\n';
 }
if(!which.year0.value){
    strErrMsg += 'Please select a year of history.\n';
 }
if(!which.referral.value){
    strErrMsg += 'Please enter a referral.\n';
 }
if(!which.physician.value){
    strErrMsg += 'Please enter a physician.\n';
 }
if(!which.clinic.value){
    strErrMsg += 'Please enter a clinic.\n';
 }
if(!which.dischargedate.value){
    strErrMsg += 'Please enter a discharged date.\n';
 }
if(!which.disposal.value){
    strErrMsg += 'Please enter a disposal.\n';
 }
if(!which.autopsy.value){
    strErrMsg += 'Please enter an autopsy.\n';
 }

 // Diagnosis code

if(!which.day1.value){
    strErrMsg += 'Please enter a date of diagnosis.\n';
 }
if(!which.month1.value){
    strErrMsg += 'Please enter a month of diagnosis.\n';
 }
if(!which.year1.value){
    strErrMsg += 'Please enter a year of diagnosis.\n';
 }
if(!which.diagnosis.value){
    strErrMsg += 'Please enter diagnosis.\n';
 }
if(!which.dgcodeno.value){
    strErrMsg += 'Please enter diagnosis code.\n';
 }

// operation code

if(!which.day2.value){
    strErrMsg += 'Please select day of operation.\n';
 }
```

```
if(!which.month2.value){
    strErrMsg += 'Please select month of operation.\n';
 }

if(!which.year2.value){
    strErrMsg += 'Please select year of operation.\n';
 }

if(!which.operation.value){
    strErrMsg += 'Please enter remark of operation.\n';
 }

if(!which.opcodeno.value){
    strErrMsg += 'Please enter operation code.\n';
 }

if(strErrMsg != ''){
  alert(strErrMsg)
    return false;
} else {
    return true;
}

}
```

// **Intro Page Code**

```
var
nOP=0,nOP5=0,nIE=0,nIE4=0,nIE5=0,nNN=0,nNN4=0,nNN6=0,nMac=0,nIEM=0,nIEW=0,nSTMENU
=0,NS4=0,nVer=0.0;
bDelBorder=0;bAddBorder=0;detectNav();
bFtReg=1;
var nTopTb=nIE||nOP&&nVer>=6.0;

if(nNN4){
            doitovNN4=getEventCode('doitov',1);doitouNN4=getEventCode('doitou',1);doitckNN4=getEvent
Code('doitck',1);dombovNN4=getEventCode('dombov',0);dombouNN4=getEventCode('dombou',0);
            }

var MaxMenuNumber=10;
var HideSelect=1;
var HideObject=0;
var HideIFrame=0;

if(nNN6)HideSelect=0;
if((nIEW&&nVer>=5.5)||nNN6)     HideIFrame=0;
var st_ht="";
var st_gcount=0;
var st_rl_id=null;
var st_cl_w,st_cl_h;
var st_cumei=0,st_cumbi,st_cuiti;
var st_rei=/STM([0-9]*)XX([0-9]*)YY([0-9]*)ZZ/;
var st_reb=/STM([0-9]*)XX([0-9]*)YY/;
var st_menus=[];
var st_buf=[];
var st_loaded=0;
var st_scrollid=null;
```

```
if(nIE4||nNN4)    window.onerror=function(sMsg,sUrl,sLine)
{
        return !confirm("Java Script
Error\n"+"\nDescription:"+sMsg+"\nSource:"+sUrl+"\nLine:"+sLine+"\n\nSee more details?");
}

if(nSTMENU)               window.onload=st_onload;
if(nIEM||nOP5)   window.onunload=function(){if(st_rl_id){clearInterval(st_rl_id);st_rl_id=null;}return
true;}

if(typeof(st_jsloaded)=='undefined'){
if(nSTMENU&&!nNN4)
{
        var
s="<STYLE>\n.st_tbcss,.st_tdcss,.st_divcss,.st_ftcss{border:none;padding:0px;margin:0px;}\n</STYLE>"
;
        for(i=0;i<MaxMenuNumber;i++)
                s+="<FONT ID=st_global"+i+"></FONT>";
        if(nIEW&&nVer>=5.0&&document.body)
                document.body.insertAdjacentHTML("AfterBegin",s);
        else
                document.write(s);
}
st_jsloaded=1;}

st_fl_id=["Box in","Box out","Circle in","Circle out","Wipe up","Wipe down","Wipe right","Wipe
left","Vertical blinds","Horizontal blinds","Checkerboard across","Checkerboard down","Random
dissolve","Split vertical in","Split vertical out","Split horizontal in","Split horizontal out","Strips left
down","Strips left up","Strips right down","Strips right up","Random bars horizontal","Random bars
vertical","Random filter","Fade",
        "Wheel","Slide","Slide push","Spread","Pixelate","Stretch right","Stretch horizontally","Cross
in","Cross out","Plus in","Plus out","Star in","Star out","Diamond in","Diamond out","Checkerboard
up","Checkerboard left","Blinds up","Blinds left","Wipe clock","Wipe wedge","Wipe
radial","Spiral","Zigzag"];
st_fl_string=
[
        "Iris(irisStyle=SQUARE,motion=in)","Iris(irisStyle=SQUARE,motion=out)","Iris(irisStyle=CIRC
LE,motion=in)","Iris(irisStyle=CIRCLE,motion=out)",
        "Wipe(GradientSize=1.0,wipeStyle=1,motion=reverse)","Wipe(GradientSize=1.0,wipeStyle=1,mo
tion=forward)","Wipe(GradientSize=1.0,wipeStyle=0,motion=forward)","Wipe(GradientSize=1.0,wipeStyl
e=0,motion=reverse)",
        "Blinds(bands=8,direction=RIGHT)","Blinds(bands=8,direction=DOWN)",
        "Checkerboard(squaresX=16,squaresY=16,direction=right)","Checkerboard(squaresX=12,squar
esY=12,direction=down)","RandomDissolve()",
        "Barn(orientation=vertical,motion=in)","Barn(orientation=vertical,motion=out)","Barn(orientati
on=horizontal,motion=in)","Barn(orientation=horizontal,motion=out)",
        "Strips(Motion=leftdown)","Strips(Motion=leftup)","Strips(Motion=rightdown)","Strips(Motion=
rightup)",
        "RandomBars(orientation=horizontal)","RandomBars(orientation=vertical)","","Fade(overlap=.
5)",
        "Wheel(spokes=16)","Slide(slideStyle=hide,bands=15)","Slide(slideStyle=swap,bands=15)","Ins
et()","Pixelate(MaxSquare=15)",
        "Stretch(stretchStyle=hide)","Stretch(stretchStyle=spin)",
        "Iris(irisStyle=cross,motion=in)","Iris(irisStyle=cross,motion=out)","Iris(irisStyle=plus,motion=
in)","Iris(irisStyle=plus,motion=out)","Iris(irisStyle=star,motion=in)","Iris(irisStyle=star,motion=out)","I
ris(irisStyle=diamond,motion=in)","Iris(irisStyle=diamond,motion=out)",
```

```
        "Checkerboard(squaresX=16,squaresY=16,direction=up)","Checkerboard(squaresX=16,squares
Y=16,direction=left)","Blinds(bands=8,direction=up)","Blinds(bands=8,direction=left)",
        "RadialWipe(wipeStyle=clock)","RadialWipe(wipeStyle=wedge)","RadialWipe(wipeStyle=radial)
","Spiral(GridSizeX=16,GridSizeY=16)","Zigzag(GridSizeX=16,GridSizeY=16)"
];

st_fl=[];for(i=st_fl_id.length-1;i>=0;i--)     eval("st_fl['"+st_fl_id[i]+"']=i;");

function
beginSTM(nam,type,pos_l,pos_t,flt,click_sh,click_hd,ver,hddelay,shdelay_h,shdelay_v,web_path,blank_src
)
{
        if(!ver)            ver='300';
        if(hddelay==null)           hddelay='1000';
        if(shdelay_h==null)         shdelay_h='0';
        if(shdelay_v==null)         shdelay_v='250';
        if(!blank_src)      blank_src='blank.gif';
        eval("sdm_"+nam+"=st_cumei;");

        var pos=type;
        switch(type)
        {
        case "absolute":
                type="custom";break;
        case "custom":
        case "float":
                pos='absolute';break;
        case "relative":
                if(!eval(pos_l)&&!eval(pos_t))
                {
                        pos='static';
                        type='static';
                }
                break;
        case "static":
        default:
                type='static';pos='static';pos_l='0';pos_t='0';break;
        }
        if(web_path)
                blank_src=web_path+blank_src;
        else if(typeof(st_path)!='undefined')
                blank_src=st_path+blank_src;
        if(web_path==null)          web_path='';

        st_menus[st_cumei]=
        {
                bodys:              [],
                mei:                st_cumei,
                hdid:               null,

                block:              "STM"+st_cumei+"XX",
                nam:                nam,
                type:               type,
                pos:                pos,
                pos_l:              eval(pos_l),
                pos_t:              eval(pos_t),
                flt:                flt=='none' ? 'left' : flt,
```

```
		click_sh:		eval(click_sh),
		click_hd:		eval(click_hd),
		ver:			eval(ver),
		hddelay:nNN4 ?	Math.max(100,eval(hddelay)) : eval(hddelay),
		shdelay_h:		eval(shdelay_h),
		shdelay_v:		eval(shdelay_v),
		web_path:		web_path,

		blank:			bufimg(blank_src),
		clicked:	0
	};
}

function
beginSTMB(offset,offset_l,offset_t,arrange,arrow,arrow_w,arrow_h,spacing,padding,bg_cl,bg_image,bg_r
ep,bd_cl,bd_sz,bd_st,trans,spec,spec_sp,lw_max,lh_max,rw_max,rh_max,bg_pos_x,bg_pos_y,ds_sz,ds_col
or,hdsp,bd_cl_t,bd_cl_r,bd_cl_b,ds_st)
{
	if(!ds_sz)			ds_sz=0;
	if(!ds_color)		ds_color='gray';
	if(!hdsp)			hdsp=0;
	if(!bd_cl_t)		bd_cl_t='';
	if(!bd_cl_r)		bd_cl_r='';
	if(!bd_cl_b)		bd_cl_b='';
	if(!ds_st)			ds_st='none';
	switch(bg_rep){case 'tile':case 'tiled':{bg_rep='repeat';}break;case 'free':bg_rep='no-
repeat';break;case 'tiled by x':bg_rep='repeat-x';break;case 'tiled by y':bg_rep='repeat-
y';break;default:break;}

	var oldmbi=st_cumbi;var olditi=st_cuiti;st_cumbi=st_menus[st_cumei].bodys.length;st_cuiti=0;
	var menu=st_menus[st_cumei];

	menu.bodys[st_cumbi]=
	{
		items:			[],

		mei:			st_cumei,
		mbi:			st_cumbi,
		block:			"STM"+st_cumei+"XX"+st_cumbi+"YY",
		par:			(st_cumbi ? [st_cumei,oldmbi,olditi] : null),
		tmid:			null,
		curiti:			-1,
		isshow:			0,
		isitem:			0,
		isstatic:	!st_cumbi&&menu.type=='static',
		isvisible:		!st_cumbi&&menu.type!='custom',
		isclick:	!st_cumbi&&menu.click_sh,
		exec_ed:0,

		arrange:arrange,
		offset:			offset,
		offset_l:	eval(offset_l),
		offset_t:	eval(offset_t),
		arrow:			getsrc(arrow,menu),
		arrow_w:		eval(arrow_w),
		arrow_h:		eval(arrow_h),
		spacing:	eval(spacing),
```

```
                padding:        eval(padding),
                bg_cl:          bg_cl,
                bg_image:       getsrc(bg_image,menu),
                bg_rep:         bg_rep,
                bd_st:          bd_st,
                bd_sz:          eval(bd_sz),
                bd_cl:          bd_cl,
                opacity: 100-eval(trans),
                spec:           spec,
                spec_sp:eval(spec_sp),
                fl_type:  -1,
                lw_max:         eval(lw_max),
                lh_max:         eval(lh_max),
                rw_max:         eval(rw_max),
                rh_max:         eval(rh_max),
                ds_st:          ds_st,
                ds_sz:          ds_st!='none' ? eval(ds_sz) : 0,
                ds_color:       ds_color,
                hdsp:           eval(hdsp),

                spec_init:      0,
                spec_sh:0,
                spec_hd:        0
        };
        var body=menu.bodys[st_cumbi];
        if(st_cumbi)    getpar(body).sub=[st_cumei,st_cumbi];
        body.z_index=   !st_cumbi ? 1000 : getpar(getpar(body)).z_index+10;
        if(body.offset=="auto")
        {
                if(st_cumbi)
                        body.offset=getpar(getpar(body)).arrange=="vertically" ? "right" : "down";
                else
                        body.offset= "down";
        }
        if(body.bd_st=="none")
                body.bd_sz=0;
        if(nSTMENU&&!nNN4&&bd_cl_t!="")
                body.bd_cl=(bd_cl_t+" "+bd_cl_r+" "+bd_cl_b+" "+bd_cl);
        bufimg(body.bg_image);
        body.background=getbg(body.bg_cl,body.bg_image,body.bg_rep);
        if(body.mbi&&!getpar(getpar(body)).bufed)
        {
                bufimg(getpar(getpar(body)).arrow);
                getpar(getpar(body)).bufed=1;
        }
        if(nIEW&&nVer<5.0&&nVer>=4.0&&body.isstatic)
                body.speceff='normal';
        else
if(nIEW&&typeof(st_fl[spec])!='undefined'&&(nVer>=5.5||(nVer<5.5&&st_fl[spec]<=23)))
                body.speceff='filter';
        else if(nIEW&&spec=="Fade")
                body.speceff='fade';
        else
                body.speceff='normal';
        eval(body.speceff+'_init(body);');
}
```

```
function
appendSTMI(isimage,text,align,valign,image_ou,image_ov,image_w,image_h,image_b,type,bgc_ou,bgc_ov
,sep_img,sep_size,sep_w,sep_h,icon_ou,icon_ov,icon_w,icon_h,icon_b,tip,url,target,f_fm_ou,f_sz_ou,f_cl_
ou,f_wg_ou,f_st_ou,f_de_ou,f_fm_ov,f_sz_ov,f_cl_ov,f_wg_ov,f_st_ov,f_de_ov,bd_sz,bd_st,bd_cl_r_ou,bd_
cl_l_ou,bd_cl_r_ov,bd_cl_l_ov,bd_cl_t_ou,bd_cl_b_ou,bd_cl_t_ov,bd_cl_b_ov,st_text,bg_img_ou,bg_img_
ov,bg_rep_ou,bg_rep_ov)
{
        if(!bd_cl_t_ou)    bd_cl_t_ou='';
        if(!bd_cl_b_ou)    bd_cl_b_ou='';
        if(!bd_cl_t_ov)    bd_cl_t_ov='';
        if(!bd_cl_b_ov)    bd_cl_b_ov='';
        if(!st_text)               st_text='';
        if(!bg_img_ou)             bg_img_ou='';
        if(!bg_img_ov)             bg_img_ov='';
        if(!bg_rep_ou)             bg_rep_ou='repeat';
        if(!bg_rep_ov)             bg_rep_ov='repeat';
        switch(bg_rep_ou){case 'tile':case 'tiled':bg_rep_ou='repeat';break;case 'free':bg_rep_ou='no-
repeat';break;case 'tiled by x':bg_rep_ou='repeat-x';break;case 'tiled by y':bg_rep_ou='repeat-
y';break;default:break;}
        switch(bg_rep_ov){case 'tile':case 'tiled':bg_rep_ov='repeat';break;case 'free':bg_rep_ov='no-
repeat';break;case 'tiled by x':bg_rep_ov='repeat-x';break;case 'tiled by y':bg_rep_ov='repeat-
y';break;default:break;}

        st_cuiti=st_menus[st_cumei].bodys[st_cumbi].items.length;
        var menu=st_menus[st_cumei];
        var body=menu.bodys[st_cumbi];
        body.items[st_cuiti]=
        {
                mei:            st_cumei,
                mbi:            st_cumbi,
                iti:            st_cuiti,
                block:          "STM"+st_cumei+"XX"+st_cumbi+"YY"+st_cuiti+"ZZ",
                sub:            null,
                isitem:         1,
                txblock:  "STM"+st_cumei+"XX"+st_cumbi+"YY"+st_cuiti+"ZZ"+"TX",
                tmid:           null,

                isimage: eval(isimage),
                text:           text,
                align:          align,
                valign:         valign,
                image:          [getsrc(image_ou,menu),getsrc(image_ov,menu)],

                image_w:        eval(image_w),
                image_h:        eval(image_h),
                image_b:        eval(image_b),
                type:           type,
                bg_cl:          [bgc_ou,bgc_ov],
                sep_img:        getsrc(sep_img,menu),
                sep_size:       eval(sep_size),
                sep_w:          eval(sep_w),
                sep_h:          eval(sep_h),
                icon:           [getsrc(icon_ou,menu),getsrc(icon_ov,menu)],
                icon_w:         eval(icon_w),
                icon_h:         eval(icon_h),
                icon_b:         eval(icon_b),
                tip:            tip,
```

```
		url:		url,
		target:		target=="" ? "_self" : target,
		f_fm:		[f_fm_ou.replace(/'/g,''),f_fm_ov.replace(/'/g,'')],
		f_sz:		[f_sz_ou,f_sz_ov],
		f_cl:		[f_cl_ou,f_cl_ov],
		f_wg:		[f_wg_ou,f_wg_ov],
		f_st:		[f_st_ou,f_st_ov],
		f_de:		[f_de_ou,f_de_ov],

		bd_st:		bd_st,
		bd_sz:		eval(bd_sz),
		bd_cl_r: [bd_cl_r_ou,bd_cl_r_ov],
		bd_cl_l: [bd_cl_l_ou,bd_cl_l_ov],
		bd_cl_t: [bd_cl_t_ou,bd_cl_t_ov],
		bd_cl_b:[bd_cl_b_ou,bd_cl_b_ov],

		st_text:  st_text,
		bg_img:		[getsrc(bg_img_ou,menu),getsrc(bg_img_ov,menu)],
		bg_rep:		[bg_rep_ou,bg_rep_ov]
	};

	var item=st_menus[st_cumei].bodys[st_cumbi].items[st_cuiti];
	if(item.bd_st=="none"||!item.bd_sz)
	{
		item.bd_sz=0;	item.bd_st="none";
	}
	if(nOP)
	{
		if(item.bd_st=="ridge")		item.bd_st="outset";
		if(item.bd_st=="groove")  item.bd_st="inset";
	}
	if(item.bd_st=="inset")
	{
		var tmclr=item.bd_cl_l;	item.bd_cl_l=item.bd_cl_r;		item.bd_cl_r=tmclr;
	item.bd_st="outset";
	}
	if(bd_cl_t_ou=="")
	{
		if("none_solid_double_dashed_dotted".indexOf(item.bd_st)>=0)
			item.bd_cl_r=item.bd_cl_l;
		if(item.bd_st=="outset")
			item.bd_st="solid";
		item.bd_cl_t=item.bd_cl_l;
		item.bd_cl_b=item.bd_cl_r;
	}
	item.bd_cl=[];
	for(i=0;i<2;i++)
		item.bd_cl[i]=item.bd_cl_t[i]+" "+item.bd_cl_r[i]+" "+item.bd_cl_b[i]+"
"+item.bd_cl_l[i];
	if(item.type=="sepline")
		bufimg(item.sep_img);
	else
	{
		for(i=0;i<2;i++)
		{
			bufimg(item.icon[i]);
			if(item.isimage)
```

```
                        bufimg(item.image[i]);
                    bufimg(item.bg_img[i]);
                }
            }
            item.background=[getbg(item.bg_cl[0],item.type=='sepline' ? '' :
item.bg_img[0],item.bg_rep[0]),getbg(item.bg_cl[1],item.bg_img[1],item.bg_rep[1])];
}

function endSTMB()
{
            var item=getpar(st_menus[st_cumei].bodys[st_cumbi]);
            if(item)
            {
                        st_cumei=item.mei;
                        st_cumbi=item.mbi;
                        st_cuiti=item.iti;
            }
}

function endSTM()
{
            var menu=st_menus[st_cumei];
            var menuHTML="";
            var menuCSS="<STYLE TYPE='text/css'>\r\n";

            var max_l=nSTMENU ? menu.bodys.length : 1;
            for(mbi=0;mbi<max_l;mbi++)
            {
                        var body=menu.bodys[mbi];
                        var bodyHTML=getBodyTextH(body);
                        if(body.isstatic)
                                    bodyHTML="<TABLE STYLE='border:none;padding:0px;' CELLPADDING=0
CELLSPACING=0"+(menu.flt=='left' ? "" : " align="+menu.flt)+"><TD class=st_tdcss>"+bodyHTML;
                        for(iti=0;iti<body.items.length;iti++)
                        {
                                    var item=body.items[iti];
                                    var itemHTML="";
                                    itemHTML+=body.arrange=="vertically" ? "<TR ID="+item.block+"TR>" :
"";
                                    itemHTML+=getItemText(item);
                                    itemHTML+=(body.arrange=="vertically" ? "</TR>" : "");
                                    bodyHTML+=itemHTML;
                                    if(item.type!='sepline')
                                    {

            menuCSS+="."+item.block+"TX0\r\n{\r\n"+getTextCSS(item,0)+"\r\n}\r\n";

            menuCSS+="."+item.block+"TX1\r\n{\r\n"+getTextCSS(item,1)+"\r\n}\r\n";
                                    }
                        }
                        bodyHTML+=getBodyTextE(body);
                        if(body.isstatic)
                                    bodyHTML+="</TD></TABLE>";

                        if(body.isstatic||nNN4||!nSTMENU)
                                    menuHTML+=bodyHTML;
                        else
```

```
                st_ht+=bodyHTML;
        }
        menuCSS+="</STYLE>";
        if(!nSTMENU||nNN4)
                document.write(menuCSS);
        if(menuHTML!='')
                document.write(menuHTML);
        if(nSTMENU&&!(nIEM||(nIEW&&nVer<5.0)))
        {
                if(st_ht!='')
                {
                        var obj=getob('st_global'+st_gcount,'font');
                        if(nNN6)
                                obj.innerHTML=st_ht;
                        else if(nIE&&nVer>=5.0)
                                obj.insertAdjacentHTML("BeforeEnd",st_ht);
                        else
                                obj.document.write(st_ht);
                        st_gcount++;
                        st_ht='';
                }
                if(!nOP&&!nNN4)
                        prefix(menu);
        }
        st_cumei++;st_cumbi=0;st_cuiti=0;
}

function getBodyTextH(body)
{
        var s="";
        if(nNN4||!nSTMENU)
        {
                s+=body.isstatic ? "<ILAYER" : "<LAYER";
                s+=" VISIBILITY=hide";
                s+=" ID="+body.block;
                s+=" Z-INDEX="+body.z_index;
                s+="><LAYER>";
                s+="<TABLE BORDER=0 CELLSPACING=0 CELLPADDING="+body.spacing;
                if(body.bg_image!="")
                        s+=" BACKGROUND=\""+body.bg_image+"\"";
                if(body.bg_cl!="transparent")
                        s+=" BGCOLOR="+body.bg_cl;
                s+=" ID="+body.block;
                s+=">";
        }
        else
        {
                var stdiv="position:"+(body.mbi ? 'absolute' : getme(body).pos)+";";
                stdiv+="z-index:"+body.z_index+";";
                stdiv+="visibility:hidden;";

                s+=nTopTb ? "<TABLE class=st_tbcss CELLPADDING=0 CELLSPACING=0" :
"<DIV class=st_divcss";
                s+=getBodyEventString(body);
                s+=" ID="+body.block;
                s+=" STYLE='";
                if(nIEM)
```

```
                s+="width:1px;";
            else if(nIE)
                s+="width:0px;";
            s+=getFilterCSS(body);
            s+=stdiv;
            s+="'>";
            if(nTopTb)
                s+="<TD class=st_tdcss ID="+body.block+"TTD>";
            s+="<TABLE class=st_tbcss CELLSPACING=0 CELLPADDING=0";
            s+=" ID="+body.block+"TB";
            s+=" STYLE='";
            s+=getBodyCSS(body);
            if(!nOP)
                s+="margin:"+body.ds_sz+"px;";
            s+="'>";
        }
        return s;
}

function getBodyTextE(body)
{
        var s="</TABLE>";
        if(nNN4||!nSTMENU)
                s+="</LAYER></LAYER>";
        else if(nTopTb)
                s+="</TD></TABLE>";
        else
                s+="</DIV>";
        return s;
}

function getItemText(item)
{
        var s="";
        if(nNN4||!nSTMENU)
        {
                var max_i=nNN4 ? 2 : 1;
                s+="<TD WIDTH=1 NOWRAP>"
                s+="<FONT STYLE='font-size:1pt;'>";
                s+="<ILAYER ID="+item.block+"><LAYER";
                if(item.bd_sz&&item.type!="sepline")
                        s+=" BGCOLOR="+item.bd_cl_l[0];
                s+=">";

                for(i=0;i<max_i;i++)
                {
                        if(item.type=="sepline"&&i)
                                break;
                        s+="<LAYER Z-INDEX=10 VISIBILITY="+(i ? "HIDE" : "SHOW");
                        if(item.type!="sepline")
                                s+=" LEFT="+item.bd_sz+" TOP="+item.bd_sz;
                        s+=">";

                        s+="<TABLE ALIGN=LEFT WIDTH=100% BORDER=0 CELLSPACING=0
CELLPADDING="+(item.type=="sepline" ? 0 : getpar(item).padding);
                        if(item.bg_img[i]!="")
                                s+=" BACKGROUND=\""+item.bg_img[i]+"\"";
```

```
                        if(item.bg_cl[i]!="transparent")
                                s+=" BGCOLOR="+item.bg_cl[i];
                        s+=">";

                        if(item.type=="sepline")
                        {
                                s+="<TD NOWRAP VALIGN=TOP"+
                                        " HEIGHT="+(getpar(item).arrange=="vertically" ?
item.sep_size : "100%")+
                                        " WIDTH="+(getpar(item).arrange=="vertically" ? "100%" :
item.sep_size)+
                                        " STYLE='font-size:0pt;'"+
                                        ">";

        s+=createIMG(item.sep_img,item.block+"LINE",item.sep_w,item.sep_h,0);
                                s+="</TD>";
                        }
                        else
                        {

        if(getpar(item).lw_max&&(getpar(item).arrange=="vertically"||item.icon_w))
                                {
                                        s+="<TD ALIGN=CENTER VALIGN=MIDDLE";
                                        s+=getwdstr(item);
                                        s+=">";

        s+=createIMG(item.icon[i],item.block+"ICON",item.icon_w,item.icon_h,item.icon_b);
                                        s+="</TD>";
                                }

                                s+="<TD WIDTH=100% NOWRAP ALIGN="+item.align+"
VALIGN="+item.valign+">";
                                s+="<A "+getURL(item)+" CLASS='"+item.block+"TX"+i+"'>";
                                if(item.isimage)

        s+=createIMG(item.image[i],item.block+"IMG",item.image_w,item.image_h,item.image_b);
                                else
                                {
                                        s+="<IMG SRC=\""+getme(item).blank.src+"\" WIDTH=1
HEIGHT=1 BORDER=0 ALIGN=ABSMIDDLE>";
                                        s+=item.text;
                                }
                                s+="</A>";
                                s+="</TD>";

                                if(getpar(item).arrow_w)
                                {
                                        s+="<TD NOWRAP ALIGN=CENTER
VALIGN=MIDDLE>";
                                        s+=createIMG((getsub(item) ? getpar(item).arrow :
getme(item).blank.src),item.block+"ARROW",getpar(item).arrow_w,getpar(item).arrow_h,0);
                                        s+="</TD>";
                                }
                        }

                        s+="</TABLE>";
                        if(item.bd_sz&&item.type!="sepline")
```

```
                                        s+="<BR CLEAR=ALL><SPACER HEIGHT=1
WIDTH="+item.bd_sz+"></SPACER><SPACER WIDTH=1 HEIGHT="+item.bd_sz+"></SPACER>";
                        s+="</LAYER>";
                }
                if(item.type!="sepline")
                        s+="<LAYER Z-INDEX=20></LAYER>";

                s+="</LAYER></ILAYER>"
                s+="</FONT>";
                s+="</TD>";
        }
        else
        {
                s+="<TD class=st_tdcss NOWRAP VALIGN="+(nIE ? "MIDDLE" : "TOP");
                s+=" STYLE='"
                        s+="padding:"+getpar(item).spacing+"px;";
                s+="'";
                s+=" ID="+getpar(item).block+item.iti;
                if(nIEW)
                        s+=" HEIGHT=100%";
                s+=">";
                if(!nOP&&!nIE)
                {
                        s+="<DIV class=st_divcss ID="+item.block;
                        s+=getItemEventString(item);
                        s+=" STYLE=\""+getItemCSS(item,0);
                        s+="\"";
                        s+=">";
                }
                s+="<TABLE class=st_tbcss CELLSPACING=0 CELLPADDING=0";
                if(!nOP)
                        s+=" HEIGHT=100%";

                s+=" STYLE=\"";
                if(nOP||nIE)
                        s+=getItemCSS(item,0);
                s+="\"";
                if(nOP||nIE)
                        s+=getItemEventString(item);
                if(getpar(item).arrange=="vertically"||nIEM)
                        s+=" WIDTH=100%";
                s+=" ID="+(nOP||nIE ? item.block : (item.block+"TB"));
                if(!nOP)
                        s+=" TITLE="+addquo(item.type!="sepline" ? item.tip : "");
                s+=">";

                if(item.type=="sepline")
                {
                        s+="<TD class=st_tdcss  NOWRAP VALIGN=TOP"+
                                " ID="+item.block+"MTD"+
                                " HEIGHT="+(getpar(item).arrange=="vertically" ? item.sep_size :
"100%")+
                                " WIDTH="+(getpar(item).arrange=="vertically" ? "100%" :
item.sep_size)+
                                ">";
                        s+=createIMG(item.sep_img,item.block+"LINE",item.sep_w,item.sep_h,0);
                        s+="</TD>";
```

```
		}
		else
		{
			if(getpar(item).lw_max&&(getpar(item).arrange=="vertically"||item.icon_w))
			{
				s+="<TD class=st_tdcss NOWRAP ALIGN=CENTER
VALIGN=MIDDLE HEIGHT=100%";
				s+=" STYLE=\"padding:"+getpar(item).padding+"px\"";
				s+=" ID="+item.block+"LTD";
				s+=getwdstr(item);
				s+=">";

	s+=createIMG(item.icon[0],item.block+"ICON",item.icon_w,item.icon_h,item.icon_b);
				s+="</TD>";
			}
			else if(getpar(item).arrange=="vertically")
			{
				s+="<TD class=st_tdcss";
				s+=" STYLE=\"padding:"+getpar(item).padding+"px\"";
				s+=" ID="+item.block+"LLTD WIDTH=3><IMG
SRC=\""+getme(item).blank.src+"\" WIDTH=1 ID="+item.block+"LLTDI></TD>";
			}

			s+="<TD class=st_tdcss NOWRAP HEIGHT=100%
STYLE=\"color:"+item.f_cl[0]+";";
			s+="padding:"+getpar(item).padding+"px;";
			s+="\"";
			s+=" ID="+item.block+"MTD";
			s+=" ALIGN="+item.align;
			s+=" VALIGN="+item.valign+">";
			s+="<FONT class=st_ftcss ID="+item.txblock+"
STYLE=\""+getTextCSS(item,0)+"\">";
			if(item.isimage)

	s+=createIMG(item.image[0],item.block+"IMG",item.image_w,item.image_h,item.image_b);
			else
				s+=item.text;
			s+="</FONT>";
			s+="</TD>";

			if(getpar(item).arrow_w)
			{
				s+="<TD class=st_tdcss NOWRAP";
				s+=" STYLE=\"padding:"+getpar(item).padding+"px\"";
				s+=" ID="+item.block+"RTD";
				s+=" WIDTH="+(getpar(item).arrow_w+2);
				s+=" ALIGN=CENTER VALIGN=MIDDLE HEIGHT=100%>";
				s+=createIMG((getsub(item) ? getpar(item).arrow :
getme(item).blank.src),item.block+"ARROW",getpar(item).arrow_w,getpar(item).arrow_h,0);
				s+="</TD>";
			}
			else if(getpar(item).arrange=="vertically")
			{
				s+="<TD class=st_tdcss";
				s+=" STYLE=\"padding:"+getpar(item).padding+"px\"";
				s+=" ID="+item.block+"RRTD WIDTH=3><IMG
SRC=\""+getme(item).blank.src+"\" WIDTH=1 ID="+item.block+"RRTDI></TD>";
```

```
                        }
                }

                s+="</TABLE>";
                if(!nOP&&!nIE)
                        s+="</DIV>";
                s+="</TD>";
        }
        return s;
}

function getBodyCSS(body)
{
        var s="";
        s+="border-style:"+body.bd_st+";";
        s+="border-width:"+body.bd_sz+"px;";
        s+="border-color:"+body.bd_cl+";";
        if(nIE)
                s+="background:"+body.background+";";
        else
        {
                s+="background-color:"+(body.bg_cl)+";";
                if(body.bg_image!="")
                {
                        s+="background-image:url("+body.bg_image+");";
                        s+="background-repeat:"+body.bg_rep+";";
                }
        }
        return s;
}

function getFilterCSS(body)
{
        var s="";
        var dxpre="progid:DXImageTransform.Microsoft.";
        if(nIEW&&(nVer>=5.0||!body.isstatic))
        {
                s+="filter:";
                if(typeof(body.spec_string)!='undefined')
                        s+=body.spec_string;

                s+=" ";
                if(nVer>=5.5)
                        s+=dxpre;
                s+="Alpha(opacity="+body.opacity+")";

                if(body.ds_sz!=0)
                {
                        s+=" ";
                        if(nVer>=5.5)
                                s+=dxpre;
                        if(body.ds_st=="simple")

        s+="dropshadow(color="+body.ds_color+",offx="+body.ds_sz+",offy="+body.ds_sz+",positive
=1) ";
                        else
```

```
		s+="Shadow(color="+body.ds_color+",direction=135,strength="+body.ds_sz+") ";
			}
			s+=";";
		}
		return s;
}

function getItemCSS(item,its)
{
		var s="";
		if(item.type!="sepline")
		{
			s+="border-style:"+item.bd_st+";";
			s+="border-width:"+item.bd_sz+"px;";
			s+="border-color:"+item.bd_cl[its]+";";

			if(!nIE&&item.bg_img[its]!="")
			{
				s+="background-image:url("+item.bg_img[its]+");";
				s+="background-repeat:"+item.bg_rep[its]+";";
			}
		}
		if(nIE)
			s+="background:"+item.background[its]+";";
		else
			s+="background-color:"+item.bg_cl[its]+";";
		s+="cursor:"+getcursor(item)+";";
		return s;
}

function getTextCSS(item,its)
{
		var s="";
		s+="cursor:"+getcursor(item)+";";
		s+="font-family:"+item.f_fm[its]+";";
		s+="font-size:"+item.f_sz[its]+";";
		s+="font-weight:"+item.f_wg[its]+";";
		s+="font-style:"+item.f_st[its]+";";
		s+="text-decoration:"+item.f_de[its]+";";
		if(!nSTMENU||nNN4)
			s+="color:"+item.f_cl[its];
		return s;
}

function doitov(e,obj,it)
{
		if(nIEW)
		{
			if(!it.layer)
				it.layer=obj;
			if(!getpar(it).isshow||(e.fromElement&&obj.contains(e.fromElement)))
				return;
		}
		else
		{
```

```
	if(!getpar(it).isshow||(!nNN&&(e.fromElement&&e.fromElement.id&&e.fromElement.id.indexOf(
it.block)>=0)))
			return ;
	}
	if(nNN4)
		getlayer(it).document.layers[0].captureEvents(Event.CLICK);

	if(typeof(onitov)=="function")
		onitov(it.mei,it.mbi,it.iti);

	if(getme(it).hdid)
	{
		clearTimeout(getme(it).hdid);
		getme(it).hdid=null;
	}

	var curiti=getpar(it).curiti;
	var curit=null;
	if(curiti>=0)
		curit=getpar(it).items[curiti];

	if(!getpar(it).isclick||getme(it).clicked)
	{
		if(getpar(it).curiti!=it.iti)
		{
			if(getpar(it).curiti>=0)
			{
				hditpop(getpar(it).items[getpar(it).curiti]);
				getpar(it).curiti=-1;
			}
			shitpop(it);
			getpar(it).curiti=it.iti;
		}
		else
		{
			if(getsub(it)&&!getsub(it).isshow)
			{
				shitst(it,1);
				showpop(getsub(it));
			}
		}
	}
	if(it.st_text!="")
		window.status=it.st_text;
}

function doitou(e,obj,it)
{
	if(nIEW)
	{
		if(!getpar(it).isshow||e.toElement&&obj.contains(e.toElement))
			return;
	}
	else
	{
```

```
	if(!getpar(it).isshow||(!nNN&&(e.toElement&&e.toElement.id&&e.toElement.id.indexOf(it.block)
>=0)))
			return ;
	}
	if(nNN4)
		getlayer(it).document.layers[0].releaseEvents(Event.CLICK);

	if(typeof(onitou)=="function")
		onitou(it.mei,it.mbi,it.iti);

	if(!getsub(it)||!getsub(it).isshow)
	{
		shitst(it,0);
		getpar(it).curiti=-1;
	}
	else if(getsub(it)&&getsub(it).isshow&&!getsub(it).exec_ed)
		hditpop(it);
	window.status="";
}

function doitck(e,obj,it)
{
	if(e.button&&e.button>=2)
		return;
	if(getpar(it).isclick)
	{
		getme(it).clicked=!getme(it).clicked;
		if(getme(it).clicked)
		{
			shitpop(it);
			getpar(it).curiti=it.iti;
		}
		else
		{
			hditpop(it);
			getpar(it).curiti=-1;
		}
	}
	if(!nNN4&&!(getpar(it).isclick&&getsub(it))&&it.url!="")
	{
		if(it.url.toLowerCase().indexOf("javascript:")==0)
			eval(it.url.substring(11,it.url.length));
		else if(it.target=="_self")
			window.location.href=it.url;
		else if(it.target=="_parent")
			window.parent.location.href=it.url;
		else if(it.target=="_top")
			window.top.location.href=it.url;
		else
		{
			for(var _curobj=window;_curobj!=_curobj.parent;_curobj=_curobj.parent)
			{
				if(typeof(_curobj.parent.frames[it.target])!="undefined")
				{
					_curobj.parent.frames[it.target].location.href=it.url;
					return;
```

```
                                        }
                                }
                                window.open(it.url,it.target);
                        }
                }
}

function getrect(mbit)
{
        if(nNN4)
        {
                var obj=getlayer(mbit);
                return [obj.pageX,obj.pageY,obj.clip.width,obj.clip.height];
        }
        else
        {
                var l=0,t=0;
                var obj=getlayer(mbit);
                var w=parseInt(nOP ? obj.style.pixelWidth : obj.offsetWidth);
                var h=parseInt(nOP ? obj.style.pixelHeight : obj.offsetHeight);
                if(!nOP&&!nIEM&&typeof(mbit.iti)=='undefined')
                        h-=mbit.ds_sz*2;
                while(obj)
                {
                        l+=parseInt(obj.offsetLeft);
                        t+=parseInt(obj.offsetTop);
                        obj=obj.offsetParent;
                }
                if(nIEM)
                {
                        l+=parseInt(document.body.leftMargin);
                        l-=mbit.bd_sz;
                        t-=mbit.bd_sz;
                }
                if(typeof(mbit.iti)!='undefined')
                {
                        if(bDelBorder)
                        {
                                l-=mbit.bd_sz;
                                t-=mbit.bd_sz;
                        }
                        if(bAddBorder)
                        {
                                l+=getpar(mbit).bd_sz;
                                t+=getpar(mbit).bd_sz;
                        }
                }
                return [l,t,w,h];
        }
}

function getxy(body)
{
        var x=body.offset_l;
        var y=body.offset_t;
        var subrc=getrect(body);
        body.rc=subrc;
```

```
	if(body.mbi==0)
	{
		if(getme(body).type=="custom")
			return [getme(body).pos_l,getme(body).pos_t];
		else if(getme(body).type=="float")
			return [getcl()+getme(body).pos_l,getct()+getme(body).pos_t];
		else
			return [subrc[0],subrc[1]];
	}
	var itrc=getrect(getpar(body));
	var bdrc=getrect(getpar(getpar(body)));
	switch(body.offset)
	{
		case "left":
			x+=itrc[0]-subrc[2];
			y+=itrc[1];
			break;
		case "up":
			x+=itrc[0];
			y+=itrc[1]-subrc[3];
			if(nIEM)
				y+=body.ds_sz;
			break;
		case "right":
			x+=itrc[0]+itrc[2];
			y+=itrc[1];
			break;
		case "down":
			x+=itrc[0];
			y+=itrc[1]+itrc[3];
			break;
		case "auto":
		default:
			break;
	}
	if(!nOP&&!nNN4)
	{
		x-=body.ds_sz;
		y-=body.ds_sz;
	}
	return adjust([x,y],body);
}

function adjust(xy,body)
{
	var rc=getrect(body);
	var tx=xy[0];
	var ty=xy[1];
	var c_l=getcl();
	var c_t=getct();
	var c_r=c_l+getcw();
	var c_b=c_t+getch();
	if(tx+rc[2]>c_r)
		tx=c_r-rc[2];
	tx=tx>c_l ? tx : c_l;
	if(ty+rc[3]>c_b)
		ty=c_b-rc[3];
```

```
        ty=ty>c_t ? ty : c_t;
        return [tx,ty];
}

function ckPage()
{
        var st_or_w=st_cl_w;
        var st_or_h=st_cl_h;
        var st_or_l=st_cl_l;
        var st_or_t=st_cl_t;
        st_cl_w=getcw();
        st_cl_h=getch();
        st_cl_l=getcl();
        st_cl_t=getct();
        if((nOP||nNN4)&&(st_cl_w-st_or_w||st_cl_h-st_or_h))
                document.location.reload();
        else if(st_cl_l-st_or_l||st_cl_t-st_or_t)
                setTimeout("scrollmenu();",500);
}

function shitst(it,nst)
{
        if(nNN4)
        {
                var st_lay=get_st_lay(it);
                st_lay[nst].parentLayer.bgColor=it.bd_cl_l[nst];
                st_lay[nst].visibility="show";
                st_lay[1-nst].visibility="hide";
        }
        else
        {
                var objs=getlayer(it).style;

                if(nIE&&nMac)
                {
                        if(it.background[0]!=it.background[1])
        objs.background=it.background[nst];
                }
                else
                {
                        if(nOP)
                                objs.background=it.bg_cl[nst];
                        else
                        {
                                if(it.bg_cl[0]!=it.bg_cl[1])
        objs.backgroundColor=it.bg_cl[nst];
                        }
                        if(it.bg_img[nst]!="")
                        {
                                if(it.bg_img[0]!=it.bg_img[1])
        objs.backgroundImage="url("+it.bg_img[nst]+")";
                                if(it.bg_rep[0]!=it.bg_rep[1])
        objs.backgroundRepeat=it.bg_rep[nst];
                        }
                }

                if(it.bd_cl[0]!=it.bd_cl[1])          objs.borderColor=it.bd_cl[nst];
```

```
		var tmp;
		if(it.icon[0]!=it.icon[1])
		{
			tmp=getob(it.block+'ICON','IMG');
			if(tmp)	tmp.src=it.icon[nst];
		}
		if(it.isimage&&it.image[0]!=it.image[1])
		{
			tmp=getob(it.block+'IMG','IMG');
			if(tmp)	tmp.src=it.image[nst];
		}

		if (!it.txstyle)	it.txstyle=getob(it.txblock,'font').style;
		tmp=it.txstyle;
		if(it.f_fm[0]!=it.f_fm[1])	tmp.fontFamily=it.f_fm[nst];
		if(it.f_sz[0]!=it.f_sz[1])	tmp.fontSize=it.f_sz[nst];
		if(it.f_wg[0]!=it.f_wg[1])	tmp.fontWeight=it.f_wg[nst];
		if(it.f_st[0]!=it.f_st[1])	tmp.fontStyle=it.f_st[nst];
		if(it.f_de[0]!=it.f_de[1])	tmp.textDecoration=it.f_de[nst];
		if(it.f_cl[0]!=it.f_cl[1])
		{
			if(nOP)	getob(it.block+'MTD','td').style.color=it.f_cl[nst];
			else	tmp.color=it.f_cl[nst];
		}
	}
}

function dombov(e,obj,mb)
{
	if(nIEW)
	{
		if(!mb.layer)
			mb.layer=obj;
		if(!mb.isshow||(e.fromElement&&obj.contains(e.fromElement)))
			return;
	}
	else
	{

	if(!mb.isshow||(!nNN&&(e.fromElement&&e.fromElement.id&&e.fromElement.id.indexOf(mb.blo
ck)>=0)))
			return ;
	}

	if(getme(mb).hdid)
	{
		clearTimeout(getme(mb).hdid);
		getme(mb).hdid=null;
	}
}

function dombou(e,obj,mb)
{
	if(nIEW)
	{
		if(!mb.isshow||(e.toElement&&obj.contains(e.toElement)))
```

```
                return;
        }
        else
        {

        if(!mb.isshow||(!nNN&&(e.toElement&&e.toElement.id&&e.toElement.id.indexOf(mb.block)>=0
)))
                return ;
        }

        if(getme(mb).hdid)
        {
                clearTimeout(getme(mb).hdid);
                getme(mb).hdid=null;
        }
        getme(mb).hdid=setTimeout("hideall(st_menus['"+mb.mei+"']);",getme(mb).hddelay);
}

function showpop(body)
{
        show(body);
}

function hidepop(body)
{
        if(body.curiti>=0)
        {
                var tmp=getsub(body.items[body.curiti]);
                if(tmp&&tmp.isshow)
                        hidepop(tmp);
                shitst(body.items[body.curiti],0);
                body.curiti=-1;
        }
        hide(body);
}

function shitpop(item)
{
        if(getsub(item))
        {
                if(!getsub(item).isshow)
                        showpop(getsub(item));
        }
        shitst(item,1);
}

function hditpop(item)
{
        if(getsub(item)&&getsub(item).isshow)
                hidepop(getsub(item));
        shitst(item,0);
}

function hideall(menu)
{
        menu.clicked=0;
        var body=menu.bodys[0];
```

```
	if(body.isshow)
	{
		if(body.curiti>=0)
		{
			hditpop(body.items[body.curiti]);
			body.curiti=-1;
		}
		if(menu.type=="custom")
			hide(body);
	}
	menu.hdid=null;
}

function bufimg(sr)
{
	if(sr!="")
	{
		st_buf[st_buf.length]=new Image();
		st_buf[st_buf.length-1].src=sr;
		return st_buf[st_buf.length-1];
	}
	return null;
}

function normal_init(body)
{
}

function normal_sh(body)
{
	moveto(getxy(body),body);
	ck_win_els(-1,body);
	_sh(body);
}

function normal_hd(body)
{
	_hd(body);
	ck_win_els(+1,body);
}

function fade_init(body)
{
	body.current=0;
	body.step=parseInt(body.opacity*10/(110-body.spec_sp));
	if(body.step<=0)
		body.step=1;
}

function fade_sh(body)
{
	if(body.exec_ed)
	{
		body.current+=body.step;
		if(body.current>body.opacity)
			body.current=body.opacity;
	}
```

```
	getlayer(body).filters["Alpha"].opacity=body.current;
	if(!body.exec_ed)
	{
		moveto(getxy(body),body);
		ck_win_els(-1,body);
		_sh(body);
	}
	if(body.current!=body.opacity)
		body.tmid=setTimeout(get_sdstr(body,1),100);
}

function fade_hd(body)
{
	if(body.exec_ed)
	{
		body.current-=body.step;
		if(body.current<0||!body.hdsp)
			body.current=0;
	}
	getlayer(body).filters["Alpha"].opacity=body.current;
	if(!body.current)
	{
		_hd(body);
		ck_win_els(+1,body);
	}
	else
		body.tmid=setTimeout(get_sdstr(body,0),100);
}

function filter_init(body)
{
	body.fl_type=st_fl[body.spec];
	if(body.fl_type==23)
		body.fl_type=parseInt(23*Math.random());
	body.spec_sp=(body.spec_sp>100 ? 100 : (body.spec_sp<=10 ? 10 : body.spec_sp));
	body.duration=10/body.spec_sp;
	if(nVer<5.5)
		body.spec_string="
revealTrans(Transition="+body.fl_type+",Duration="+body.duration+")";
	else
	{
		body.spec_string=" progid:DXImageTransform.Microsoft."+st_fl_string[body.fl_type];
		body.spec_string=body.spec_string.replace(')',',Duration='+body.duration+')');
	}
}

function filter_sh(body)
{
	if(nVer<5.5)
		ft_shx(body);
	else if(bFtReg)
		eval("try{ft_shx(body);} catch(_err){bFtReg=0;normal_sh(body);}");
	else
		normal_sh(body);
}

function filter_hd(body)
```

```
{
	if(nVer<5.5)
		ft_hdx(body);
	else if(bFtReg)
		eval("try{ft_hdx(body);}catch(_err){bFtReg=0;normal_hd(body);}");
	else
		normal_hd(body);
}

function ft_shx(body)
{
	var fl_obj=getlayer(body).filters[0];
	if(fl_obj.Status!=0)
		fl_obj.stop();
	moveto(getxy(body),body);
	ck_win_els(-1,body);
	fl_obj.apply();
	_sh(body);
	fl_obj.play();
}

function ft_hdx(body)
{
	var fl_obj=getlayer(body).filters[0];
	if(fl_obj.Status!=0)
		fl_obj.stop();
	if(body.hdsp)	fl_obj.apply();
	_hd(body);
	ck_win_els(+1,body);
	if(body.hdsp)	fl_obj.play();
}

function showFloatMenuAt(nam,x,y)
{
	if(nSTMENU)
	{
		var menu=getMenuByName(nam);

	if(menu&&typeof(menu.ready)!="undefined"&&menu.type=="custom"&&menu.bodys.length&&
!menu.bodys[0].isshow)
		{
			movetoex(menu,[x,y]);
			show(menu.bodys[0]);
		}
	}
}

function hideMenu(nam)
{
	hideall(getMenuByName(nam));
}

function getMenuByName(nam)
{
	return st_menus[eval("sdm_"+nam)];
}
```

```
function movetoex(menu,xy)
{
	menu.pos_l=xy[0];
	menu.pos_t=xy[1];
}

function getcursor(it)
{
	if(nNN6)
		return "default";
	return it.type!="sepline"&&((it.mbi==0&&getme(it).click_sh&&getsub(it))||it.url!="") ? "hand"
: "default";
}

function getwdstr(obj)
{
	if(getpar(obj).arrange=="vertically")
	{
		if(getpar(obj).lw_max>0)
			return " WIDTH="+getpar(obj).lw_max;
		else
			return "";
	}
	else
	{
		if(obj.icon_w>0)
			return " WIDTH="+obj.icon_w;
		else
			return "";
	}
}

function detectNav()
{
	var naVer=navigator.appVersion;
	var naAgn=navigator.userAgent;
	nMac=naVer.indexOf("Mac")>=0;
	nOP=naAgn.indexOf("Opera")>=0;
	if(nOP)
	{
		nVer=parseFloat(naAgn.substring(naAgn.indexOf("Opera ")+6,naAgn.length));
		nOP5=nVer>=5.12&&!nMac&&naAgn.indexOf("MSIE 5.0")>=0;
	}
	else
	{
		nIE=document.all ? 1 : 0;
		if(nIE)
		{
			nIE4=(eval(naVer.substring(0,1)>=4));
			nVer=parseFloat(naAgn.substring(naAgn.indexOf("MSIE ")+5,naAgn.length));
			nIE5=nVer>=5.0&&nVer<5.5;
			nIEM=nIE4&&nMac;
			nIEW=nIE4&&!nMac;
		}
		else
		{
```

```
	nNN4=navigator.appName.toLowerCase()=="netscape"&&naVer.substring(0,1)=="4" ? 1 : 0;
			if(!nNN4)
			{
				nNN6=(document.getElementsByTagName("*") &&
naAgn.indexOf("Gecko")!=-1);
				if(nNN6)
				{
					nVer=parseInt(navigator.productSub);
					if(naAgn.indexOf("Netscape")>=0)
					{
						bDelBorder=nVer<20001108+1;
						bAddBorder=nVer>20020512-1;
					}
					else
					{
						bDelBorder=nVer<20010628+1;
						bAddBorder=nVer>20011221-1;
					}
				}
			}
			else
				nVer=parseFloat(naVer);
			nNN=nNN4||nNN6;
		}
	}
	nSTMENU=nOP5||nIE4||nNN;
}

function st_onload()
{
	if(nIEM||nOP5||nNN4||(nIEW&&nVer<5.0))
	{
		if(st_ht!='')
			document.body.insertAdjacentHTML('BeforeEnd',st_ht);
		for(i=0;i<st_menus.length;i++)
			prefix(st_menus[i]);
	}
	st_loaded=1;
	if(!nNN4)
	{
		for(i=0;i<st_menus.length;i++)
		{
			var menu=st_menus[i];
			var curit=null;

	for(body=menu.bodys[0];body&&body.isshow&&body.exec_ed;body=(curit&&getsub(curit) ?
getsub(curit) : null))
			{
				ck_win_els(-1,body);
				curit=body.curiti>=0 ? body.items[body.curiti] : null;
			}
		}
	}
}

function getpar(mbit)
```

```
{
	if(mbit.isitem)
		return st_menus[mbit.mei].bodys[mbit.mbi];
	else
		return !mbit.par ? null : st_menus[mbit.par[0]].bodys[mbit.par[1]].items[mbit.par[2]];
}

function getsub(item)
{
	return !item.sub ? null : st_menus[item.sub[0]].bodys[item.sub[1]];
}

function getme(mbit)
{
	return st_menus[mbit.mei];
}

function getsrc(sr,me)
{
	if(sr=='')
		return '';
	var _sr=sr.toLowerCase();
	if(_sr.indexOf('http://')==0||(_sr.indexOf(':')==1&&_sr.charCodeAt(0)>96&&_sr.charCodeAt(0
)<123)||_sr.indexOf('ftp://')==0||_sr.indexOf('/')==0||_sr.indexOf('gopher')==0)
		return sr;
	else
		return me.web_path+sr;
}

function getcl()
{
	return parseInt(nNN||nOP ? window.pageXOffset : document.body.scrollLeft);
}

function getct()
{
	return parseInt(nNN||nOP ? window.pageYOffset : document.body.scrollTop);
}

function getcw()
{
	return parseInt(nNN||nOP ? window.innerWidth :
(nIEW&&document.compatMode=="CSS1Compat" ? document.documentElement.clientWidth :
document.body.clientWidth));
}

function getch()
{
	return parseInt(nNN||nOP ? window.innerHeight :
(nIEW&&document.compatMode=="CSS1Compat" ? document.documentElement.clientHeight :
document.body.clientHeight));
}

function get_sdstr(mb,issh)
{
```

```
	return	"var
_mb=st_menus['"+mb.mei+"'].bodys["+mb.mbi+"];_mb.tmid=null;"+mb.speceff+(issh? "_sh(" :
"_hd(")+"_mb);_mb.exec_ed=1;"
}

function getlayer(mbit)
{
	if(!mbit.layer)
	{
		if(typeof(mbit.iti)=='undefined')
			mbit.layer=getob(mbit.block,nTopTb ? 'table' : 'div');
		else
			mbit.layer=nNN4 ?
getlayer(getpar(mbit)).document.layers[0].document.layers[mbit.block] : getob(mbit.block,nIEW ? 'table' :
null);
	}
	return mbit.layer;
}

function get_st_lay(item)
{
	return getlayer(item).document.layers[0].document.layers;
}

function moveto(xy,body)
{
	if(xy&&(body.mbi||getme(body).pos=='absolute'))
	{
		var ly=getlayer(body);
		if(nNN4)
			ly.moveToAbsolute(xy[0],xy[1]);
		else if(nOP)
		{
			var lys=ly.style;
			lys.pixelLeft=xy[0];
			lys.pixelTop=xy[1];
		}
		else
		{
			var lys=ly.style;
			lys.left=xy[0]+'px';
			lys.top=xy[1]+'px';
		}
		body.rc=[xy[0],xy[1],body.rc[2],body.rc[3]];
	}
}

function createIMG(src,id,width,height,border)
{
	var s='<IMG SRC=';
	s+=addquo(src);
	if(id!='')
		s+=' ID='+id;
	if(width&&height)
	{
		if(width>0)
			s+=' WIDTH='+width;
```

```
		if(height>0)
			s+=' HEIGHT='+height;
	}
	s+=' BORDER='+border+'>';
	return s;
}

function show(body)
{
	var delay=body.mbi&&getpar(getpar(body)).arrange=="vertically" ? getme(body).shdelay_v :
getme(body).shdelay_h;
	body.exec_ed=0;
	if(!body.rc)
		getxy(body);
	if(body.tmid)
	{
		clearTimeout(body.tmid);
		body.tmid=null;
		ck_win_els(1,body)
	}
	if(delay>0)
		body.tmid=setTimeout(get_sdstr(body,1),delay);
	body.isshow=1;
	if(delay<=0)
		eval(get_sdstr(body,1));
}

function _sh(body)
{
	var ly=getlayer(body);
	if(nNN4)
	{
		ly.visibility='show';
		if(!body.fixed)
		{
			ly.resizeBy(body.bd_sz*2,body.bd_sz*2);
			ly=ly.document.layers[0];
			ly.moveTo(body.bd_sz,body.bd_sz);
			ly.onmouseover=dombovNN4;
			ly.onmouseout=dombouNN4;
			for(var iti=body.items.length-1;iti>=0;iti--)
			{
				var item=body.items[iti];
				if(item.type!="sepline")
				{
					var st_lay=get_st_lay(item);

	st_lay[2].resizeTo(st_lay[0].parentLayer.clip.width,st_lay[0].parentLayer.clip.height);
					if(getcursor(item)=="hand")
					{
						with(st_lay[2].document)
						{
							open();
							write("<A "+getURL(item)+"\"><IMG
BORDER=0 SRC='"+getme(item).blank.src+"' WIDTH="+st_lay[2].clip.width+"
HEIGHT="+st_lay[2].clip.height+"></A>");
							close();
```

```
                                        }
                                    }
                                    st_lay[0].resizeBy(-item.bd_sz,-item.bd_sz);
                                    st_lay[1].resizeBy(-item.bd_sz,-item.bd_sz);
                                    ly=getlayer(item).document.layers[0];
                                    ly.onmouseover=doitovNN4;
                                    ly.onmouseout=doitouNN4;
                                    ly.onclick=doitckNN4;
                                }
                            }
                            if(body.bd_sz)
                                setTimeout("var
_body=st_menus["+body.mei+"].bodys["+body.mbi+"];getlayer(_body).bgColor=_body.bd_cl;",1);
                            body.fixed=1;
                        }
                    }
                    else
                        ly.style.visibility='visible';
}

function hide(body)
{
        if(body.tmid)
        {
                clearTimeout(body.tmid);
                body.tmid=null;
        }
        if(body.isshow&&!body.exec_ed)
        {
                body.exec_ed=0;
                body.isshow=0;
        }
        else
        {
                body.exec_ed=0;
                body.isshow=0;
                eval(get_sdstr(body,0));
        }
}

function _hd(body)
{
        var ly=getlayer(body);
        if(nNN4)
                ly.visibility='hide';
        else
        {
                var lyf;
                if(nIE5&&!nMac)
                {
                        lyf=ly.filters['Alpha'];
                        lyf.opacity=0;
                }
                ly.style.visibility='hidden';
                if(nIE5&&!nMac)         lyf.opacity=body.opacity;
        }
}
```

```
function fixmenu(menu)
{
	for(mbi=0;mbi<menu.bodys.length;mbi++)
	{
		var body=menu.bodys[mbi];
		if(nOP&&nVer<6.0)

	getlayer(body).style.pixelWidth=parseInt(getob(body.block+"TB",'table').style.pixelWidth);
		if(nIEW&&nIE5)
			getlayer(body).style.width=getlayer(body).offsetWidth;
		else if(nIEM||!nIE)
		{
			if(body.arrange!="vertically")
			{
				var iti=0;
				var fixit=getob(body.block+iti);
				var h=parseInt(nOP ? fixit.style.pixelHeight : fixit.offsetHeight);
				if(h)
				{
					for(iti=0;iti<body.items.length;iti++)
					{
						var item=body.items[iti];
						var lys=getlayer(item).style;
						var tm_h=h-2*body.spacing;
						if(nOP)
							lys.pixelHeight=tm_h;
						else if(item.type=="sepline"||nIE)
							lys.height=tm_h+'px';
						else
							lys.height=tm_h-2*item.bd_sz+'px';

						if(nIEM)
						{
							var fh=h-2*body.spacing;
							lltd=getob(item.block+"LLTD");
							ltd=getob(item.block+"LTD");
							rtd=getob(item.block+"RTD");
							rrtd=getob(item.block+"RRTD");
							if(lltd)
								lltd.style.height=fh+'px';
							if(ltd)
								ltd.style.height=fh+'px';

	getob(item.block+"MTD").style.height=fh+'px';
							if(rtd)
								rtd.style.height=fh+'px';
							if(rrtd)
								rrtd.style.height=fh+'px';
						}
					}
				}
			}
			else if(nOP)
			{
				for(iti=0;iti<body.items.length;iti++)
				{
```

```
                                        var item=body.items[iti];
                                        if(item.type!="sepline")
                                        {
                                                var fixit=getob(body.block+iti);
                                                var it=getlayer(item);
                                                var h=parseInt(it.style.pixelHeight);
                                                var w=parseInt(fixit.style.pixelWidth);
                                                if(h)
                                                        it.style.pixelHeight=h;
                                                if(w)
                                                        it.style.pixelWidth=w-2*body.spacing;
                                        }
                                }
                        }
                }
        }
}

function prefix(menu)
{
        var body=menu.bodys[menu.bodys.length-1];
        var item=body.items[body.items.length-1];
        while(1)
                if(getlayer(item)) break;
        if(!nNN4)
                fixmenu(menu);
        if(menu.type!="custom")
                show(menu.bodys[0]);
        if(nIEM)
                window.onscroll=function()
                {
                        if(st_scrollid)
                                clearTimeout(st_scrollid);
                        st_scrollid=setTimeout('scrollmenu();',500);
                }
        else if(!st_rl_id)
        {
                st_cl_w=getcw();
                st_cl_h=getch();
                st_cl_l=getcl();
                st_cl_t=getct();
                st_rl_id=setInterval("ckPage();",500);
        }
        menu.ready=1;
}

function scrollmenu()
{
        for(i=0;i<st_menus.length;i++)
        {
                var menu=st_menus[i];
                if(menu&&menu.type=="float")
                {
                        hideall(menu);
                        var _b=menu.bodys[0];
                        ck_win_els(+1,_b);
                        moveto(getxy(menu.bodys[0]),_b);
```

```
                        ck_win_els(-1,_b);
                }
        }
}

function getbg(bg_cl,bg_img,bg_rep)
{
        var s=bg_cl;
        if(bg_img!='')
                s+=" url("+bg_img+") "+bg_rep;
        return s;
}

function ck_win_els(change,obj)
{
        if(!st_loaded||nNN4||nOP||obj.isstatic)         return;
        if(HideSelect)      win_ele_vis("SELECT", change, obj);
        if(HideObject)      win_ele_vis("OBJECT", change, obj);
        if(HideIFrame)      win_ele_vis("IFRAME", change, obj);
}

function win_ele_vis(tagName, change, obj)
{
        var els=nNN6 ? document.getElementsByTagName(tagName) : document.all.tags(tagName);
        var i;
        for (i=0;i<els.length;i++)
        {
                var el=els.item(i);
                var flag;
                for(flag=0,tmobj=el.offsetParent;tmobj;tmobj=tmobj.offsetParent)
                        if(tmobj.id&&tmobj.id.indexOf("STM")>=0)
                                flag=1;
                if(flag)
                        continue;
                else if(elements_overlap(el,obj))
                {
                        if (el.visLevel)
                                el.visLevel+=change;
                        else
                                el.visLevel=change;
                        if (el.visLevel==-1)
                        {
                                if(typeof(el.visSave)=='undefined')
                                        el.visSave=el.style.visibility;
                                el.style.visibility="hidden";
                        }
                        else if (el.visLevel==0)
                                el.style.visibility=el.visSave;
                }
        }
}

function elements_overlap(el,obj)
{
        var left=0;
        var top=0;
        var width=el.offsetWidth;
```

```
	var height=el.offsetHeight;
	if(width)
		el._width=width;
	else
		width=el._width;
	if(height)
		el._height=height;
	else
		height=el._height;

	while(el)
	{
		left+=el.offsetLeft;
		top+=el.offsetTop;
		el=el.offsetParent;
	}
	return ((left<obj.rc[2]+obj.rc[0]) && (left+width>obj.rc[0]) && (top<obj.rc[3]+obj.rc[1]) &&
(top+height>obj.rc[1]));
}

function getob(id,t)
{
	if(nNN6)
		return document.getElementById(id);
	else if(nNN4)
		return document.layers[id];
	else
		return t ? document.all.tags(t)[id] : document.all[id];
}

function getBodyEventString(body)
{
	var s=" onMouseOver='dombov(event,this,st_menus["+body.mei+"].bodys["+body.mbi+"]);'";
	s+=" onMouseOut='dombou(event,this,st_menus["+body.mei+"].bodys["+body.mbi+"]);'";
	return s;
}

function getItemEventString(item)
{
	if(item.type=='sepline')	return '';
	var s="
onMouseOver='doitov(event,this,st_menus["+item.mei+"].bodys["+item.mbi+"].items["+item.iti+"]);'";
	s+="
onMouseOut='doitou(event,this,st_menus["+item.mei+"].bodys["+item.mbi+"].items["+item.iti+"]);'";
	s+="
onClick='doitck(event,this,st_menus["+item.mei+"].bodys["+item.mbi+"].items["+item.iti+"]);'";
	return s;
}

function getEventCode(pre,isitem)
{
	var s=isitem ? 'st_rei' : 'st_reb';
	s+='.exec(this.parentLayer.id);mei=RegExp.$1;mbi=parseInt(RegExp.$2);';
	if(isitem)		s+='iti=parseInt(RegExp.$3);return
'+pre+'(e,this,st_menus[mei].bodys[mbi].items[iti]);';
	else	s+='return '+pre+'(e,this,st_menus[mei].bodys[mbi]);';
	return new Function('e',s);
```

```
}

function addquo(n)
{
	return "\""+n+"\"";
}

function getURL(item)
{
	return " HREF=" + addquo(item.url=="" ? "javascript:;" : item.url.replace(new
RegExp("\"","g"),"&quot;")) + " TARGET=" +
addquo(item.url==""||item.url.toLowerCase().indexOf('javascript:')==0 ? "_self" : item.target);
}
```

// **Form Design Code**

```
<html>
	<head>
		<title>Patient Hospital History Record Form</title>
		<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
		<SCRIPT LANGUAGE="JavaScript">
<!-- Begin
//***************************************************************
// Check the email field - is it valid?
//***************************************************************
function validEmail(Email) {
	invalidChars = " /:,;";
	//A blank Email is not valid.
	if (Email == "") {
		return false;
		}
	//Look for any invalid chars.
	for (i=0; i<invalidChars.length; i++) {
		badChar = invalidChars.charAt(i);
		if (Email.indexOf(badChar,0) != -1) {
			return false;
			}
		}
	//Must be one @...
	atPos = Email.indexOf("@",1);
	if (atPos == -1) {
		return false;
		}
	//... but ONLY one!
	if (Email.indexOf("@", atPos+1) != -1) {
		return false;
		}
	//Look for at least one period.
	periodPos = Email.indexOf(".", atPos);
	if (periodPos == -1) {
		return false;
		}
	//Is this really valid?
	if (periodPos+3 > Email.length) {
		return false;
		}
	return true;
```

```
}

function checkrequired(which) {
var strErrMsg = ''
if(!which.FirstName.value){
    strErrMsg += 'Please enter Patient First Name.\n';

 if(!which.LastName.value){
    strErrMsg += 'Please enter Patient Last Name.\n';
 }
 if(!which.hospital_number.value){
    strErrMsg += 'Please enter Patient Hospital Number.\n';
 }
if(!which.day.value){
    strErrMsg += 'Please enter a Day.\n';
 }
if(!which.month.value){
    strErrMsg += 'Please enter a Maonth.\n';
 }
if(!which.year.value){
    strErrMsg += 'Please enter a Year.\n';
 }
 if(!which.sex.value){
    strErrMsg += 'Please enter Patient Gender Year.\n';
 }

if(!which.ocupation.value){
    strErrMsg += 'Please enter Patient Occupation.\n';
 }
if(!which.tribe.value){
    strErrMsg += 'Please enter a Tribe.\n';
 }
 if(!which.state0.value){
    strErrMsg += 'Please Select State.\n';
 }

if(!which.zip.value){
    strErrMsg += 'Please enter a Zip Code.\n';
 }
if(!which.country0.value){
    strErrMsg += 'Please Select Country.\n';
 }

 if(!which.address1.value){
    strErrMsg += 'Please enter First address.\n';
 }
 if(!which.address2.value){
    strErrMsg += 'Please enter Second address.\n';
 }

if(!which.phone.value){
    strErrMsg += 'Please enter Patient Phone.\n';
 }
 if(!which.phone1.value){
    strErrMsg += 'Please enter Next of Kin Phone Number.\n';
 }
```

```
if (!validEmail(which.Email.value)) {
        strErrMsg += 'Please enter a valid Email.\n';
        boolSubmit=0;
        }
if(!which.EmailConfirm.value){
    strErrMsg += 'Please enter a EmailConfirm.\n';
        }
else {
        if (!(which.Email.value==which.EmailConfirm.value)) {
            strErrMsg += 'Email and EmailConfirm must match.\n';
        }
}
 if(!which.nextfname.value){
    strErrMsg += 'Please enter Patient Next of Kin First Name.\n';
 }
 if(!which.nextlname.value){
    strErrMsg += 'Please enter Patient Next of Kin Last Name.\n';
 }
if(!which.relationship.value){
    strErrMsg += 'Please enter Relationship.\n';
 }

if(strErrMsg != ''){
   alert(strErrMsg)
   return false;
} else {
   return true;
}
}
}

                </SCRIPT>
        </head>
        <body text="#000000">
                <p align="center"><b><font face="Arial, Helvetica, sans-serif" size="5">
                PATIENTS HOSPITAL RECORD</font></b></p>

                <FORM name="frmMembApp" METHOD="post" ACTION="patient.php"
onSubmit="return checkrequired(this)">
                        <input type="hidden" name="go" value="Y">
                        <input type="hidden" name="Subject" value="Individual Membership
Application">
                        <INPUT TYPE="hidden" NAME="From" VALUE="telemedicine.com">
                        <div align="center">
                        <table border="0" cellspacing="0" cellpadding="4" width="550"
bgcolor="#800000">
                                <tr>
                                        <td colspan="2" align="center">
                                                <p><b>
                                                <font face="Arial, Helvetica, sans-serif" size="2"
color="#FFFF00">Nigerian Telemedicine Association<br>
                                                                Ahmadu Bello University,
Zaria<br>
                                                                Nigeria, West Africa<br
/></font></b></td>
                                </tr>
                                <tr>
```

```
                    <td bgcolor="#FFFFCC" width="140"><b>
                    <font face="Arial, Helvetica, sans-
serif">Patient</font></b><font face="Arial, Helvetica, sans-serif"><b>s Profile</b></font></td>
                    <td bgcolor="#FFFFCC" width="394"><b>
                    <font face="Arial, Helvetica, sans-serif" size="1"
color="#FF0000">(*)</font></b><font face="Arial, Helvetica, sans-serif" size="1">
                                        required field</font></td>
                </tr>
                <tr>
                    <td bgcolor="#FFFFCC" align="right"
width="140"><b><font face="Arial, Helvetica, sans-serif" size="1" color="#FF0000"><font

face="Arial, Helvetica, sans-serif">(*)</font>
                                        </font></b><font face="Arial, Helvetica,
sans-serif" size="2">First Name</font></td>
                    <td bgcolor="#FFFFCC" width="394">
                        <input name="FirstName" size="35">
                    </td>
                </tr>
                <tr>
                    <td bgcolor="#FFFFCC" align="right"
width="140"><b><font face="Arial, Helvetica, sans-serif" size="1" color="#FF0000"><font

face="Arial, Helvetica, sans-serif">(*)</font>
                                        </font></b><font face="Arial, Helvetica,
sans-serif" size="2">Last Name</font></td>
                    <td bgcolor="#FFFFCC" width="394">
                        <input name="LastName" size="35">
                    </td>
                </tr>
                <tr>
                    <td bgcolor="#FFFFCC" align="right" width="140">
                    <font face="Arial, Helvetica, sans-serif" size="2">Hospital
                    Number</font></td>
                    <td bgcolor="#FFFFCC" width="394">
                        <input name="hospital_number" size="35">
                    </td>
                </tr>
                <tr>
                    <td bgcolor="#FFFFCC" align="right" width="140">
                    <font face="Arial, Helvetica, sans-serif" size="2">Date of
                    Birth</font></td>
                    <td bgcolor="#FFFFCC" width="394">
                                        <select name="day" size="1">
                                            <option>Select Day</option>
                                            <option value="1">1
                                            </option>
                                            <option value="2">2
                                            </option>
                                            <option value="3">3
                                            </option>
                                            <option value="4">4
                                            </option>
                                            <option value="5">5
                                            </option>
                                            <option value="6">6
                                            </option>
```

```
                    <option value="7">7
                    </option>
                    <option value="8">8
                    </option>
                    <option value="9">9
                    </option>
                    <option value="10">10
                    </option>
                    <option value="11">11
                    </option>
                    <option value="12">12
                    </option>
                    <option value="13">13
                    </option>
                    <option value="14">14
                    </option>
                    <option value="15">15
                    </option>
                    <option value="16">16
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                    <option value="17">17
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                    <option value="18">18
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                    <option value="19">19
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                    <option value="20">20
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                    <option value="21">21
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                    <option value="22">22
                    </option>
                    <option value="23">23
                    </option>
                    <option value="24">24
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                    <option value="25">25
                    </option>
                    <option value="26">26
                    </option>
                    <option value="27">27
                    </option>
                    <option value="28">28
                    </option>
                    <option value="29">29
                    </option>
                    <option value="30">30
                    </option>
                    <option value="31">31
                    </option>
            </select> 
            <select name="month" size="1">
                    <option>Select Month</option>
                    <option value="January">January
                    </option>
                    <option
value="February">February
```

```
                                                    </option>
                                                    <option value="March">March
                                                    </option>
                                                    <option value="April">April
                                                    </option>
                                                    <option value="May">May
                                                    </option>
                                                    <option value="June">June
                                                    </option>
                                                    <option value="July">July
                                                    </option>
                                                    <option value="August">August
                                                    </option>
                                                    <option
value="September">September
                                                    </option>
                                                    <option value="October">October
                                                    </option>
                                                    <option
value="November">November
                                                    </option>
                                                    <option
value="December">December
                                                    </option>
                                                    </select> 
                                                <select name="year" size="1">
                                                    <option>Select Year</option>
                                                    <option value="1960">1960
                                                    </option>
                                                    <option value="1961">1961
                                                    </option>
                                                    <option value="1962">1962
                                                    </option>
                                                    <option value="1963">1963
                                                    </option>
                                                    <option value="1964">1964
                                                    </option>
                                                    <option value="1965">1965
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                                                    <option value="1966">1966
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                                                    <option value="1967">1967
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                                                    <option value="1968">1968
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                                                    <option value="1969">1969
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                                                    <option value="1970">1970
                                                    </option>
                                                    <option value="1971">1971
                                                    </option>
                                                    <option value="1970">1970
                                                    </option>
                                                    <option value="1971">1971
                                                    </option>
                                                    <option value="1970">1970
                                                    </option>
```

```
<option value="1971">1971
</option>
<option value="1970">1970
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<option value="1971">1971
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<option value="1970">1970
</option>
<option value="1971">1971
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<option value="1972">1972
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<option value="1989">1989
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<option value="1990">1990
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<option value="1991">1991
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<option value="1992">1992
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<option value="1993">1993
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<option value="1994">1994
```

```
                                        </option>
                                        <option value="1995">1995
                                        </option>
                                        <option value="1996">1996
                                        </option>
                                        <option value="1997">1997
                                        </option>
                                        <option value="1998">1998
                                        </option>
                                        <option value="1999">1999
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                                        <option value="2000">2000
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                                        <option value="2001">2001
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                                        <option value="2002">2002
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                                        <option value="2003">2003
                                        </option>
                                        <option value="2004">2004
                                        </option>
                                        <option value="2005">2005
                                        </option>
                                        <option value="2006">2006
                                        </option>
                                        <option value="2007">2007
                                        </option>
                                        <option value="2008">2008
                                        </option>
                                        <option value="2009">2009
                                        </option>
                                        </select></td>
                                </tr>
                                <tr>
                                        <td bgcolor="#FFFFCC" align="right" width="140">
                                        <font face="Arial" size="2">Sex</font></td>
                                        <td bgcolor="#FFFFCC" width="394">
                                                <select name="sex" size="1">
                                                        <option>Select Sex</option>
                                                        <option value="Female">Female
                                                        </option>
                                                        <option value="Male">Male
                                                        </option>
                                                </select>
                                        </td>
                                </tr>
                                <tr>
                                        <td align="right" bgcolor="#FFFFCC" width="140"><b>
                                        <font face="Arial, Helvetica, sans-serif" size="1"
color="#FF0000">(*)</font></b><font color="#FF0000" face="Arial, Helvetica,

sans-serif" size="1"><b> </b>
                                                </font>
                                        <font face="Arial, Helvetica, sans-serif" size="2">
                                                Occupation</font></td>
                                        <td bgcolor="#FFFFCC" width="394">
                                                <input name="ocupation" size="35">
```

```
                    </td>
                </tr>
                <tr>
                    <td height="34" bgcolor="#FFFFCC" align="right"
width="140"><font face="Arial, Helvetica, sans-serif" size="1"

color="#FF0000"><b><font face="Arial, Helvetica, sans-serif">(*)</font> </b>
                        </font>
                    <font face="Arial, Helvetica, sans-serif"
size="2">Tribe</font></td>
                    <td height="34" bgcolor="#FFFFCC" width="394">
                        <select name="tribe" size="1">
                            <option>Select Tribe</option>
                            <option value="Ibgo">Ibgo
                            </option>
                            <option value="Hausa">Hausa
                            </option>
                            <option value="Yoruba">Yoruba
                            </option>
                            <option value="Ibira">Ibira
                            </option>
                            <option value="Fulani">Fulani
                            </option>
                            <option value="Igala">Igala
                            </option>
                            <option value="Okwun">Okwun
                            </option>
                            <option value="Tivi">Tivi
                            </option>
                            <option value="Idoma">Idoma
                            </option>
                            <option value="Ibibiyo">Ibibiyo
                            </option>
                            <option value="Isakiri">Isakiri
                            </option>
                            <option value="Ogori">Ogori
                            </option>
                            <option value="Etulo">Etulo
                            </option>
                            <option value="Egede">Egede
                            </option>
                            <option value="Nupe">Nupe
                            </option>
                            <option
value="Basange">Basange

                            </option>
                            <option value="Gwari">Gwari
                            </option>
                            <option value="Eganyi">Eganyi
                            </option>
                            <option value="Katab">Katab
                            </option>
                            <option value="Okpela">Okpela
                            </option>
                            <option value="Awuchi">Auchi
                            </option>
                        </select>
```

```
                                        </td>
                                    </tr>
                                    <tr>
                                        <td bgcolor="#FFFFCC" align="right" width="140">
                                        <font face="Arial, Helvetica, sans-serif"
size="2">State</font></td>
                                        <td bgcolor="#FFFFCC" width="394">
                                                <select name="state0" size="1">
                                                        <option value="">Select state of
Origin</option>
      <option value="Abia">Abia</option>
     <option value="Adamawa">Adamawa</option>
     <option value="Akwa Ibom">Akwa Ibom</option>
     <option value="Anambra">Anambra</option>
     <option value="Bayelsa">Bayelsa</option>
     <option value="Bauchi">Bauchi</option>
     <option value="Benue">Benue</option>
     <option value="Borono">Borono</option>
     <option value="Cross River">Cross River</option>
     <option value="Delta">Delta</option>
     <option value="Ebonyi">Ebonyi</option>
     <option value="Edo">Edo</option>
     <option value="Ekiti">Ekiti</option>
     <option value="Enugu">Enugu</option>
          <option value="FCT">FCT</option>
     <option value="Gombe">Gombe</option>
     <option value="Imo">Imo</option>
     <option value="Jigawa">Jigawa</option>
     <option value="Kaduna">Kaduna</option>
     <option value="Kano">Kano</option>
     <option value="Katsina">Katsina</option>
     <option value="Kebbi">Kebbi</option>
     <option value="Kogi">Kogi</option>
     <option value="Kwara">Kwara</option>
     <option value="Lagos">Lagos</option>
     <option value="Nassarawa">Nassarawa</option>
     <option value="Niger">Niger</option>
     <option value="Ogun">Ogun</option>
     <option value="Osun">Osun</option>
     <option value="Ondo">Ondo</option>
     <option value="Oyo">Oyo</option>
     <option value="Plateau">Plateau</option>
     <option value="Rivers">Rivers</option>
     <option value="Sokoto">Sokoto</option>
     <option value="Taraba">Taraba</option>
     <option value="Yobe">Yobe</option>
     <option value="Zamfara">Zamfara</option>
     <option value="Non-Nigerian">Non-Nigerian</option>
                                                </select></td>
                                    </tr>
                                    <tr>
                                        <td bgcolor="#FFFFCC" align="right"
width="140"><b><font face="Arial, Helvetica, sans-serif" size="1" color="#FF0000"><font

face="Arial, Helvetica, sans-serif">
                                        (*)</font>
```

```
                                                    </font></b><font face="Arial, Helvetica,
sans-serif" size="2">
                                         Zip/Postal Code</font></td>
                                        <td bgcolor="#FFFFCC" width="394">
                                                <input name="zip" size="10"> </td>
                                </tr>
                                <tr>
                                        <td bgcolor="#FFFFCC" align="right" width="140"><font
face="Arial, Helvetica, sans-serif" size="2">Country</font></td>
                                        <td bgcolor="#FFFFCC" width="394">
                                                <select name="country0" size="1">
                                                        <option selected>Select
Country</option>
                                                        <option>Non African</option>
     <OPTION>Algeria</OPTION> <OPTION>Angola</OPTION>
    <OPTION>Benin</OPTION> <OPTION>Botswana</OPTION> <OPTION>Burkina
    Faso</OPTION> <OPTION>Burundi</OPTION> <OPTION>Cameroon</OPTION>
    <OPTION>Cape Verde</OPTION> <OPTION>Central Africa</OPTION>
    <OPTION>Chad</OPTION> <OPTION>Congo</OPTION> <OPTION>Congo
    Democratic</OPTION> <OPTION>Djibouti</OPTION> <OPTION>Equatorial
    Guinea</OPTION> <OPTION>Egypt</OPTION> <OPTION>Eritrea</OPTION>
    <OPTION>Ethiopia</OPTION> <OPTION>Gabon</OPTION> <OPTION>Gambia</OPTION>
    <OPTION>Ghana</OPTION> <OPTION>Guinea</OPTION> <OPTION>Guinea
    Bissau</OPTION> <OPTION>Ivory Coast</OPTION> <OPTION>Kenya</OPTION>
    <OPTION>Lesotho</OPTION> <OPTION>Liberia</OPTION> <OPTION>Libya</OPTION>
    <OPTION>Madagascar</OPTION> <OPTION>Malawi</OPTION>
    <OPTION>Mali</OPTION> <OPTION>Mauritius</OPTION>
    <OPTION>Morocco</OPTION> <OPTION>Mozambique</OPTION>
    <OPTION>Namibia</OPTION> <OPTION>Niger</OPTION> <OPTION>Nigeria</OPTION>
    <OPTION>Reunion</OPTION> <OPTION>Rwanda</OPTION> <OPTION>South
    Africa</OPTION> <OPTION>Senegal</OPTION> <OPTION>Seyshelles</OPTION>
    <OPTION>Sierra Leone</OPTION> <OPTION>Somalia</OPTION>
    <OPTION>Sudan</OPTION> <OPTION>Swaziland</OPTION>
    <OPTION>Tanzania</OPTION> <OPTION>Togo</OPTION> <OPTION>Tunisia</OPTION>
    <OPTION>Uganda</OPTION> <OPTION>Zambia</OPTION>
   <OPTION>Zimbabwe</OPTION>
                                        </select>
                                                </td>
                                </tr>
                                <tr>
                                        <td bgcolor="#FFFFCC" align="right"
width="140"><b><font face="Arial, Helvetica, sans-serif" size="1" color="#FF0000"><font

face="Arial, Helvetica, sans-serif">
                                        (*)</font>
                                                    </font></b><font face="Arial, Helvetica,
sans-serif" size="2">
                                        Phone Number</font></td>
                                        <td bgcolor="#FFFFCC" width="394">
                                                <input name="phone" size="35">
                                        </td>
                                </tr>
                                <tr>
                                        <td bgcolor="#FFFFCC" align="right"
width="140"><b><font face="Arial, Helvetica, sans-serif" size="1" color="#FF0000"><font
```

```
face="Arial, Helvetica, sans-serif">(*)</font>  </font></b><font face="Arial, Helvetica, sans-serif" size="2">Address, line 1</font></td>
                                        <td bgcolor="#FFFFCC" width="394">
                                                <input name="address1" size="35">
                                        </td>
                                </tr>
                                <tr>
                                        <td bgcolor="#FFFFCC" align="right" valign="top" width="140"><b><font face="Arial, Helvetica, sans-serif" size="1"

color="#FF0000"><font face="Arial, Helvetica, sans-serif">(*)</font>  </font></b><font face="Arial, Helvetica, sans-serif" size="2">Address, line
                                        2</font></td>
                                        <td bgcolor="#FFFFCC" width="394">
                                                <input name="address2" size="35">
                                                <br>
                                        </td>
                                </tr>
                                <tr>
                                        <td colspan="2">
                                                <hr size="1">
                                        </td>
                                </tr>
                                <tr>
                                        <td colspan="2" bgcolor="#FFE0D9">
                                                <p><b><font face="Arial, Helvetica, sans-serif">Profile

                                                </font></b><font face="Arial, Helvetica, sans-serif">

                                                <b>of Next of Kin</b></font></p>
                                                <p><font face="Arial, Helvetica, sans-serif" size="2"><b><font color="#FF3300">

                                                Please read</font></b>: This address will only be used

                                                for reference purpose. If it is the same address as above

                                                please skip this section.</font></p>
                                        </td>
                                </tr>
                                <tr>
                                        <td align="right" bgcolor="#FFE0D9" width="140">
                                        <font face="Arial" size="2">First Name</font></td>
                                        <td bgcolor="#FFE0D9" width="394">
                                                <input name="nextfname" size="35"></td>
                                </tr>
                                <tr>
                                        <td align="right" bgcolor="#FFE0D9" width="140">
                                        <font face="Arial" size="2">Last Name</font></td>
                                        <td bgcolor="#FFE0D9" width="394">
                                                <input name="nextlname" size="35"></td>
                                </tr>
                                <tr>
                                        <td align="right" bgcolor="#FFE0D9" width="140">
                                        <font face="Arial" size="2">Relationship</font></td>
                                        <td bgcolor="#FFE0D9" width="394">
                                                <input name="relationship" size="35"></td>
                                </tr>
```

```
                                        <tr>
                                                <td align="right" bgcolor="#FFE0D9" width="140"><font
face="Arial, Helvetica, sans-serif" size="2">
                                                Address, line 1</font></td>
                                                <td bgcolor="#FFE0D9" width="394">
                                                        <input name="address3" size="35">
                                                </td>
                                        </tr>
                                        <tr>
                                                <td align="right" bgcolor="#FFE0D9" width="140"
height="33"><font face="Arial, Helvetica, sans-serif" size="2">
                                                Address, line 2</font></td>
                                                <td bgcolor="#FFE0D9" width="394" height="33">
                                                        <input name="address4" size="35">
                                                </td>
                                        </tr>
                                        <tr>
                                                <td height="27" align="right" bgcolor="#FFE0D9"
width="140">
                                                <font face="Arial, Helvetica, sans-serif" size="2">E-Mail
Address</font></td>
                                                <td height="27" bgcolor="#FFE0D9" width="394">
                                                        <input name="Email" size="35"></td>
                                        </tr>
                                        <tr>
                                                <td height="27" align="right" bgcolor="#FFE0D9"
width="140">
                                                <font face="Arial, Helvetica, sans-serif" size="2">E-Mail
<i>
                                                Confirm</i></font></td>
                                                <td height="27" bgcolor="#FFE0D9" width="394">
                                                        <input name="EmailConfirm" size="35"></td>
                                        </tr>
                                        <tr>
                                                <td height="27" align="right" bgcolor="#FFE0D9"
width="140">
                                                Phone Number</td>
                                                <td height="27" bgcolor="#FFE0D9" width="394">
                                                        <input name="phone1" size="35"></td>
                                        </tr>
                                        <tr>
                                                <td colspan="2">
                                                        &amp;nbsp;</td>
                                        </tr>
                                        <tr>
                                                <td width="140">&amp;nbsp;</td>
                                                <td width="394">
                                                        <p align="left">
                                                        <input type="submit" value="  Submit Record  "
style="float: left">
                                <input type="reset" value="Reset All Entery" name="B1">
                        </td>
                                        </tr>
                                </table>
                                </div>
                                <p align="center">&amp;nbsp;
                        <a href="#">back
```

```
                                                    to top</a></p>
                </FORM>

                <p>
                        <center>
                                <b><font face="Arial, Helvetica, sans-serif" size="1">Nigerian
                                Telemedicine System</font></b></center>
        </body>
</html>
```

// Uploading Still Image and Medical Lab Test Code

```
<html>
<head><title>Upload labratory still images</title></head>
<body  bgcolor="FFFFCC" style="margin: 1px">
<table border="1" cellpadding="5" width="100%" align="center">
<tr><td colspan="2" bgcolor="#0066cc"><font color="#FFFFCC" size="+1" align="center">Still
Images Uploaded</font></td></tr>
<tr  bgcolor="#ffff00"><td><nobr>Image Name</nobr></td>
        <td align="right"><nobr>File size</nobr></td></tr>
<?php
$save_path="C:\\wamp\\www\\web1\\still_images\\images";
$file = $_FILES['userfile'];
$k = count($file['name']);
for($i=0 ; $i < $k ; $i++)
{
        if($i %2)
        {
                echo '<tr bgcolor="#FFFF99"> ';
        }
        else
        {
                echo '<tr>';
        }

        echo '<td align="left">' . $file['name'][$i] ."</td>\n";
        echo '<td align="right">' . $file['size'][$i] ."</td></tr>\n";

        if(isset($save_path) && $save_path!="")
        {
                $name = split('/',$file['name'][$i]);

                move_uploaded_file($file['tmp_name'][$i], $save_path . $name[count($name)-1]);
        }

}

echo "<tr style='color: #0066cc'><td>SSL</td><td>". (($_SERVER[HTTPS] != 'on') ? 'Off' : 'On')
."</td></tr>";
if(! isset($save_path) || $save_path =="")
{
        echo '<tr style="color: #0066cc"><td colspan=2 </td></tr>';
}
?>
```