Implementation of Internet Technology in Malaysia's Hospitals: Infrastructure and Info-structures Required

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Abstract: It is inevitable that everyone is demanding for good services from any organization we deal with. The emerging of Internet technologies encourages these companies to take advantage of this cutting-edge technology to restructure their entire operations for ensuring improved services and increased productivity and revenues. Hospital is one such service-oriented as well as expertise-oriented organization that required the adoption of Internet technology. In meeting the increasing demands of improved healthcare in Malaysia, it is expected that the nations are demanded for a more virtual, more integrated, and more efficient healthcare delivery system. Malaysia is to be a nation of healthy individuals, families and communities, through a healthcare system that is efficient and technologically appropriate, and consumer friendly, with emphasis on quality and respect for community participation towards an enhanced quality of life. All can only be realised with the present of Internet for the electronically capturing, storing, dissemination and processing of large volume of hypertexts and multimedia contents. It is hoped that this research will invite more parties be it the Government funded hospitals or the privately owned specialist centres to adopt the necessary technologies and to help to transfer Internet technology into healthcare sectors so as to meet the increasing demands of improved healthcare services in Malaysia. The aim of this paper is to discuss and to present the required Internet infrastructure and info structures for hospitals adoption. The paper will describe the Internet technologies that would support the effective implementation of customer-centric information system for the patients. The paper will also identify and address the implementation issues in this regard. The paper concludes with a general Internet-based service model for hospitals in Malaysia and other hospitals around the world.

Key Words: Infrastructures, Info-Structures, Internet Technology, Hospital

Introduction

In line with Vision 2020, Malaysia's healthcare system is to be transformed. Telemedicine was identified as a key application to jumpstart the country's test bed for an unproven products and services - the Multimedia Super Corridor (MSC) (http://www.mdc.com.my). The chief architect of this vision is Malaysia's Prime Minister Dato' Seri Dr Mahathir Mohamad. Telemedicine then became Dr Mahathir's pet dream. Early on in a speech hyping the MSC in 1996, his wish list included Malaysia becoming a regional centre for telemedicine by the year 2000. The emerging of Internet technology has encouraged hospitals in Malaysia to take advantage of this technology to restructure their operations. It is pleased to announce that Malaysia has embarked on an ambitious telemedicine project that aims to bring cost-effective, specialist healthcare to remote parts of the country via extensive use of cutting-edge technology. By the adoption and implementation of Internet technology into the healthcare industry, the above will no longer a daydreaming. Malaysia's Government has started the torch through the MSC telemedicine (MSC Telehealth Flagship Application, http://www.telehealth.com.my) flagship application and this brings huge impact to the adoption of Internet technology to hospitals and specialist centers and further to the diffusion into individual family.

Problem Statements: This paper has an objective of providing both the information and a dimension on the implementation of Internet technology in Malaysia's hospitals in general and the required infra and info-structures in particular. The study is carried out to provide the communities with the current status on the implementation of Internet technology in hospitals as well as what are the necessary infra and info-structures pertaining to the implementation of Internet technology in hospitals. The paper will also identify and address the implementation issues in the same regard. The paper is concluded with a general Internet-based service model. It is hoped that this research will invite more parties be it the government funded hospitals or the privately owned specialist centres to adopt the necessary technologies and to participate more proactively in various campaigns so as to meet the increasing demands of improved healthcare services in Malaysia. Consequently, achieving the national health vision – Malaysia becoming a regional centre for telemedicine. What is anticipated is a complete wellness platform, enabling the healthcare providers the reliable delivery to patients a level of care meeting expectations via Internet access and thus the precise and specific infra and info-structures have been of vital importance.

Background Information: With rapid changes in communication, technology and increased globalisation, an agile business is one that pushes ahead to prepare for the future by constantly evolving, taking advantage of emerging technologies. Continuous individual healthcare relies to a great extent on a lifetime medical record to ensure continuous patient-focused healthcare. This record will assist in achieving a continuum of healthcare in order to keep the individual in the best possible state of health. Internet application can help to realise the vision of serving a population of 21 million with the best ever healthcare system and delivery.

It was found that the hospitals' Web sites are merely the so-called "brochure ware" sites rather than e-commerce sites. Site maintenance is by individual effort and they are mostly using the overseas public free Web hosts such as Yahoo's Geocities and Lycos's Tripod. Among the 113 Government hospitals (http://www.hypermall.com.my/hospitals.asp), only 22 government hospitals are having their Web sites published. Cybermedportal.com (http://www.cybermedportal.com/CHPmalaysia/index.html) reported that there are 221 private healthcare facilities - hospitals, maternity homes, and geriatric homes in Malaysia and the adoption of Internet technology to their business planning is almost non-existence.

Benefits: The public healthcare system in Malaysia is heavily subsidised. It was published that for every Ringgit Malaysia (RM) paid by outpatients in government hospitals, the cost to provide the treatment is between RM15 and RM21. Online hospitals will be able to reduce the operational costs, as a result reducing the government budgets. "The doctor is online" (Malaysia CNET .com, http://malaysia.cnet.com/internet/guidebook/telemedicine/) has arrived in Malaysia, this will encourage and help to maintain good relationship between the patients and the medical officers which was rather poor in the past; 24 hours a day, 7 days a week, delivering of economical and effective healthcare solutions will be a consequence. By the adoption of Internet technology, many new services can be promoted, and outsourcing will also be made feasible with Internet. This would help to address the long exist issue, namely the acute shortage of medical expertise in Malaysia. Further to this, more online services could be offered which include: medical dictionary, doctor chat, quick queries, surgical problems, health insurance, etc. When these hospitals become mature in Internet technology management, Internet business can be gracefully incorporated. Among the benefits of Internet business are; increase business agility, increase operational efficiency, maximising knowledge worker productivity, and to provide opportunity for new channel models and marketplaces. A quick review: under a 30-month pilot program of the telemedicine, heart patients in rural areas, for example, will no longer need to travel to the capital city to confirm if they need bypass surgery, and serious accident victims may get quicker specialist attention prior to treatment. This is especially good for those who cannot face trudging around the city can now sit back and consult the doctors from comfort of his home via the Internet. A longer term benefit: in near future, should there is an emergency on the plane, some hospitals could be contacted to obtain first hand prescription as surfing the net from onboard will be made possible very soon. It was stated in (TIME, 2000) that Cathay Pacific Airways will install high speed in-flight Internet services across its entire 62-fleet and the Singapore Airlines has tested two systems in November 2000 and December 2000 respectively. The passengers will be able to enjoy this service only if hospitals are having Web-based online systems. In a nutshell, information and other services will become more virtual (e.g. remote report viewing), more distributed and more integrated, resulting in better, timely and efficient healthcare delivery and provision for integration with other healthcare systems.

What is 'Internet Technology"?: In the widest sense, it covers the techniques, procedures and the machinery used in the storage, distribution, communication, usage, retrieving and processing of large volume of hypermedia over the World Wide Web (WWW).

Understanding Why Do Hospitals Adopt Internet Technology: Quite simply, hospitals that adopt Internet technology will definitely keep their operation and prestige at competitive advantage. When applied as part of an integrated solution, it will increase patient interaction and satisfaction, improve workforce effectiveness and maximise their infrastructure investments. In the most successful cases, all the above three areas are improved simultaneously. The Internet or Web-based platform, combines the access, connectivity and integration of healthcare information solutions in supporting the healthcare for the nations is every one hospital wishes and dreams. Supplying a broad range of healthcare solutions; both software and professional services in meeting healthcare and wellness expectations; vertical B2B and B2C can then follow.

Hospital Operating Procedures: Fig. 1 below depicts the standard operating procedures of a hospital. In the figure, processes that are marked by asterisks are the potential bottleneck points. If the entire data flow is made fully computerized and Web-based, patients would be able to do their registrations from home or at work. While in the hospital end, procedures such as assigning a ward and probably engaging a doctor to a patient could be arranged prior to their arrivals. As such reducing the check-in time of a patient, which could be critical for some cases. If a system takes too long to record and to verify every request, etc. undue burden might be imposed on the patients. The Web-based solutions, therefore, could substantially reduce queuing time at the registration and the billing counters. Consequently, streamlining of hospital processing procedures is made a lot easier. For many occasions, patients are requested to collect their medical reports at a later time, usually another 5 to 7 working days. This can cause inconvenience to people who stay outstations and those who can hardly take a day off. Internet no doubt, could offer the so-called virtual report viewing. How far a medical institution can operate fully with little human intervention is everyone's guess. Against all skepticism, Selayang Hospital, a medical institution under the Malaysia's Ministry of Health (IT Malaysia, 2001) has its total Hospital Information System (HIS) Web-based implemented. In Selayang Hospital, patients' Electronic Medical Records (EMR) consists of patients' entire medical details, their medical history and the treatment they have received (refer to Fig. 2). By capturing those details electronically, over the time, the EMR will be made available to other authorized healthcare providers at any location that will ultimately facilitate the development of the MSC flagships called Lifetime Health Plan (section "Telehealth Implementation") for every citizen in Malaysia.

Design Consideration and Issues: One of the modern Web portal essential is "stickiness". The traditional pull technology is becoming a limit for more efficient use of the Web. As Web grows in size and complexity the importance of push/delivered model is significant. Contents should be designed towards customisation and personalization, i.e. "customer-centric". The push technology is a data distribution technology in which selected data is automatically delivered to user's desktop. Push technology is convenient, and rather than having to go hunting for the latest information, it simply arrives automatically on our computers. Bear in mind that by 2004, it is estimated that Malaysia will have approximately 4 million Internet users. With the Internet push model for the future, a patient information can be delivered automatically, either every time it changes or on a regular schedule. Delivery can be by e-mail, pager alert or custom Web page.
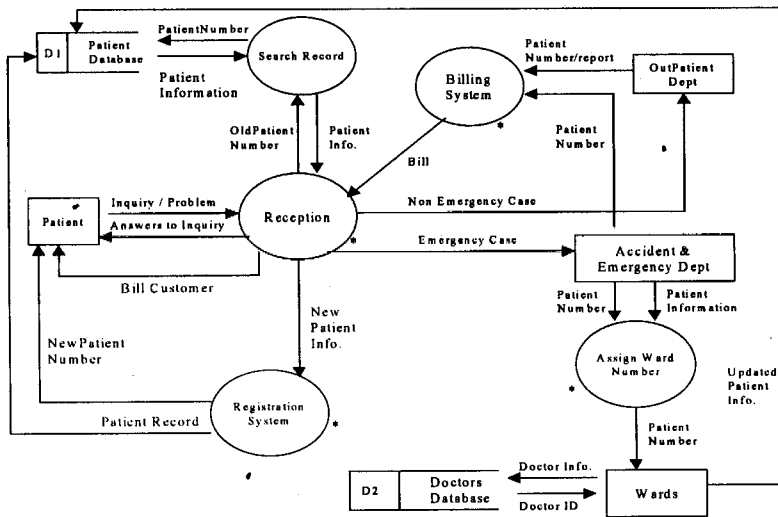
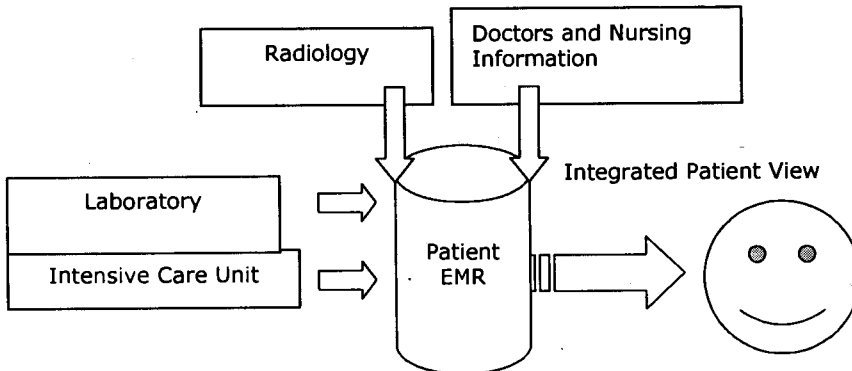Figure 1: A data flow diagram showing the overview of the current hospital system

Fig. 2: Integrated Patient View by Having Patient EMR

Logistic Design: An intelligent application is required that will be able to contact backup vendors and place the order or search the Web for alternative suppliers for e-drug, a typical Business-to-Business (B2B) scenario. Customer service design: the information may be delivered directly into your calendar or reminder application, an example of Business-to-Customer (B2C) transaction. In short, an efficient way to manage the distribution, replication and synchronisation of application and contents to dispersed Internet servers is required.

Connecting to the Internet: ADSL (Web,1999), broadband, ISDN and WebTV (Deitel *et al.,* 2001) are among the many ways for computers to connect to Internet. Mobile Internet access through General Packet Radio Services (GPRS) is coming our way, encouraging fast access anytime, anywhere and by anyone. GPRS uses Internet-style packet based

technology. It lets you be permanently connected to the Internet but it only uses the radio link for the duration of time that it transfers data. With GPRS, when you switch on your mobile phone, it goes online immediately and is ready to send and receive large amount of information through the air. Beside the GPRS, 3Gs would offer broadband data speeds 100 times faster than current mobile phones, streaming videos and "m-commerce" (NewsWeek, 2000). This will permit the patient to check information at any time and at any place they want.

For ensuring security over the Internet, an essential component is the "socket" as everyone using the Web for e-commerce is concerned about the security of their personal data such as IC, cash information and credit card number, etc. There are several protocols that provide transaction security, such as Secure Socket Layer (SSL) and Secure Electronic Transfer

(SET) and possibly by tunnelling Virtual Private Networks (VPNs) to ensure confidentiality and security of the information. It is stated in (Quality of Service for Virtual Private Networks, http://www.cisco.com/warp/public/cc/so/neso/vpn/vpne/qsvpnwp.htm) that VPNs use advanced encryption and tunnelling to permit organisations to establish secure, end-to-end, private network connections over third-party networks, such as the Internet or extranets. Since there could be a lot of mission-critical transactions over hospital Web sites, it is recommended that the entire architecture should be made redundant and fault tolerant with multi terabit of online storage, both to handle heavy load and to be reliable.

Whilst in the software suite selection, Visual Studio.NET is one of the cutting-edge integrated development tool that contains a set of technologies and training materials designed to help developers take advantage of new Windows® 2000 features. Using the .NET platform, services such as messaging, project management and accounting as well as credit card authentication, are all provided on tap over the Internet (Economist, 2001; Microsoft. NET, http://www.microsoft.com/net/). Sun Open Net Environment (Sun ONE) is Sun Microsystems' offering for Web services. It comprises a development environment, technology building blocks and infrastructure platform that provides for the creation, assembly and deployment of Web services (Web,2001). Oracle9i (Oracle Technology Network, http://technet.oracle.com/) is another powerful tool for in-house software deployment.

Sampling Used: The following section describes and tabulates the specific infrastructures and info-structures required for the following three key healthcare providers in Malaysia.

Telehealth Implementation: To deliver the telehealth vision, the Malaysian Government invites leading Malaysian and international companies to develop pilot applications that will be implemented over a five-year period. The applications will be tested at several sites both within and outside the MSC. The MSC site will provide the ideal test environment due to its superior infrastructure, while the site outside MSC will be representative of the rest of Malaysia in terms of infrastructure and other, including behavioural, constraints.

The pilot applications that will lead the development of telehealth in Malaysia are:

1. Mass Customised Personalised Health Information and Education (MCPHIE) to provide information and education on healthcare to mass and specific communities.
2. Continuing Medical Education (CME) which is an infra-structural project to build human resources. It will provide information and enhance the capability of healthcare providers.
3. Teleconsultation to connect healthcare providers in a multi-point manner to share opinions and for mutual support.
4. Lifetime Health Plan (LHP) which ensures patient-focused and continuous care depends on a lifetime health record.

Hospitals: The winners of the top 4 of CARI (.com.my, http://www.cari.com) in May 1999 awards in the category of health and medical are Hospital Seremban (Best Medical Centre In Negeri Sembilan) (Hospital Seremban Web Site, http://members.tripod.com/~hospitalseremban/index.html), Jabatan Kesihatan Negeri Terengganu

(http://www.mohtrg.gov.my/) and Sabah State Health Department (http://www.borneo-online.com. my/shd). Regrettably, none of the above has gone full swing in their business operations using Internet. Surfers can only view information such as the hospitals' departmental structures, time schedules, basic information and other hospital links. The privately owned Damai Service Hospital (http://www.dsh.com.my/) has adopted the Internet to chart new services by providing information to new and prospective patients, potential business investors, nursing-school and job applicants, academicians, community members, staff, doctors and the general public.

Healthcare Portals: The adoption and implementation of technology to their portals is rather encouraging. Among the successful portals are: MayHospi.com (Malaysian Premier Health Portal ,http://www.mayhospi.com/default.asp), an online health portal and TM Health Online by Telekom (http://www.health.com.my/) which is a virtual medical information centre. As in the case of healthcare portals, Prohighway.com Sdn. Bhd. (http://www.prohighway.com/), is a company which manages a nation wide e-drug procurement program. The company officials expect 1,000 doctors registered with its portal to buy RM100 million to RM120 million worth of drugs and medical supplies a year. A Web site that comes in tri-lingual, 21stcentury. com. my, had seen growing needs in healthcare services in Malaysia (21st Century ™, http://www.21stcentury.com.my/). To create healthcare awareness among the nations, each state health department has to play a more proactive role. The best diffusion approach is through the Internet. Many are helping including Sabah Medical Association (http://sama.freehosting.net/) which is a non-profit organisation for doctors working in Sabah.

Infrastructures and Info-structures: The word info-structure is a combination of the words information and infrastructure. It is a term that encompasses the scope of activities related to information – its development, analysis, adaptation for different users and purposes and the deployment to improve ones work as well the infrastructure that supports it. A comprehensive IT infrastructure is required for the successful implementation of Internet-based hospitals in Malaysia. The provision of a comprehensive range of infrastructure facilities and services is essential to support the growth of teleconsultation, etc. Infrastructure constraints at the beginning of the Seventh Malaysia Plan period have largely been overcome with the accelerated capacity expansion of roads, ports, airports, urban transportation and communications. Some of the major projects completed were the KL International Airport, Light Rail Transit (LRT) and Malaysia's own satellites, MEASAT 1 and MEASAT 2. The IT infrastructure has enabled a wide spectrum of services and applications to be offered to the community. We first look at the key divisions of a hospital where IT infrastructure could be deployed, as depicted in Table 1.

Info-Structure Services: Info structure services encompass all the networking, hardware, software and services that make communications possible. In effect, it is the "electronic plumbing" that makes everything work together in harmony. It is a market that is growing rapidly to keep pace with the demand for faster, better and cheaper connections among all participants in the automotive value net. Section below outlines the essential info-structure components for hospitals.

Table 1: System Architectures for Various Divisions within a Hospital

Division	Networking and Components	Hardware	Software Systems
Images and radiology	• Virtual LAN • Server • ISDN interface • Cabling systems • Copper wire • Scanner • Plotter • PCs • Dedicated imaging workstation		• Web servers • OS such as Solaris, Windows NT and Digital open VMS • Picture Archiving and Communication Systems (PACS)
Clinical	• Virtual LAN • Server • Cabling systems • Copper • Printer • PCs		• Web servers • RDBMS • Patient EMR
Administrative and financial	• Virtual LAN • Server • Intranet • Cabling systems • PCs • Printer • Fibre optics		• Web servers • RDBMS

Network and Internet Architectures: Connecting to the Internet via Megabits link. A number of databases to be accessed by the nation-wide and Internet community. This will enable the patients and public to rely on the Internet as an information resource. Strategically leveraging on Intranet technologies to provide more services over a consistent interface to them is required. Some critical teleconsultation will require an ATM backbone with switched LAN hubs where each node (PC/workstation) will enjoy higher bandwidth in anticipation of more multimedia traffic. The network provides for switching, routing and transaction tracking of every object sent through it. A fibre optic backbone is an ideal proposal with an unprecedented 2.5-10 gigabits per second capacity, which is more than enough network power to support virtual boardrooms, remote CAD/CAM operations (for images production) and live multimedia Internet broadcasting. A satellite system which was launched in August 2000 promises fast Internet access and file transfer for multimedia contents (IT Malaysia, 2000). The system is the country first broadband satellite service where data is delivered via a Digital Video Broadcasting (DVB-S) standard based PC-card which has direct connection to the antenna. The architecture makes it ideal for the hospitals to exchange content-rich documents and to possibly conduct interactive sessions between two or more parties.

Client/Server Based Information System: Some kind of information system based on an relational database system is proposed, allowing different parties to communicate and link directly without administrative intermediaries thereby significantly improving efficiency and productivity. Consequently, numerous online services can be offered. Recognising the need for more accessible information, there is a need for the company to provide various types of content and information it hosts via some storage means. These include materials and document management systems for informational records. The diverse range of user interfaces in accessing such information has driven the standardising on a more convenient approach based on the World Wide Web (WWW).

A summary of the "Client/Server Based Information System" is presented in Table 2.

Successful Implementation of Internet Technology in Hospitals: Towards successful implementation of Internet technology in hospitals, the following guidelines are highly recommended:
• Identify job functions that would benefit most from Internet or Web-based application.
• Implement change from the highest level.
• Spend time educating and explaining the adoption policy to staff.
• Set up a pilot programme.
• Overcome technical challenges before implementing the Web-based system.
• Medical personnel are experts in healthcare but barely in IT. Remedy could be to have some computer literacy program for the medical doctors and other officers.
• In order to provide affordable services to the vast majority of the country's population, the devise of inexpensive diagnostic care program that can be attached as an attractive value added benefit to a company's employee benefits program such as an insurance policy.

Obstacles and Implementation Issues: By its nature, the deployment of Internet technology involves the use of communications technologies in communications between the patients and the hospital. This leaves open the possibility that such communications may be intercepted by third parties. The lack of Internet technology implementations in Malaysia is largely due to obstacles that can be broadly placed into three categories:

Technical Obstacles: Technical obstacles deal with issues relating to the physical components that make up the infrastructure. Connection Speed: The current telephone communication speed is too slow for accessing large or heavily graphic oriented data. The fibre optic or ISDN connections are not readily available to a larger group of crowd from the comfort of their home. Data Security and Integrity: In order to allow the patients to have confident in the entire system and process, the hospital's computer (server) must be reliable and secure.

Table 2: Internet-Based Hospital – The Infra and Info Structures

Type	Element	Examples
Physical	Network Type	• Fibre optic LAN • Broadband connectivity • ADSL/DSL • ISDN
	Network Protocol	• TCP/IP • UDP
	Switching Technique	• ATM
	Storage	• SAN • NAS • DAS
	Hardware	• Server • Workstation • Cable • Modem • Router • Videoconferencing equipment • Printer • Plotter • Scanner • Barcoder
	Other devices	• Cell phone • Palm pilot • Pager • Pocket PC • PDA
Information	Content Types	• Images • 3-D Animation • Audio-video clips • Hypertexts
	Information Organisation Means	• Virtual library • Discussion forum • FAQ databases • Mailing lists • Newsgroup • EMR (Electronic Medical Record) – for research use
	Content/Resource Management Tool	• Data warehousing tool
	Data Mining Tool	• Group-ware recommended • Computer Supported Collaborative Working (CSCW) software
	Software Providers	• Customised software by software houses. • Turnkey system by vendors.
	Special Training	• Mastering programme • Hands-on demonstration • Computer and Internet literacy courses

As such, the company must open up necessary communication channels to allow for external connections. This "opening-up" of communication channels can give rise to undesirable hacking activities toward the internal hospital computer. Data in transit (as it travels between the server and patient computer) can be exposed to threats such as data sniping, alteration, sabotage, etc.

Social Obstacles: Management Acceptance: The success of an implementation depends quite heavily on the management's acceptance. Only with the acceptance from the management, the necessary supports can be obtained. The management must be convinced that Internet adoption and implementation in hospital would be beneficial not only to the clients but also to the organisation.

Financial Obstacles: Additional Investment: The company may need to purchase additional communication equipment in order to allow for simultaneous connection to the host computers. In some cases, additional computer host may need to be purchased. The patient may also need to invest on PC that is suitable (in terms of communication capability, storage capacity and processing power).

Training Cost: office workers need to undergo proper training to equip themselves with the necessary skills and discipline to deals with the impending changes in the working style and environment.

Recommendations: Malaysia has both the infra and info structures technology but looking at the net-literate which is far lower, there is only about 1.5 million of Internet population and the truth is that genuine transformations normally take a tremendous amount of time. Reduction in registration fees and connection charges may be a solution to increase Internet account application. Some positive steps have been taken by the Malaysian government which include:

Table 3: A General Internet-Based Hospital Working Model

Element	Probable Activities	Information/ Benefits Gained	Suggested Communication Medium	Examples of On-line Features	Physical Contact to Hospitals
Patients meeting doctors	• Face-to-face prescription • Diagnosis of diseases • Taking X-ray	• Face-to-face contact • Immediate advice	N/A	Refer to history files •	As and when needed
Patients checking out data from home or workplace	• View personal password protected report • Participate in forum • Live chat with doctors • Browse health tips of the day • Take part in medical related quizzes • View self records	• Medical news • Featured topics • Heath services: e-health tools, • Ask a doctor, discussion forum • Medical dictionary • Health yellow pages • Health risk assessment • Online medical journal • Patient EMR to set up	• WAP phone • Internet • Fax • WebTV	• Email • Database • FTP	It could be on monthly or weekly basis (Varied)
Teleconsultation	• Consult a doctor online for prescription	• Particularly suited for remote users	• Internet • Telephone	• E-mail • Discussion form	Half-yearly
Life Time Health Plan (LTHP)	• Self-manage for health • Clinical support system	• Health products • To create a personalised lifetime health plan • Maintain health to ensure continuity of care	• Internet • Computer • Telephone	• Email • Chat- room • Forum • Lifetime health record • Patient medical records	As and when needed

EPF withdrawal scheme for computer, a scheme that enables members to withdraw for purchasing personal computer for them or their children. Diffusion hurdle: Public awareness poses a barrier in the adoption and implementation of any technology. A small milestone on the road to widening access to Internet services could be to turn post office into local Internet facilities, enabling the residents nearby to surf and transact with the remote hospitals. This concept is not new where the British's Government is working towards a strategy that the local Postmaster to become an agent to advise and assist customers with their online dealings (Internet. Works, 2000). Security issues: what is expected is the following scenario - security and fail-safe mechanisms guard against invasions of privacy and loss of service while confidentiality, integrity and reliability of the information is maintained at all times.

Conclusion

The public also requires convincing of the benefits of telemedicine and a change from being reactive to proactive about their health. They may also need to get used to the depersonalisation of seeing virtual doctors, as some hold firm to the idea that nothing beats face-to-face contact. Detractors also wonder whether the setting up and maintenance of new infrastructures for the project would ultimately result in cutting public health expenditure or adding to it. Adoption of Internet technology in hospitals is inevitable, as it is part of the MSC project whose growth has been carefully shaped and guided by strategic development master plans. The Malaysia's government realising the value of IT deployment, has initiated plans to develop a multi-billion ringgit IT infrastructure to recognise, understand and proactively

respond to these waves of IT revolution. There is a need to devise more activities and programs to educate local physicians and students in state-of-the-art techniques and treatment programs in order to achieve a satisfactory level of technology diffusion. Culture and awareness is necessary. This is what we are still lagging behind. The diffusion of technology will not be a smooth sailing as technology is merely a tool, and the successful implementation of Internet technology in Malaysia's hospitals will rely largely on the deployment, promotion and support from all parties. It was stated in (LAN Asia, 1997) that the hurdle of MSC flagship applications is that some Malaysians will react adversely to technology while others will think that it will not affect them at all. Nevertheless, the nations are optimistic about the telemedicine project because of the momentum the MSC is gaining in the society.

It is reckoned that all hospitals in the country need to go Web-based and paperless following the footstep of Selayang Hospital as the HIS implemented in the hospital can benefit all patients, clinicians and the healthcare providers. Overall, it is believed that the trend is towards providing global access to medical data and expertise, nurturing a vibrant healthcare industry with deployment of technologies and achieving the national health vision.

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