Health Information system for Saudi Arabia

An Overview and guidelines

Dr/ Saleh Al-Zahrani
Assistant professor of Information Systems
Imam Mohammad Bin Saud University
Faculty of Computer science and Information
Email: DR_saleh@hotmail.com

Abstract

In the information and communication technology (ICT) age as the dependency on the knowledge exchange is increasing, many countries are concentrating on building their own national networks. In the developed countries, many hospitals and healthcare providers have been linked to exchange knowledge, and medical information electronically. In the developing countries, governments have set programmes to encourage their organisations to implement and use information networks. For example, in Saudi Arabia there is a great interest in ICT development in all aspects of life. The Saudi government has paid a reasonable attention to use ICT in healthcare. Therefore, some hospitals have implemented advanced technology to provide high standards of healthcare. Some hospitals in Saudi Arabia are using ICT and developing their hospital information systems with limited connection among them. It is generally accepted that the time has now come to use ICT in Saudi Hospitals and develop a national health information network for the entire country. The central point of this paper is to develop a national information network to allow healthcare organisations to communicate with each other using international standards to improve the quality of care and maximize resource utilizations. This paper will define the overall goals, and expected benefits of National Health Information Network Systems (NHINS). Also, it highlights the critical issues and provides guidelines to be followed in implementing NHINS.

Keywords:
National Health Information System, Computer Network, Saudi Arabia, Information and Communication Technology.

Introduction

Many countries are concentrating on building their own national information networks. Furthermore, governments have set programs to encourage their people to implement and use information networks. For example, the USA government announced a nation wide program to develop and use a wide information system. In terms of health care some governments have set out its vision for modernising health services, improving the nation's health and tackling health inequalities. In some developed countries, such as the USA, UK, and Canada it has been proposed that the national information infrastructure be used to convey medical information. Turban *et al.* (1999) suggested that the information infrastructure that supports these medical communications would allow a doctor to check a patient's record from any location.

Many Developed countries have built their own nation health information network. For example, the government of New Zealand implemented a National Health Information Network (NHIN). in contrast, in developing countries a few attentions have been paid to ICT in healthcare. Several studies (Ahmad, and Zink, 1998, Al-Nahdi, 1998, Al-zahran, 2001, 2002, and 2003 Anderson, and Brann, 2000 and Pakenham, and Smith, 2000) indicate that ICT problems in healthcare are related to the multidimensional nature of the healthcare environment lack of resources, political issues, culture, and lack of national ICT specialists. The Saudi government has paid a reasonable attention to healthcare. Therefore, some hospitals have implemented advanced technology to provide high standards of healthcare such as King Faisal Specialist Hospital (KFSH). Also, some private hospitals have made extensive use of computers and have already obtained reasonable experience. Some public and private hospitals lag behind many other organisations in the use of computer and on-line technology. Some hospitals are working alone to adopt technology without taking advantage of each other's, such as sharing computer resource. Many resources and efforts have been wasted due to lack of cooptation or coordination exists among those organisations. Therefore, all Saudi healthcare organisations should establish partnerships and enter into collaborative relationships to take advantage of their experience.

Al-Zahrani (2001) investigates the provision of a computer network system to link Saudi University Hospitals electronically in order to exchange medical information.

Findings show that Saudi Universities are working independently to establish their own computer network system, thus not taking advantage of the synergies that co-operation would bring. It was shown that it is accepted that the time has come not just to implement a computer network system for University Hospitals, but also to plan and implement a nationwide computer health system for Saudi Arabia. This paper emphasizes on a nationwide health information network system for Saudi Arabia.

Similar efforts in advanced countries

Due to the growing cost and sophistication of healthcare and the advances and growing use of ICT especially networking technologies many countries have build its own nation health network. In the developed countries, especially in the USA and the UK, it has been proposed that the national information infrastructure be used to convey medical information. Examples of good practice can be found in studies in Wisconsin, USA (Pemble, 1997), and Essex, UK (Health Report, 2000). The Wisconsin Health Information Network is an example of a successful model of a community health information network. In the UK, many projects are going on to link physicians and other healthcare service providers. For example, Essex has largest National Health Servers (NHS) community project. This project will link 300 sites and 10,000 users within ten NHS organisations across Essex (Health Report, 2000). The network will comprise three major acute sites to create the North Essex Community Network. Eventually, all general practices in North Essex will have access to the network.

Word-wide, many hospitals are planning to link physicians and other healthcare providers by using ICT. Many nations built a national health network. For instance, the government of New Zealand implemented a national health information network. Moreover, in Canada advisory committee on health was established since 1997 to develop a strategy for implementing a nation-wide health information infrastructure (Pascal, 2002). In fact, there are similarities between the proposed system of this study and other countries. Thus, Saudi Arabia health net will be able to take advantage of being a ‘follower’ in the technology race. Therefore, expensive errors may be avoided. On the other hand, Saudi Arabia is a unique country in terms of culture, religion, etc. Therefore, adapting ICT will have to be done with caution. Those who will develop the new system must take into account the cultural

differences, and any changes must be applicable to Saudi culture and social issues should be considered. It is clear that the proposed system can learn a great deal from experiences in the advanced counters. This means that the development of the national health networks in the UK, USA and Canada will act as a guideline for planning and implantations.

Issues involved in the new health network:

The primary issues involved in the new healthcare computer network are providing high quality standards of healthcare to the population of Saudi Arabia, maximizing the effectiveness, efficiency, and quality of providing health care and protect patient privacy and confidentiality of clinical information, promoting movement of information instead of patients and reduce time and cost, providing remote access to services, specialists, care and information needed, providing national clinical databases for the people in the kingdom and sharing of excess computing capacity and linking islands of information.

Potential Members of Saudi Health Network

Development of the 'NHINS' will enable every Healthcare organisation to reach minimum levels of investment in ICT to support their own site requirements, including the ability to exchange medical information with and among other organisations. It is suggested that the following list of initial sites that would contribute to information infrastructure of a national health net could include large public hospitals, large private hospitals, University hospitals, King Faisal Specialist Hospital (KFSH), Sultan Bin Abdulaziz Humanitarian City, Saudi Red crescent Society and transplant unites.

Current situation

Saudi Arabia's commitment to ICT can be traced back to the late 1960s. Some Saudi Arabian healthcare originations such as universities hospitals already make extensive use of ICT. A few originations such as KFHS have highly integrated computer

network system. Other Saudi organisations, which have just been established, such as Sultan Bin Abdulaziz Humanitarian City, provide healthcare using high technology. Other healthcare organizations are either using or plan to implement hospital computer systems to facilitate their work. Some public and private hospitals unfortunately lag behind many other organisations in the use of technology. Al-Zahran (2001, 2002) claimed that, many of these hospitals depend on traditional paper-based, clinical records and will for some time to come. The majority still relies on pen, paper, post, and often several staff to book outpatient appointments. This leads to unnecessary delays, frustration for patients and staff alike, and the potential for errors. In truth, up to now, the use of ICT in Saudi hospitals has not been a success story. He also, adds that many resources have been wasted, some important data has not been collected and used, and some data has been collected but not used. In term of attitudes (Al-Zahrani 2003) indicated that healthcare professionals in Saudi university hospitals have been found to have a generally positive attitude towards using computers

Again Al-Zahrani (2001) had suggested that a new ICT strategy is essential to support and develop effective networked campuses in Saudi Arabia universities. However, most people who work in the healthcare sector have indicated that the time has now come to establish a national computer network for Saudi Arabia to share their valuable resources for the benefit of healthcare. It is clear that the non-existence of this kind of computer network system results in the failure of the exchange of medical information among healthcare originations. Also, it minimises the sharing of medical/technical experience and knowledge due to the lack of information exchange. Then, a national computer network for Saudi healthcare organisations is needed to share their valuable resources for the benefit of all our citizens.

Implementation Strategy and Preliminary Implementation Plan

Large project should be implemented in phases in order to implement successfully. For such reason the proposed system will involve a stepped approach to full implementation. The first stage comprises linking initial members in a corporate Intranet. The following section is the proposed phases of implementation plan.

System investigation and feasibility study: This stage will be composed of strategic planning and the implementation plan. Strategic planning should be presented to and approved by the concerned institutions and involved organisations. The implementation stage should start immediately after the strategic plan has been approved. Saudi government should assemble a strategic planning team to establish a national health network system infrastructure. It should be created to represent participants healthcare organisations, industry and concerned government organisations that will be involved in the project in order to achieve the following objectives:

- Set out project vision, approve the strategic plan and allocated budget,
- Define objectives among healthcare originations and clarify their responsibility,
- Co-ordinate planning activities, procurement and implementation plan,
- Address the highest strategic priorities and set regulations and rules to involve a wide range of healthcare providers in the future.
- Take overall responsibility to co-ordinate the sub-committees

Outside expertise such as technical professionals, engineers, data services professionals, and telecommunications specialists are needed. Saudi government should appoint the chairman of the board's vision and strong leadership for this ambitious project. The strategic team should take this proposed project entity and break it into bite-sized sub-project. Sub-project teams such as a technical sub-team, medical sub-team, administrative sub-team and budget sub-team should be created. Each sub project team should be responsible for specific tasks. Investigate network infrastructure and conduct feasibility study are critical point in the initial steeps. It is important to Saudi government to answer the question " what costs and benefits will the new system provide". Therefore, government should make sure that the proposed system will derive great value and its benefits exceed costs.

Technical assessment and system design: This phase consists of the evaluation of various networks technologies (hardware and software) it also includes the design of a

network model and detailed specifications of the network including the standards to be used. General criteria should be considered such as reliability, flexibility, performance, ease of operations and so on. Applications that will run the network should be defined. Most networks have both common applications and department applications. The Saudi network is anticipated to work for a variety of users, and each user category needs different applications. However, they have to define what kinds of applications are needed. Therefore, common applications are needed as word-processing, spreadsheets, graphics, email, and so on. Each department needs different applications, therefore, we believe they need at least to have the following: Hospital patient system, Nursing system, Laboratory systems, Pharmacy systems, and Medical record systems. Furthermore, health care sector need specific applications such as, telemedicine, teleconferencing.

End-users who will be affected by the proposed system and their needs should be identified carefully. The proposed system will serve distinct end-users and, also make specific demands, or may need special applications. Therefore, the system designer should recognise all of these needs. Some of those end users may need significantly more storage capacity than others. Also, may need to exchange large quantities of data, sending large attachment, running video conferencing or browsing the Internet frequently. For example, a physician may want to see a past X-ray image of a patient. He or she can easily scan the database to view the image, print it or download it all altogether, while at the same time talking by phone with another X-ray specialist who is also viewing the same image. Consequently large bandwidth highly recommended.

Medical research requires the exchange of bandwidth intensive applications such as imaging and video. An image or a video, once produced, can be stored in a central archiving system for future retrieval. Therefore central database is needed to hold and share frequently accessed medical information such as image files, video files, tutorials, a hospital lab result, hospital news, and patient information. Health Level 7 (HL7) is a protocol that is used to allow medical computers from different vendors to communicate with each other (James, 2001). It's used in the majority of large US hospitals and is the most successful among standards for its syntax and authoritative standards for medical information exchange between health care providers. So, author

recommends HL7 to be used for transferring medical information among Saudi healthcare organisations.

Network service is a very important factor in network. Therefore, Saudi health net needs to organise its services and provide access to make their servers available to their users. Each site needs to provide and deliver services as provide health care professionals with 24 hour on-line access to relevant information from patient records, and to provide around -the- clock access for patients to access their own medical records. Each site needs to offer private and public information services to facilitate network for end-users. The proposed network would allow the exchange of vast amounts of information, which ranges from public information (on disease, health, and lifestyle, etc.) to more sensitive information. For example, different end-users may access medical records from remote locations. However, confidentiality and patient privacy must be respected and protected. Therefore all computer users must be uniquely identified. Moreover, each site must divide its site into two parts:

- A public site that could be seen by the public (disease, lifestyle, etc.),
- A private site that is hidden from the external world (accessed only by authorised personnel such as physicians, nurses, etc.).

Pre-installation preparations: This phase investigates and defines end-users who will use the new system and prepare a list of user requirements. Al-Zahrani (2001) identified 4 categorise to use healthcare system as following:

1. Patients and public: they need on-line convenience and secure access to their medical records and to health information (treatment, disease, lifestyle etc)
2. Healthcare professionals (physicians, nurses, paramedical): they need on-line access to national resources and fast access to patient records,
3. Decision makers and managers: they need information for planning purposes

4. Computer staff, they need, convenient access to national computer resources and information for planning purpose

Various end-users (e.g. physicians, nurses, managers etc) have different sets of requirements and needs. The network can best serve these users when the expected usage pattern is accounted for in the initial design phase of the proposed system. System analysts and system designers should focus on end-user needs, both general and specifically. Information of this kind is very important and critical in estimating future usage patterns. Technical committee need to prepare ICT specialists for network activities to design, troubleshoot and implement the network in addition to planning for future expansion. In term of training each health originations should prepare their staff and encourage using new technology effectively. For the system to become operational, a number of users must be trained in how to use the system to meet their functions' needs. Also the success of any system depends on the skills of the people who use and operate it. Ministry of health should sponsor, design and organise training programmes to provide staff with background knowledge, skills, and up-to-date information needed to support hardware and software.

The implementation: This phase consists of the procurement of network hardware and software and the installation and testing of those network components to implement the proposed system. Saudi health net committee should buy hardware and specific software (e.g. Tele medicine). It should acquire or build in-house, general-purpose software and specialised software to meet the needs of medical staff. Each site should ensure that all software applications required must be obtained, either by being built in-house or bought off the shelf. There are different implementation approaches to implement new system (cut over, phases, pilot). The implementation phase will include the organisational structure of the implementation team, and the conditional and final acceptance test plan. The new health net will involve a stepped approach to full implementation. The first stage comprises linking large hospitals in Riyadh in a corporate Intranet. Following this, it is proposed that this corporate intranet be connected to all public and private hospitals in the main cities in Saudi Arabia. Third step is to cover mobile clinics and rural healthcare providers kingdom wide forming a clinical WAN.

Operations and production plan: The new system will be in operation and end-users will sign off after the implementation stage is finished. This stage will focus on how to make the transition from implementation to operations environment. Also, it will concentrate on an end-users support plan, operations training and a training plan (e.g. end-user training for the new system). In fact, once any new system is operational, it will be inevitable that changes will be required over time. All systems, if they are to be run efficiently, need to be monitored and maintained. Loudon and Loudon (2000) define maintenance as changes in hardware, software, documents, or procedures to a production system to correct errors, meet new requirements, or improve processing efficiency. Therefore, The new system should be monitored and maintained without interruption. Maintenance support must be available anytime, anywhere. However, maintenance and monitoring should be organised with hardware and software suppliers. Each health origination should have its own maintenance team to carry out its daily tasks and improve its network services. More precise, this team should, monitor performance, establish quality assurance criteria, determine problems and obstacles, provide security privileges, and adjust network services.

Expected Benefits

It is anticipated that the proposed SNHINS will bring about the advantages like better co-operation between healthcare providers in exchanging medical information, knowledge, and expertise. It will help providing fast, convenient, accurate, and up-to-date general information (e.g. advice on hygiene, fitness, life style and health) for the public on line , connecting national information resources efficiently and effectively. Reduce time, cost, distance, and volume barriers, by providing remote access to services, specialists, care and information needed. It will facilitate conduct of telecommunications and electronic conferences among special interest discussion groups, (e.g. videoconferencing, teleconferencing). SNHINS could be used for providing health care professionals with 24 hour on-line access to relevant information from patient records and round-the-clock access for patients to access their own medical records Sharing knowledge in medical field by providing every health care professional with on-line access to the latest knowledge (state of the art) on treatment for effective diagnosis.

Conclusion

The advances and use of ICT especially networking technologies play great role to improve health care and protect patients' confidentiality and privacy. Healthcare cost is growing up dramatically. A national health information network is essential to improve the effectiveness, efficiency and quality of health care. The Kingdom spans a large geographical area and people move from one city to another around the country. Therefore, a national health information network is a strategic necessity and essential integrated part of any effective health care system. ICT is just one part of prerequisites to develop a national health information network for Saudi Arabia. This paper focuses on proposed system that aims to link all Saudi healthcare organisations to exchange medical information in order to provide high quality standards of healthcare to the population of Saudi Arabia, and, promote movement of information instead of patient. Expected benefits, and guidelines for implementations plan for proposed system have been explained in some details.

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