

PROPOSING A COLLABORATIVE DEVELOPMENT SYSTEM: HEALTH-CARE COLLABORATION SYSTEM (HCCS)

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Abstract: Health Sector is one of the most important sectors of a country. Obviously, compared to decades ago health-care centers have advanced significantly, especially with the implementation of hospital management system, enterprise resource planner and supply chain management. In addition, telemedicine has opened a new arena in health sector. However, there have been several attempts by researchers to examine electronic collaboration between the health-care centers owing to inadequate collaborative systems in place for the health-care centers. This paper investigates the current situation of health-care collaboration system, and come up with a proposal for a deployment approach that can be adopted for implementing collaborative systems in health care centers.

Keywords: Collaborative system, Health-Care organization, Information exchanging; System Integration

INTRODUCTION

Many organizations nowadays are seeking to create a collaborative environment among their component areas by providing a building block for all of them under one name with many types of services. A collaborative system can be defined as an interaction between two or more systems actively engaged in a variety of integrative actions, such as communication, information sharing, coordination, cooperation, problem solving, and

negotiation. Collaboration systems enable people in remote places to communicate and cooperate. And most collaboration systems are not designed in the approach of an open system and cannot communicate with each other. It will bring substantial benefits to Internet users if we can build an integrated collaboration environment, which combines many components from same area to be under one collaboration system via a single easy-to-use, intuitive environment. Some of these environments act as Enterprise Collaboration Systems ECS which is a type of information system (IS). ECS is a combination of groupware, tools, Internet, extranets and other networks needed to support enterprise-wide communications, such as the sharing of documents and knowledge to specific teams and individuals within the enterprise. Some examples of enterprise communication tools include e-mail, videoconferencing, collaborative document sharing, project management tools and others. The objective of an ECS is to provide each user with the tools for managing communications, documents and other information that individuals need to manage their own tasks efficiently in their departments. However, traditional collaboration systems can only provide limited collaboration capabilities to a small group of people in a local or private community. They have features that sometimes can be compared but often the systems make implicit architecture and implementation assumptions that hamper interoperability and functionality. Therefore it is very

important to create a more general framework to cover the wide range of collaboration solutions and allow different users from different communities to collaborate. As a result of that collaborative system, the system will evolve, becoming smarter and more capable over time.

The Health care sector is a one of the areas that have embraced a collaborative system with complex facilities, organizations, and trained personnel engaged in providing health care service within a geographical area. Health care systems are designed to meet the health care needs of target populations. The term "health care system" refers to a country's system of delivering services for the prevention and treatment of disease and for the promotion of physical and mental well-being. Of particular interest to a health care system is how medical care is organized, financed, and delivered. There are a wide variety of health care systems around the world.

In some countries, health care system planning is distributed among market participants, whereas in others planning is made more centrally among governments, trade unions, charities, religious, or other co-ordinated bodies to deliver planned health care services targeted to the populations they serve. The goals for health systems, according to the World Health Report 2000 - Health systems: improving performance (WHO, 2000), are good health, responsiveness to the expectations of the population, and fair financial contribution. Duckett (2004) proposed a two dimensional approach to the evaluation of health care systems: quality, efficiency and acceptability on one dimension and equity on another.

In addition, there are many hospitals starting to implement the total hospital information system THIS which provides enterprise version, which is conceived, designed and developed to increase clinical outcomes, operational efficiency, and improve financial outcomes for any healthcare provider. THIS is a secured, reliable and seamlessly integrated web based information system that allows health care providers to record, share the clinical and other patient related information among themselves and other entities. This system is beneficial to hospitals in streamlining their operations, improving their efficiency and operational control as well as enhancing their operational capabilities. The system when fully implemented will assist in improving diagnoses and treatments of the various clinics in the hospitals, it will also provide a better means of recording, processing, and systematically accessing information relating to doctors, patients, and staff. However, the independence of these hospitals from each other may affect the total benefits that can be gotten from integrating all the hospitals, clinics and

other related organization under one system such as global researchers, statisticians, surveys and information exchange, staff, experiences, organs, and suppliers. In This paper, we: (a) Investigate the current situation of health-care collaboration system. (b) Come up with a proposal for a deployment approach that can be adopted for implementing collaborative systems between health care organizations.

LITERATURE REVIEW

Related work

Many organizations consider the collaborative system as one way to achieve the highest productivity and improve the quality of their work products. For instance, Allina hospital is non-private organization which provides healthcare online services via collaborative system. Allina hospital decided to adopt new technology to provide better communication between the people inside the hospital and other organizations outside. The hospital implemented the collaborative software system via online standard called SharePoint Online. The main benefit from this collaborative system is to help reduce cost and time.

In addition, Canadian Association of Occupational Therapists (CAOT) and a Primary Health Care (PHC) system involves health professionals working together and delivering care within the context of the broader determinants. This works of the Enhancing Interdisciplinary Collaboration in Primary Health Care (EICP) considered a good Initiative to focus on how to create the conditions for health professionals to work together in the most effective and efficient way so that they can produce the best health outcomes for individuals and their families—the patients, clients and consumers of our national health system. A PHC system coordinates and integrates services to respond to the health status of the population. It includes illness prevention, health promotion, diagnosis and management of health concerns. It encourages the use of the health professional(s) from the most appropriate health discipline(s) to maximize the potential of all health resources (adapted from Marriot and Mable, 2002).

Moreover, a case study among Spanish Hospitals illustrates their experiences on collaborative developing reference models for healthcare processes. The primary objective is to gain a global view of processes and to increase its comprehension, having people with different backgrounds and different approaches defining common processes with different viewpoints in different workplaces (Grlitzner et al, 2003). Specific objectives are to analyze patterns of healthcare activities, to build a systemic view of patient centered processes, and to

improve our knowledge and understanding of hospital organization in order to achieve the effectiveness and efficiency of health-care.

Collaborative systems faces many challenges, for instance since the 1990s, there was a huge gap between what the public health staff know and what they need to know to achieve the main objective of improving the health of the population in the world. However, there have been major improvements in terms of knowledge and understanding of the global public health care problems which was followed with important investments in data collection.

Users of health information should know that; strengthening health information systems will be linked in order of the information production to use. This will include delivering care and responsibility for managing and planning health programs. Although, knowledge and experience has to be increasingly assembled if progress is to be made. Furthermore, the health sector needs standardized and qualitative information to present to the national health authorities. Although, often data are collected without being analyzed, in term of it to be turned into information that can be used for day-to-day management or longer-term planning.

The reliability measurement of the availability of disease- specific biometric tests, clinical diagnoses, and the feasibility of measuring population behaviors and the coverage of health services, will determine the health statistics which could vary greatly in terms of scientific soundness, usability and timeliness Therefore, measuring health from a conceptual point and technically is complex, because it requires a statistical, public health and biomedical knowledge.

Technology review

XML

XML web-service provides inter-data exchange capability to two or more applications regardless of the platform they are built on. Using xml web-service multiple systems can be integrated so that they can share information with each other.

Data Warehousing and Data Mining

Data Warehousing and Data Mining are fairly new data management technology and have great impact on organization for data analyzing, decision making and business rules identifying. Data warehouse keeps subject- oriented, non-volatile, time-variant data while maintaining data integrity. Data mining provides the tools to dig into data warehouse and build knowledge on particular subject or area. When there is a data warehouse, there is a need of data mining; data warehouse and data mining both

together help organization to analyze historic data and based on that make some rules/decision.

CASE STUDY: HEALTH SECTOR MALAYSIA

Malaysia is composed of Peninsular Malaysia and the states of Sabah and Sarawak on the island of Borneo with a population of 28.25 million in 2010 pendent on their department of statics. In 2007, Health care in Malaysia is provided by the public and private sectors and non-governmental organizations. The major provider and financier of health services is the Ministry of Health (MOH). Basic health care through health facilities is currently available to and accessible to more than 95 % of the population of Peninsular Malaysia and about 70 % of the population in Sabah and Sarawak. Care services are now widely available in government hospitals and private hospitals across the country. In 2005, there were 2,877 primary health care clinics, 125 public hospitals (including institutions) under the MOH and 9,410 doctors working in public hospitals.

Malaysia is fortunate to have a very comprehensive range of healthcare services. The Malaysian government is very committed to its principles of universal access to high-quality healthcare, which the local Ministry of Health offers through a network of nationwide clinics and hospitals.

PROBLEM STATEMENT

Lack of Collaboration

Most of the health Centers do not have collaboration with each other. Therefore, they do not share information. This makes it difficult for the patient to change hospital in emergency situation. If a patient needs to be transferred from one hospital to another, his/her records have to be summarized and sent to the new hospital. Sometimes, it does not give the clear picture about the patient.

Most of all, not all the supporting units (e.g. pharmacy, radiology, pathology) in a hospital are integrated. Some units have their own management system. For instance, patient has to bring along the prescription to the pharmacy unit in order to get the advised medicine, because the pharmacist cannot access information about the patient's treatment as it is in another system.

Lack of Standard

Each health center have their own way of operating them. Patients are being treated differently for the same medical condition in different health center. This often confuses the patients, if they are getting right treatment or not. Moreover, each time a patient goes to a new health center, he/she has to open a new file and all his/her particulars have to be repeated and most of the time the procedure is different in each

hospital.

Difficult to Monitor

If the health authority (ministry of health) needs to know the current situation of the health sector, they have to visit each hospital, gather information and manually analyze the information, which is very time consuming and expensive task. Moreover, it is not possible for the authority to monitor the activities in each health care center.

Undisclosed Knowledge

Nowadays, it is rare to find a hospital or clinic that does not have data storage system. Typically, health centers keep patient information, physician's information, patients' records, treatment and operation related information and so on. This information is worth more than pure gold to the pharmaceuticals and researchers. For pharmaceuticals this vast amount of information will help to make important decisions about their production, and for researchers this could be a great assistance in their research which will ultimately help the entire nation. However, at the moment this vital information is kept undisclosed locations and health centers who do not allow any external access to their data.

PROPOSED SOLUTION: HEALTH CARE COLLABORATION SYSTEM (HCCS)

The proposed solution is to establish an electronic collaboration system between health centers, Health Ministry and stakeholders (e.g. suppliers). Each health center's database system will be connected to a central data warehouse, which will be controlled by the health ministry. Data will be collected periodically to the ware house in a predefined interval. The ware house will be open to the health center and stakeholders in certain extend through XML web services controlled by the ministry.

For real-time collaboration XML web-services will be implemented, which integrates each health care system in order to make the collaboration happen. The information which will be shared with the web-service is patients' profile, availability of blood and organs in blood banks and organ banks. This collaboration will only be between the health centers and the service will be provided by proper authority, which is, in this case the health ministry. Therefore, the control will be with the health ministry. Fig.1 illustrates the entire system in brief.

Therefore, there will be two separate systems, one that will be collecting historical data for future analysis, and another which will be providing live

(real-time) data for the health centers to search for patient information, blood and organs. The base technologies for the first system would be, as mentioned earlier, data warehouse, data mining and xml web service. For the live system, data will be collected in two ways in a fixed interval and on-demand. Fixed interval is to collect data about blood and organ banks, and on-demand for patient profile (and patients' medical history). XML services will be used to pull data from available health centers and store in a volatile storage (e.g. temporary tables, xml files). An API will be available for the health centers to integrate this live-search system with their hospital/clinic management system. The users of the system are (a) The health ministry (b) Health Centers (hospitals, clinics...) (c) Suppliers (d) Researchers, each containing multiple levels of actors (users). Figure 2 shows the basic use case diagram for the entire system.

The development of the system will be a challenging task, if not properly planned. There are number of methods available for system development projects. However, in this case, considering the complexity of the project, Dynamic System Development Method would be the best method to follow.

Dynamic System Development Method – a generic approach for project management and solution delivery, although at first it was just a software development methodology. DSDM is a hybrid of iterative and incremental methods, and emphasizes continuous user involvement. Dynamic system development method consists of five phases: (a) Feasibility Study (b) Business Study (c) Functional Model Iteration (d) Design and Build (e) Implementation phase.

In each of the stages certain studies and tasks will be carried out, a brief of those are below.

Feasibility Study

The dependencies of the project will be identified. Current infrastructure of the stakeholder must be studied in order to list out the constraints and sorting methods. What would be the potential risks and how could they be resolved. A primary estimation of schedule, costs and requirement analysis.

Business Study

How each stakeholder will benefit from the system and to what extent. Are there any business risks that the system might introduce, if there is, how they can be illuminated? List all non-functional requirements. Estimation of technological development and rank the requirements from most critical to least critical.

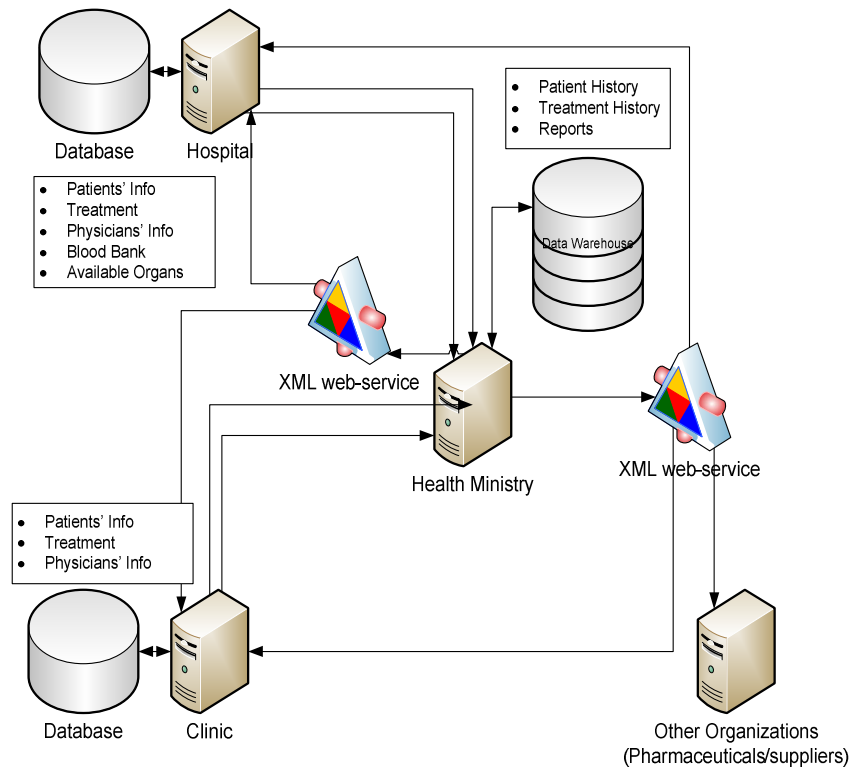


Figure 1: Health Care Collaboration System

Function Model Iteration

In the phase function model of the system would be identified and a working prototype of the system will be built. This phase is not concerned with the usability of the system but rather its functionality. It's an incremental and iterative phase; therefore development of each component will be continuous and repeated when necessary. Functional model iteration has life cycle of its own; consisting four stages a) identify function module b) agree and commit c) develop the product and d) review.

Design and Build

Requirements for each aspect of the system will be reassessed. If any upgrading is needed, that will be performed. Lastly, all the components will be integrated and the system will be ready for implementation.

Implementation

The actual system will be deployed in the operational environment. The primary objective is placing the

fully functional system in the work place and training the users. Any further development needed will be listed and added as needed.

CONCLUSION

The proposed solution, health care collaborating system, will change the entire health-sector of a country and introduce numerous opportunities. The main idea is to deploy data warehouse, where data from different hospitals and clinics will be stored. This will allow health authorities to make important decisions and also draw some standards. Researchers could use these vast amounts of data to aid their research. Moreover, the proposed solution will help the hospitals to search blood-banks and organs in other hospitals in case of emergency. These will eventually increase patient satisfaction. Therefore, the entire health care sector will benefit from the proposed solution.

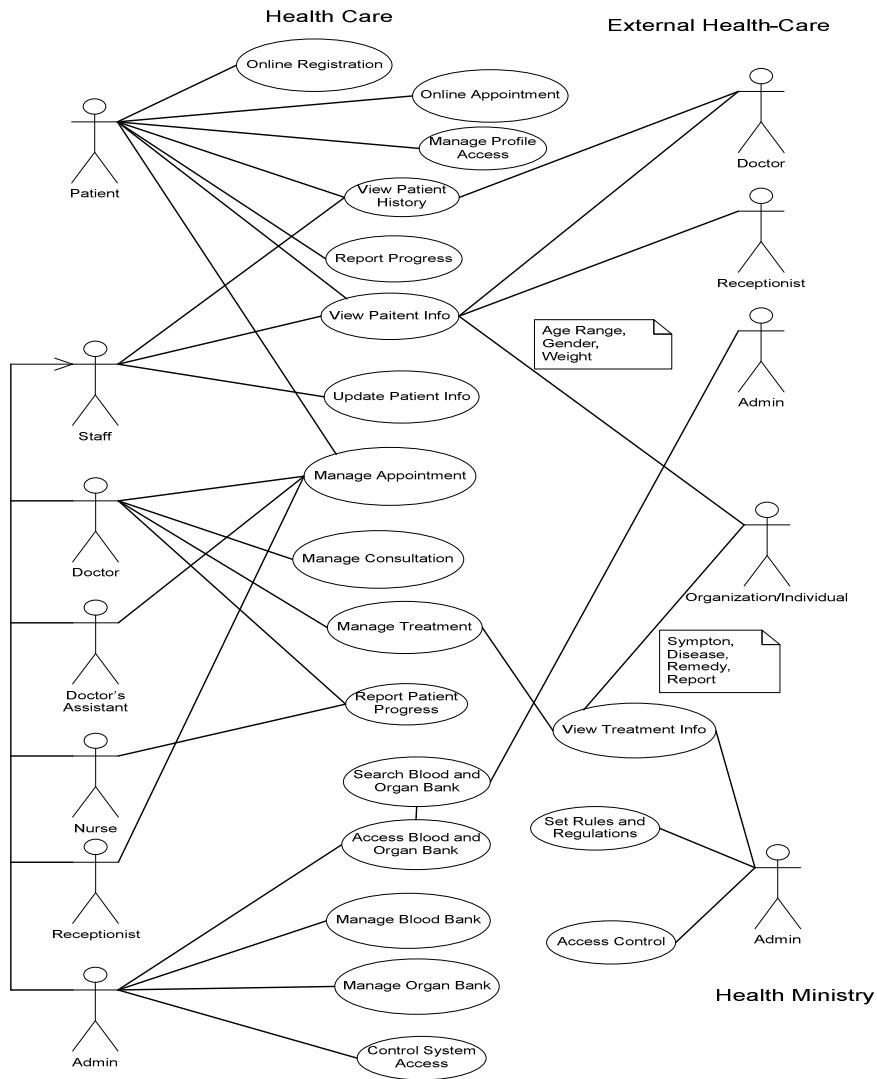


Figure 2: Use case of Health Care Collaboration System

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