A Transcultural Model of e-Governance for Healthcare sector in India

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Abstract— Healthcare industry has seen a lot of transformation and innovation over the years. It is coming forward as a recognized sector in India after Information Technology and Pharmaceutical. But despite this, India's healthcare infrastructure has not kept pace with the economies and the sectorial growth. Enormous amount of resources have been spent but very little change on actual health status is noticed. This research crafts an effective e-governance model that systematically applies relevant prerequisites to a successful transcultural e-governance project, drawing empirical evidence through its application to a specific healthcare industry sector. As e-governance in transnational enterprises (TNEs) would involve global technology transfers from the original project context into a different socio-cultural environment, our e-government model will incorporate and infuse cultural factors to facilitate technology transfers and acceptance.

Keywords— *e*-health, e-Governance, tele-medicine, tele-consultation, tele-referal

1. INTRODUCTION

Today is the world of change and revolution. Things which are not dynamic are considered as mortal. The rise of e-government has been one of the most striking developments of the web Global shifts towards increased deployment of IT by governments emerged in the nineties, with the advent of the World Wide Web. The technology as well as e-governance initiatives have come a long way since then. Recognizing the increasing importance of electronics, the Government of India established the Department of Electronics in 1970.[1] The subsequent establishment of the National Informatics centre (NIc) in 1977 was the first major step towards e-Governance in India as it brought 'information' and its communication in focus. However, the main thrust for e-Governance was provided by the launching of NIcNET in 1987 – the national satellite-based computer network. This was followed by the launch of the District Information System of the National Informatics centre (DISNIc) program to computerize all district offices in the Country for which free hardware and software was offered to the State Governments. NIcNET was extended via the State capitals to all district headquarters by 1990 [1].

E-Governance was started in India by AKSHAYA in Kerala. This project involves setting up around 5000 multipurpose community technology centers called Akshaya e- Kendra's across Kerala. E-Governance is the application of Information and Communication Technology (ICT) for delivering government services, exchange of information communication transactions, integration various stand-one systems and services between Government-to-Citizens (G2C),Government to Business(G2B), Government-to-Government(G2G) as well as back office processes and interactions within the entire government frame work.[2] Through the e-Governance, the government services will be made available to the citizens in a convenient, efficient and transparent manner. The three main target groups that can be distinguished in governance concepts are Government, citizens and businesses/interest groups.

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In E-governance there are no distinct boundaries. There are four pillars of E-Governance:

1. Connectivity: Connectivity is required to connect the people to the services of the government. There should be a strong connectivity for an effective e-governance.
2. Knowledge: Here knowledge refers to IT knowledge. Government should employ skill full engineers who can handle the e-governance in an efficient way. These engineers also handle all kind of fault that may occur during the working of e-governance.
3. Data Content: To share any kind of knowledge or information over the internet, there should be its database. This database should have the data content which is related to government services.
4. Capital: Capital can be on public or private partnership. It refers to money used by government to provide their services or to that sector of the economy based on its operation.

2. BACKGROUND IN HEALTHCARE

Healthcare industry in India is seeing a lot of transformation and innovation. It has grown leaps and bounds and seen a lot of changes. It is growing at a steady pace and is expected to be US $300 billion by 2020. Growing incomes and rise in elderly population are some of the factors for this rapid growth. It is moving ahead and is a recognised sector just like software and pharmaceutical industry. This sector has registered a growth of 9.3% from 2000-2011 and is projected to grow to 32% by 2015. Indian hospitals are gaining reputation globally as "quality" service providers and many Indian hospitals have secured accreditation in this regard. India has become a preferred medical destination by people from other countries and this medical tourism is expected to grow to US $2.2 billion industry by coming years .Private players play a major role in this regard as this sector is financially stronger and well managed. The high growth in this segment is arising due to various reasons [3]:

1. Increasing health awareness.
2. Increasing penetration of health insurance.
3. Increasing percentage of household expenditure on health.
4. Rapid growth in private companies owning and managing hospitals
5. High growth in medical tourism- cost of comparable treatment is on average 1/8th to 1/5th of those in western countries.
6. The medical insurance premium income is expected to grow to US$3.8 billion in 2015. Currently less than 15% of population is covered by health insurance.

Procedure	**US**	**Thailand**	**India**	**X times US**
Cardiac Surgery	50,000	14,250	4000	12.50
Bone Marrow Transplant	62,500	62,500	3000	13.33
Liver Transplant	500,000	75,000	45,000	11.11
Orthopaedic Surgery	16,000	6900	4500	3.56

Table I: Cost of Key healthcare procedure

A. Genesis of the problem

In spite of much stated growth in this sector there is a lot to be done. The key statistical indicators as Infant mortality, longevity, infectious disease rates and provision of health services indicate that there is a lot to be done in this sector. India's healthcare infrastructure has not kept pace with the economies and sectorial growth. The number of healthcare facilities is inadequate. For instance India needs 74,150 community health centres per million populations but has less than half that number. More than 8 states do not have labs for testing drugs and more than half of existing labs are not properly equipped or staffed. When it comes to healthcare there are two India: Indians who get specialised medical care and Indians who have limited or no access to quality care. Only

25% of the Indians have access to western (allopathic) medicine which is practiced in mainly urban areas where 2/3rd of hospitals and healthcare centres are located. Many of the rural poor have to rely on alternate forms of treatment like Ayurveda, Unani or acupuncture. This rural-urban divide has given rise to distinctly different healthcare requirements. The main focus of most of the healthcare providing institutions is technological advancements in the urban areas but the actual need exists in the villages. One solution to this problem is telemedicine- the remote diagnosis, monitoring and treatment of patients via videoconferencing or the internet. Thus there is total uncertainty in processes, results and thus the impact on the patients. There are administrative, diagnostic and therapeutic delays or errors to add to patient's trauma. Due to the aforesaid problems there is lack of proactive information and thus lack of adequate counseling. There are tie-ups with foreign medical institutes which are leading to a better quality of healthcare being provided. But most of the investment which is done in the healthcare industry is concentrated in the metropolitan areas thus leaving the tier 2 cities none benefited with this development. The per capita spend on the healthcare is less than 1% which is very-very low for a country like India with a booming population.

In the past five decades life expectancy has increased from 50 years to over 64 in 2000. IMR has come down from 1476 to 7. Crude birth rates have dropped to 26.1 and death rates to 8.7.

The recent trends in the Indian healthcare system are:

1. Increased expenditure due to economic growth and higher disposable income leading to higher per capita health spend.
2. Shift in disease profile from more infectious to more chronic lifestyle disorders.
3. Unhygienic living conditions are forcing the migration of urban poor to the cities.
4. 70% of the healthcare is now provided by the private sector in India. There are no standards in service delivery in this unorganized sector.
5. Increased penetration of the private health insurance, but the share of out-of-pocket purchases continues to be an overwhelming proportion of total healthcare spend.
6. New and emerging schemes for healthcare delivery and health insurance for the poor.
7. Emergence of various models as PPP (Public private partnership).

The new healthcare system calls for more standardization in the processes and practices as it has private players and it is found that each of these follow their own standards because there is no common standard at the national level and it leads to discrepancies in records, diagnosis and even treatment.

B. Need of ICT solutions over conventional frameworks

There are two key characteristics of health care that should drive the type of ICT solution we consider. First, we need to take seriously that the fundamental business of health care is knowledge: knowledge of the patient, knowledge of medical treatments and practice, knowledge of the healthcare system, and knowledge of the prevailing environment. This knowledge is extensive and complex, is continuously changing, must be shared among many providers and consumers, and must be brought to bear at the right time, in the right context, at the point of care. Second, we need to be fully cognizant of the inherent complexity of health care: it is composed of a large variety of participants, highly heterogeneous systems and practices, highly autonomous and independent agents, and highly distributed information sources and health services.

In such a business environment, there are three elements that have proven to be a key to success: (1) The knowledge enterprise, (2) Connectivity, and (3) Open Internet-based networks of businesses and users.

The knowledge enterprise, the business model that has proven to be successful for knowledge-based industries is the knowledge enterprise. Yet the business model we use in most healthcare systems is based on an industrial enterprise. This is characterized by a focus on physical components, big players to get economies of scale, detailed planning, standardization, stability, and locked-down, tightly integrated computer systems. The aim has largely been to move from what is seen by many from an inefficient "cottage industry" to a more efficient industrial enterprise. This approach may be suitable for running hospitals but it will not work for managing and preventing chronic illness across the continuum of care. Here, the organizations and people involved use different systems, different practices, different data and different processes. The type of care is also

different: it requires continuous care surveillance, with reminders and alerts sent to the right people and followed up with the right intervention at the right time. The model of information systems has to adapt to match this model of care. Instead of the industrial model, which may work within a hospital setting, we need a knowledge enterprise model – the kind that is typical of Google, Amazon and eBay. The knowledge enterprise is characterized by networked information, support for autonomy and personalization, and the use of systems that are open, adaptive and distributed. Not many are thinking this way in health care. We are still planning, standardizing, and buying the big systems. These kinds of electronic healthcare systems, currently being rolled out in the UK, require massive investments – between 5-10% of annual health care expenditure. Some jurisdictions are also moving to mandate a limited number of "authorized" applications rather than setting up the infrastructure that would allow for a multitude of interoperable systems. It is difficult to think of anything more likely to kill innovation or more antagonistic to the Internet revolution than the restriction of an entire industry to a limited number of "standard" software applications.

Connectivity, The second key is connectivity. In the period of the Information Economy (1970 to 1995), competitive advantage lay with investing in crunching power: large applications that could process more information more quickly than others. Technology adoption was driven by Moore's Law: the performance to price ratio of computing doubles every eighteen months. But for the Knowledge Economy (from 1995 forwards), raw computing power and large monolithic applications are not the keys to success. Here competitive advantage accrues to those who invest in connecting power: connecting to more people and more systems to share knowledge faster and farther. The prevailing law is Metcalf's Law: the value of a computer is proportional to the square of the number of connections it makes.

The more connections the better: think of LimeWire (sharing music files), YouTube (sharing video clips), and Skype (Voice over IP). The key message: don't spend time getting agreement on the data, don't spend time ensuring all the systems conform – get connected. Once connected, individual value propositions will drive stakeholders towards agreements and standards, continuously increasing the value of the data in an evolutionary way. The need to understand the flow of information will drive faster [4] adoption of standards, in a virtuous cycle of increased information flow, improving standards, and increasing value. However, this is not what we have focused on in health care. Instead, most investment has been directed at the development of large, closed, monolithic systems. The Electronic Health Record (EHR) is almost universally seen as the key to better knowledge sharing in health care, but rather it is the connectivity of the players that is the key. It is the information flow that is important, because from that everything else derives. Without it—without the connectivity to populate and to access health data— health care will remain a world of disconnected silos of information.

Open networks Thirdly, we need to design our systems to accommodate the heterogeneity and incompleteness of information, the distributed and diverse nature of the information sources and users, and the various forms of autonomous and governed institutions and businesses that are part of health care. Instead, the conventional approach in health care can largely be characterized as an attempt to remove the heterogeneity and autonomy from the system, so that is can better run like a well organized bank.

The paradigm example of a system built to accommodate heterogeneity and autonomy is the Internet, and there are two keys to its success: (1) connecting anything, anybody, anywhere, and (2) divesting investment and control of the network (and its services) from a central authority to suppliers and users.

When the Internet was conceived in the early 1990s, it was radically different from the prevailing ICT model at that time. As Tim Berners Lee, the founding father of the World Wide Web, said in 1991: "The dream behind the Web is of a common information space in which we communicate by sharing information. Its universality is essential: the fact that a hypertext link can point to anything, be it personal, local or global, be it draft or highly polished". This was highly radical at the time, where uniformity, accuracy, and completeness of information were considered an essential part of computing methodology. The Internet was also designed from the beginning to have no central authority and to operate "while in tatters". While initial government investment was essential to provide the core infrastructure, the Internet's huge growth has cost the taxpayer little or nothing, as each node is independent and has to manage its own financing and its own technical requirements. This allowed a mix of government and private investment, new applications and services to "plug in" and add value, and new and innovative technologies and business models to rapidly evolve. These three key factors—the

knowledge enterprise, connectivity, and open networks of users and suppliers—have already transformed the retail, finance and music industries, and are beginning to transform film and television.

However, by and large, health care is not thinking along these lines. There is a strong move towards centralized systems and control. There is a strong focus on standards and agreed terminologies. All of which can be positive, but not when used to constrain the development of open networks of innovative healthcare services and businesses.

C. E-health or E-governance in Healthcare

In spite of much talk and hyped concept there is very little which is done and which can be quoted as achievement in this area by the government bodies. Enormous amount of resources have been spent but very little change on actual health status of people have been noticed. Thus despite the availability of technical skills the gains from information technology usage has been apparent. Effective usage of technology is not purely technical. It has socio-cultural and organizational aspects which need to be recognized and carefully implemented. IT applications such as computers, networks, databases will be of very little help if they are used to just automate the existing infrastructure. To benefit from the potential of IT corresponding organizational changes should be anticipated, planned and brought about in the health departments in a systematic way. Thus healthcare today needs to have following characteristics:

1. It should be patient centric.
2. Provide a continuum of care.
3. Specialized, timely and targeted healthcare interventions should be given.

Heeks [5] found that out of 400-500 software export firms in India, the top 20 firms were responsible for 70% of exports. Geographically, most of the 558 company headquarters are located in few large cities; 152 in Bangalore, 122 in Mumbai, 93 in Chennai, 86 in Delhi, 34 in Hyderabad, 27 in Calcutta, 22 in Pune and remaining 22 in all other cities. These unequal structures of IT resulting from policies pursued under e-governance, thus, imply greater economic and geographical divides in India.

D. Devices and Methods

Electronic Medical Records (EMR)

An electronic medical record is a computerized legal medical record created in an organization that delivers care such as hospitals and doctor's premises. Thus EMR is a part of a local standalone information system that allows storage, retrieval and manipulation of records. Handwritten paper medical records can be associated with poor legibility which can contribute to medical errors (Institute of medicine (1999) national academics press). The Electronic Medical record is an online record which tracks and details a patient's care during the time spent in the hospital.

With the increasing and growing population needs, the EMR will gradually replace all the paper based systems and records by integrating the patient's information in a central system. This allows the authorized clinicians to access a patient's records from any location within an area Health service at any time to make rapid assessment and coordinate care of the patient. Thus ultimately EMR will improve the quality, safety and efficiency of care by providing an integrated system of patient information.

The EMR is a single database where patient details are entered once and made available to the entire hospital anywhere and everywhere to all the clinicians with an authorized access. Information gathered about the patient from many hospital service departments can guide clinical decisions through rules and alerts brought to the attention of clinicians. This single view of a patient's details facilitates good communications between departments and clinicians and eliminates duplication of information. Implementation of EMRs involves all the stakeholders viz, patients, doctors, providers, medical staff, front desk staff, clerical staff etc.

Electronic Health Record (EHR)

The Health Information Management System's Society (HIMSS) defines EHR as: "Electronic Health Record is a longitudinal electronic record of a patient generated by one or more encounters in any care delivery centre. In this information details such as past illness, medical history, demographics, problems, progress notes,

medications, immunizations etc are all recorded. Thus an EHR has the ability to generate a complete record of a clinical patient encounter as well as supporting other care related activities such as decision support, quality management and outcome reporting. It automates and streamlines a clinician's workflow." [6] Hippocrates was the first person to develop a medical record in the fifth century BC. Major work in the field of EHR was done in 1960s. Some of the notable early EHR projects are:

1. COSTAR (Computer Stored Ambulatory Record) developed in Harvard.
2. HELP (Health Evaluation through Logical Processing) known for its decision support features.
3. TMR (The medical record) by the Duke University Medical centre.
4. CHCS (Computer Healthcare System), the Department of Defense (DoD) clinical care patient record system used worldwide.

An EHR enables the administrator to obtain data for billing, the physicians to see trends in the effectiveness of treatment, a nurse to report an adverse reaction and a researcher to analyze the efficacy of medication in patients. If each of these professionals works with a data silo, each will have an incomplete picture of patient's condition. Thus EHR integrates data to serve different needs. Goal is to collect once and use it multiple times.

Telehealthcare and Telemedicine

Telehealthcare is the use of electronic information and communications technologies to provide and support healthcare when distance separates the participants (Institute of Medicine 1996). The concept of Telehealthcare has originated from NASA who utilized the technology to monitor the vital signs of astronauts. Thus this technology developed in 70's and has been fine tuned and implemented with transmissions via satellites. The field is being re-defined as constantly the equipment capabilities evolve. (Erickson n.d) The usage of multimedia technology (voice, video and data) to deliver medical services is telemedicine.

Reduced rate of internet usage and improvement in video and compression standards have increased the number and types of medical services that can be delivered from a distance to include most of the specialty. This uses a hybrid technology utilizing elements of television, telecommunication, computers, engineering and medicine. The synergy between health reforms initiatives and advantages in Information technology that support medicine has resulted in proliferation in the telemedicine technology. India is the seventh largest country in the world with an area of about 3.2 million square kilometers.

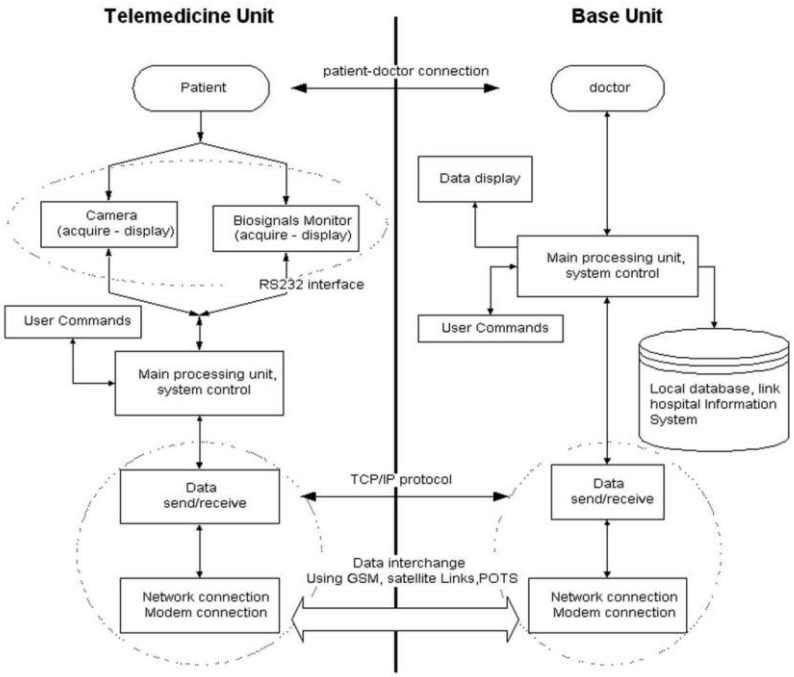

Figure I: Telemedicine at a glance

The health administration has always been concerned to provide the basic minimum healthcare for the population which is predominantly rural and is distributed across distant geographical locations from Jammu and Kashmir to Kanyakumari, islands of Lakshadweep, Andaman and Nicobar and deserts of Rajasthan and Gujarat. 75% of the qualified doctor's practice in urban cities and thus the benefits of development in the medical sciences are available to a privileged few residing in the urban areas. Thus the main aim of telemedicine is to bridge this gap of urban and rural divide and to reach to the grassroots levels. Thus the greatest promise of telemedicine is to help isolated or scattered populations gain access to health services. Information and communication technologies and services can improve the work conditions of isolated health staff only if those technologies are selected, developed, adapted and carefully deployed to suit the population's real needs in their real environment. In India the Department of Information Technology, Ministry of Communication and Information Technology has prepared a guideline "Recommended guidelines & Standards for Practice of Telemedicine in India" to standardize services of different telemedicine centers. The guideline aims at enhancing inter-operability among the various telemedicine systems being setup in the country. At the same time the Ministry of Health and family welfare has setup a task force on Telemedicine in the year 2005 to address issues in telemedicine in the national context. Some of the objectives of telemedicine are:

1. To make high quality healthcare available to traditionally under privileged population. For a country like India this can prove to be beneficial so that the facilities are available to all the citizens equally despite the economic and geographic barriers.
2. Save the time wasted by both providers and patients in travelling from one location to another to avail the services. A patient who requires an immediate medical attention if made to travel long distances may collapse if the services are not within immediate reach.
3. Reduce costs of medical care- The medical care is becoming expensive day by day. The incidental expenses related to patient care as travel, accommodation for relatives, food etc. where if a patient is not insured this amounts to a hefty amount which sometimes leads to selling property, livestock etc. Apollo (Hyderabad), Asia Heart Foundation (Bangalore) and Narayan Hrudayalaya have been some of the pioneering institutions in this field. ISRO is launching an exclusive health satellite to serve the needs of the diversified population. The data rates of typical devices used in telemedicine are:

Digital Device	**Data Rate required**
Digital BP Monitor	< 10 kbps
Digital Thermometer	<10 kbps
Digital audio Stethoscope	<10kbps
Ultrasound	256 kb (image size)
Scanned X-ray	1.8 Mb
Digital radiography	6 Mb
Mammogram	24 Mb
Compressed and full motion Video	384 Kbps – 1.544 Mbps

Table II: Devices used in Telemedicine

The mobile clinics are a way of improving healthcare delivery in remote areas using the concept of Telehealthcare. It has onboard facilities of X-Ray, Ultrasound, lab and ECG along with dispensing. This provides diagnostics and treatment to people at a nominal cost and also solves the problem of shortage of medical staff in rural areas since they don't have to be stationed permanently. (www.tifac.org.in, 2003).

Some of the challenges for Telehealthcare are:

1. Familiarity of healthcare providers: It is very important to provide complete training to the doctors as if they are not convinced about its effectively and efficiency it is difficult to make it penetrate to deeper levels. The very thought of patient being physically absent makes them uncomfortable.
2. Patient's familiarity: It is very important for the patients to develop familiarity with this new system for its success. Any new system can only be successful if the people using the system have complete trust on the delivery of the service else no matter what best you try and implement it cannot become successful.
3. Training to all the users: Training enhances the trust and leads to success of any initiative.

3. CURRENTLY ONGOING PROJECTS

Corporate healthcare is gearing into fast track growth using latest technology to provide best quality service to face the competition. Overburdened and collapsed public health care system (Govt. Hospitals) is also taking ICT route (Deepalakshmi, 2008) in various part of the country. Changing the dynamics of healthcare is the prime objective. Development gateway foundation provides web-based information sharing platforms for developing countries. It holds an on-line community for professionals working on e-governance initiatives. Health care ICT helps in increase productivity (use of OT, equipments, Doctors, Nurses and live saving drugs); it helps for maintaining stock and store, patient satisfaction, delivery of quality care and abolishes outdated procedures. It reduces red tapism, delay, chaos encountered in big Government hospitals. Web services are essential for medical professionals, administrative members and patients to organize, share and access medical services.

Wipro for Delhi Municipal Corporation:

Wipro provided Hospital Information System (HIS) to six hospitals of DMC. This HIS has 28 modules meeting the hospital needs, like Patient registration, demographic details, outpatient visits, doctors' appointment scheduling, Admission/ Discharge/ Transfer, Order Entry, Laboratory/ Radiology/ Cardiology Result Reporting, Operation Theatre Management and Pharmacy etc. Automating these functions has helped DMC in handling large numbers of patients and helps them in providing better patient care. An Electronic Patient Folder with details of each visit would be available at all of these locations once the implementation is done at all six hospitals. This will enable the doctors to have ready access to past episodes and information of the patient, thus ensuring efficient patient care.

TCS for Tamil Nadu:

The Tamil Nadu Government has allotted Rs 5 crore to Tata Consultancy Services (TCS) to develop a suitable solution to maintain electronic medical records (EMR). The system will start functioning in all the 26 district headquarters hospitals, 162 taluka hospitals and 77 non-taluka hospitals and some of the Primary Health Centers (PHCs) managed by the Government [7].This application created by TCS is web-based, wherein each patient will be allotted a unique ID. All related data will be fed into the system. The system, being centralized, can be accessed from anywhere, E-Governance in Practice making the clinical history of the patients handily available. ICT is employed in medical college hospitals in Tamil Nadu to manage in-patient and out-patient details, medical records, office automation, and lab and pharmacy services. Such electronic dataflow lends accuracy. Tamil Nadu State AIDS Control Society (TNSACS) has successful web based management information to cover 1100 VCTC, Blood bank, ART centers, STD clinics, ANC, NGOs. Number of HIV+ cases, age sex breakup, ART stock, VCTC kits stock is monitored by Chennai head office. Data privacy, authentification [8] is used for aids. Final decrease in aids prevalence in Tamilnadu speaks about success of e-governance and ICT applications.

21st Century's Health NET in Goa:

The Government of Goa in association with 21st Century Health Management Solutions implemented an INR 2.5-crore Hospital Management Information System (HMIS) called Health NET in Goa Medical College (GMC) Hospital. The objective is to improve the availability and quality of healthcare delivery process and give Goa a fully computerized healthcare system by providing good quality healthcare services to all segments of society, especially the poor in remote locations. It includes Patient Management Systems, Hospital Management

Systems, the Laboratory Management System, Blood Bank Management System, the Advanced Imaging System Library and Academic Section Management System, and Management Information System.

Intel's World Ahead:

The World Ahead Programme is an initiative launched by Intel to provide education and healthcare service in India. In the healthcare sector, Intel has carried out tele-health projects in Baramati, Maharashtra and Trivandrum, Tamil Nadu, and child health monitoring in Chandni Chowk, Delhi. Rui hospital connected with Aurobindo Eye hospital Madurai and Narayan Hrudayalaya Bangalore for getting tele-health service for Heart and eye patients. Later a Trivandrum hospital acquiring clinical support from Shankar netryalaya Chennai has become possible by ICT. Intel also provided a school health monitoring system, developed by TCS, in St Philomena Girls' Higher Secondary School, Trivandrum .The web-based solution introduces schoolchildren and faculty to benefits such as digitalized health records and health camps with participatory and action-based health learning. Intel has experience in ICT application in Health sector in Mexico, Brazil, China and South Africa.

HP in Maharashtra:

In January 2007 with 100 Cr. funding automation project of 19 Govt. hospital and 14 medical colleges started. HP healthcare solution and Amrita Technology worked together for system integration and doctor's training. HP services are used at JJ hospital (Grant Medical College), where the registration desk deals with 5 lakh OPD patient and 30 thousand in-patients annually. There has been remarkable change in patient experience towards e-healthcare and computerization.

CMC LTD in Andhra Pradesh:

India Healthcare Project in Andhra Pradesh: Hand held mobile computing devices like Personal Digital Assistants (PDAs) are being provided to Primary Health Centers (PHCs) and Auxiliary Nurses and Midwives (ANMs). While nursing or counseling the beneficiaries, the ANMs collect data using the PDA in the villages. At the PHC they transfer the data from PDA to the desktop. All data that is available on the desktops at various PHCs is transferred to the district level and State Health Commissioner's office using available network. Data compilation and report generation could now be done at the PHC level, district level and State level. Application of ICT at grass root level covering 459 ANM in 67 PHC in Nalgonda district of Andhra Pradesh.

Orissa GRAMSAT project:

It is a satellite based communication network for conducting training programme, tele-education and tele-medicine etc. It operates on INSAT 3B using C band (DRS Network). The programmes are transmitted from ORSAC (Orissa Remote Sensing Application Centre).The VSAT (Very Small apertures Terminal) data network connects 30 DRDAs , 314 Blocks, 9 State Govt. offices and 800 gram-panchayats of KBK district, with the objective of providing digital communication between the state capital, districts and blocks for different e-governance projects. E-Grama: Is an e-governance effort (Mishra, et. al. 2004) by NIC Berhampur, Dept of IT, Govt. of India, which started in December 2002, with the objectives of providing G2C services to common man through different Gram Panchayat and village level IT KIOSKS using Information and Communication Technology (ICT). In this model, the self-financed KIOSKS were opened by the villagers, youth clubs and NGO's. From their own resources and they were accessing the intranet portal from the server placed at NIC Berhampur through different Remote Access Servers (RAS). Different static and dynamic services in Oriya E-Governance in Practice (State local language) and English are provided. This project has been successfully implemented in the rural areas of the province of Orissa, as a pilot project in Ganjam district and it is extended to the other eight KBK districts of Orissa. There is zero cost involved in developing and implementing the customized software and training, as everything was done in house at NIC Berhampur. The "e-Grama" IT Kiosks are evenly distributed over the geographical area of the districts - one kiosk per 3 to 4 Gram panchayats. The Kiosks are run by Kiosk operators, who are given free of cost training at NIC regarding the implementation and running the web based software Currently a project has been undertaken to apply ICT tools for prevention of AIDS at MKCG Medical College by effective use of e-Grama IT Kiosks.

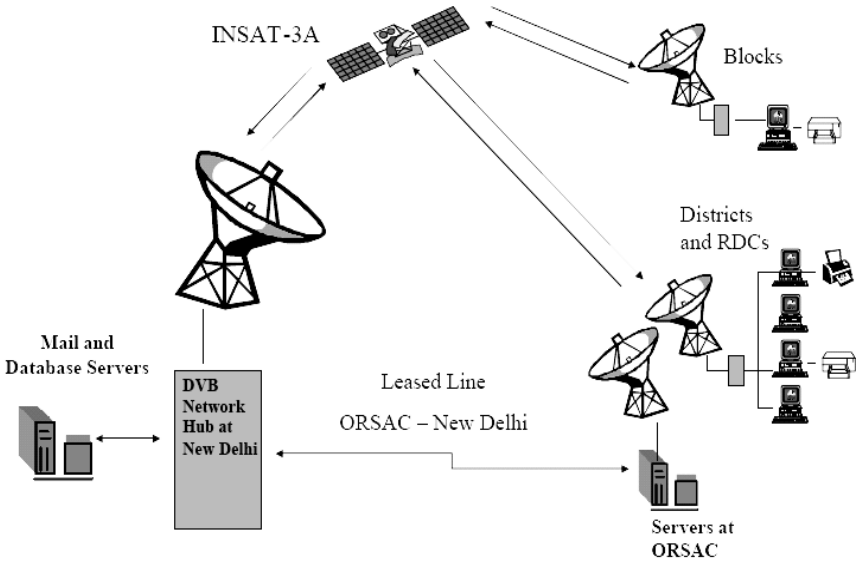

Figure I: GRAMSAT Orissa Data network Deployment Architecture

Hello doctor 24X7 at MKCG Medical College:

Hello doctor24x7 is a project extending e-health care service undertaken by 3 final yr medico of MKCG medical college using internet and mobile phones to provide health care information to rural people in form of tele consultation, tele-medicine, specialist referral, and emergency health care information to poor patients of remote area. This idea has been appreciated at IIPC (Intel India Pioneer Challenge competition 2008), jointly organized by DST, INTEL & Indo-US technology forum on the subject" Technology entrepreneurship". University of California, Berkeley selects aspiring entrepreneurs having innovative idea and business plans which are novel, feasible, and useful to improve society. A rural person may save around 80% of his medical expense by this proposed project using e-clinic, mobile health calling cards and web enabled consulting cards. SORIG: A service oriented frame work for rural information grid [10] proposed by NIC, Berhampur is an Endeavour to meet need of rural population. This service also includes tele- medicine, e-health care, disease surveillance, epidemics and aids prevention etc.

Rajiv Aarogyasri or Aarogyasri in Hyderabad:

Rajiv Aarogyasri or Aarogyasri is a program of the Government of Andhra Pradesh. It covers those below the poverty line. The government issues an Aarogyasri card and the beneficiary can use it at government and private hospitals and get services free of cost.

Rajiv Aarogyasri is the flagship scheme of all health initiatives of the State Government with a mission to provide quality healthcare to the poor. The aim of the Government is to achieve "Health for all". In order to facilitate the effective implementation of the scheme, the State Government set up the Aarogyasri Health Care Trust under the chairmanship of the Chief Minister. The Trust is administered by a Chief Executive Officer, an IAS Officer. The trust, in consultation with the specialists in the field of healthcare, runs the scheme. The scheme provides financial protection to families living below poverty line up to Rs. 2 lakhs in a year for the treatment of serious ailments requiring hospitalization and surgery.

Until July 2013, 938 treatments are covered under the scheme in order to improve access of BPL families to quality medical care for treatment of identified diseases involving hospitalization, surgeries and therapies through an identified network of health care providers. The scheme provides coverage for the systems like Heart, Lung, Liver, Pancreas, Kidney, Neuro-Surgery, Pediatric Congenital Malformations, Burns, Post - Burn Contracture Surgeries for Functional Improvement, Prostheses (Artificial limbs), Cancer treatment (Surgery, Chemo Therapy, Radio Therapy), Polytrauma (including cases covered under MV Act) and Cochlear Implant Surgery with Auditory-Verbal Therapy for Children below 6 years (costs reimbursed by the Trust on case to case basis). All the pre-existing cases of the above mentioned diseases are also covered under the scheme.

GVK EMRI (Emergency Management and Research Institute):

GVK EMRI (Emergency Management and Research Institute) is a pioneer in Emergency Management Services in India. As a not - for - profit professional organization operating in the Public Private Partnership (PPP) mode, GVK EMRI is the largest professional Emergency Service Provider in India today.

GVK EMRI handles medical, police and fire emergencies through the "108 Emergency service". This is a free service delivered through state- of -art emergency call response centres and has over 5004 ambulances across Andhra Pradesh, Gujarat, Uttarakhand, Goa, Tamil Nadu, Karnataka, Assam, Meghalaya, Madhya Pradesh, Himachal Pradesh, Chhattisgarh, Uttar Pradesh, Rajasthan and 2 Union Territories Dadra & Nagar Haveli and Daman & Diu. With a vision is to respond to 30 million emergencies and save 1 million lives annually, GVK EMRI is set to expand fleet and services set to spread across more states.

With increased focus on research and analytics, GVK EMRI has plans to significantly enhance the overall emergency management scenario - further reducing individual suffering.

4. NATIONAL VISION FOR E-HEALTH

India should aspire to continue to lead the world in health outcomes for its citizens. Central to the achievement of this will be a health system which more effectively responds to the health care needs of individuals and communities. Developing a world class E-Health capability would provide new options for how Indians manage their own health and interact with the health system across geographic and health sector boundaries.

E-Health will enable a safer, higher quality, more equitable and sustainable health system for all Indians by transforming the way information is used to plan, manage and deliver health care services.

E-Health will:

1. Ensure the right consumer health information is electronically made available to the right person at the right place and time to enable informed care and treatment decisions.
2. Enable the Indian health sector to more effectively operate as an inter-connected system overcoming the current fragmentation and duplication of service delivery.
3. Provide consumers with electronic access to the information needed to better manage and control their personal health outcomes.
4. Enable multi-disciplinary teams to electronically communicate and exchange information and provide better coordinated health care across the continuum of care.
5. Provide consumers with confidence that their personal health information is managed in a secure, confidential and tightly controlled manner.
6. Enable electronic access to appropriate health care services for consumers within remote, rural and disadvantaged communities.
7. Facilitate continuous improvement of the health system through more effective reporting and sharing of health outcome information.
8. Improve the quality, safety and efficiency of clinical practices by giving care providers better access to consumer health information, clinical evidence and clinical decision support tools.
9. Support more informed policy, investment and research decisions through access to timely, accurate and comprehensive reporting on Indian health system activities and outcomes.

The E-Health vision can also be expressed in terms of what it might mean for each of the three key groups of impacted stakeholders:

1. Consumers – individuals who receive Indian health care services and the friends, family and careers who are directly involved in the care of the individual.
2. Care Providers – the individuals and organizations that provide Indian health care services.
3. Health Care Managers – Indian health sector clinical managers, health service managers, planners, researchers and policy makers.

4. CONCLUSION

Healthcare sector has seen a remarkable growth in the past years and is believed to grow at the same pace in the future too. E-governance has proved its benefits in all the sectors and is poised to be beneficial in this sector also provided the reasons for its success are kept in mind and used during the implementation process.

The existing scenario of e-governance in healthcare and booming healthcare industry has attracted many researchers to contribute their findings in this domain. There is still a lot of gap in the perceptions of people about the implementation and success of e-governance in the healthcare industry. The fallout of this was to study this gap, analyze it and come up with suggestions for improvement of this sector.

5. REFERENCES

[1] Tom Butler, Joseph Feller, Andrew Pope, Paul Barry and Ciaran Murphy, Promoting knowledge sharing in government and non-government organizations using open source software. Oreste Signare, Franco Chesi, Maurizio Pallotti, CMG Italy-XIX Annual Conference, 7-9June 2005 Florence-Italy, E-Governance: Challenges and opportunities.

[2] Dogac, G. Laleci, S. Kirbas, Y. Kabak, S. Sinir, A. Yildiz, Y. Gurcan," Artemis: Deploying Semantically Enriched Web Services in the Healthcare Domain", Software Research and Development Center Middle East Technical University (METU).

[3] Source: IBEF, Indian Healthcare Foundation, India country Commercial Guide 2010.

[4] Britt H, Miller GC, Henderson J, Charles J, Valenti L,Harrison C,Bayram C,Zhang C, Pollack AJ, O'Halloran J, Pan Y. General practice activity in Australia 2011-12. General practice series no.31. Sydney. Sydney University Press, 2012.

[5] Heeks, R,"Understanding e-Governance for Development" I-Government Working Paper Series, No. 11, Manchester: Institute for Development Policy and Management, University of Manchester, 2001a

[6] Newman, J.A. & Walters, R.M., "Finally…Getting Value from IT Investments and Going Paperless", HIMSS Proceedings, June 2000.

[7] O'Buyonge Abrams A, Chen Leida, E-Health.dot-coms Critical Success factor 2006 Idea Group Inc Pages:: 379 -84.

[8] Lele R.D (2008), ICT in day-to-day Clinical Practice Postgraduate medicine API and ICP 2008 Vol. XXII. pp. 3-9.

[9] Das R K, Dash S S (2007), Telereferal Service of NIC- A Helping hand for the Doctors and Inhabitants of KBK districts of Orissa, Adopting e-Governance, GIFT Publishing 2007, Pages: 253-8.

[10] Patra, M R, Das R K, SORIG: a serviceoriented framework for rural information grid – an implementation viewpoint, ACM International Conference Proceeding Series; Vol. 232 p 49-52.

[11] Agarwal, A. K. (2006). E-governance: Resolving Disputes Electronically. In R.K. Metra(Ed.) E-government: Macro Issues (pp. 35-44). Delhi, India.

[12] Jain, N. & Awasthi, V. (2004). A New Perspective of E-Governance by Web Services. In M. P. Gupta (Ed.), Promise of E-governance Operational Challenges (pp. 68-76). Delhi, India.

[13] Kachnowski, S. (2004). Healthcare E-Governance in Post 911 America. In M. P. Gupta (Ed.), Promise of E-governance Operational Challenges (pp. 77-84). Delhi, India. Lee, S. M., & Tan, X., and Trimi, S. (2005). Current Practices of Leading EGovernment Countries. Communications of the ACM 48(10):99-104.

[14] Potekar, S. D., Bhusari, R. H., Hussain, M., & Satre, T. (2004). Impact of eGovernance in District Administration. In M. P. Gupta (Ed.) Promise of E-governance Operational Challenges (pp. 57-67). Delhi, India.