Hospital Information Systems Integration Plan System Perespective

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Abstract—*Information and Communication Technology (ICT) is playing a vital role in every aspect of life; and has drastically contributed in the health sector as well. It's generally agreed that the development and use of integrated healthcare systems are becoming an absolute necessity to support the delivery of low cost, high-quality care [1]. To achieve this goal; Planning of Information System is one of the most significant activities for Information System attainment in a large organization. This paper presents the information systems integration plan for Hospitals operating under the Directorate of Health Services Kashmir (DHSK). The main objective of the System integration is to specify techniques to link all databases of different sub-systems in DHSK so that the information interchange between the sub-systems is seamless. The plan shall be accomplished by applying the methodology consisting of four steps: requirement analysis, conceptual design, systems architecture design and system implementation. As the results of design, the databases shall definitely share many identical data items. The presence of identical data items will allow the information update in batch processing and will facilitate to design a common physical layer. Thus, a common XML based database implementation along with shared assemblies is recommended to implement the databases with identical data items, whereas, private assemblies are recommended for the unique data items. In addition, a concept of data warehouse is recommended for implementation to provide summarized information for DHSK for future planning.*

1. INTRODUCTION

With the evolution of IT technologies and increasing demands from people for computerizing medical-related information, healthcare institutions are bound to develop systems to manage and process the large amount of medical information. In order to exchange information and medical knowledge,

hospitals and healthcare institutions need to integrate their systems' functions and data. There are many systems that have already been designed and implemented in many hospitals and healthcare institutions across the globe. Information systems are playing a vital role as for as the day to day functioning of the hospitals are considered. Universally, researchers have consensually reached to a common conclusion that improved health outcomes cannot be achieved without strengthening the basic health information systems as a whole, rather than

focusing on discrete, disease-focused components[2]. Since many software's have been developed for managing the hospitals and to keep the data updated in many respects. But according to a recent research, it is found that much of the material remains unprocessed, or, if processed, unanalyzed, or, if analyzed, not read, or, if read, not used or acted upon[9].There is a desperate need to utilize the information available in the Hospital information systems. The department of health services Kashmir can utilize the already designed software's and integrate the hospital information systems via a common interface using the web services or by using the XML based data exchange mechanisms[5], so as to exchange the data between different databases of the hospital information systems of different hospitals running under the direction of DHSK. Thus, integration of all such information systems in a way which could facilitate a better exchange of information between different stand alone hospital information systems is very significant and unavoidable and it will certainly provide a single-system image to the users and policy makers. The other approach that this paper focuses on is: The directorate can design a new system which we can call as the Integrated Hospital Information system(IHIS), which can have all the functionalities for establishing and managing a detailed data warehouse. As established by the research of past two decade, data warehouse is being considered as a best practical way to gather, process, and depict valuable information to support the decision makers in making important decisions. The warehouse will provide strategic information to various hospitals on demand .The IHIS will take all the data from the operational systems of various hospitals and wherever necessary can include relevant data from the other sectors. The data warehouse will store the data in the formats which will be suitable for various decision makings. The data from the operational data bases will be first cleansed in order to remove inconsistencies and then the integrated data will be stored in the IHIS warehouse for future use.

2. NEED

It is generally agreed that the development and use of integrated healthcare systems are becoming an absolute necessity to support the delivery of low cost, high-quality care. To achieve this goal, however, requires cooperation and coordination not previously experienced. Providers have generally maintained their own independent data and the incompatibility of healthcare systems largely prohibits its cross-institutional use[3]. There currently is nothing that ties healthcare data together in a coherent and uniform way, which is expensive, redundant and insufficient.

The need for healthcare systems integration is multidimensional and is being driven by a number of medical, technical, organizational and political factors [2]. Benefits resulting from an integrated healthcare environment are numerous and substantial. Integrated data can greatly assist the various care givers in making correct assessments and administering the proper treatments, as well as facilitating the optimization of operations across the valley. The collaboration and widespread sharing of data can help in identifying and pursue opportunities for improving outcomes and lowering costs. There is little question that the answer to many of today's global healthcare delivery problems lies in the integration of data generated by the various medical services. Integrated data is quickly becoming the desired characteristic of new and replacement healthcare systems[4].

Healthcare systems integration must occur in several different ways: at the provider, patient, software, computer and data levels. Users must not only share systems, but interact with each other in a seamless way based on business, political and procedural considerations. Computer software developers must not only cooperate but share a common data model and design products that can interact with each other. Computer integration is continuously being addressed by the computer industry, however, the use of different operating systems, i.e., MVS, UNIX, Pick, MS-DOS, Microsoft Windows, OS/2, etc[5]., still impedes progress. However the most important area and which is the heart of this paper is the data integration which is fundamental and a necessary prerequisite to systems integration. It requires the development of a healthcare data model that can serve as the basis for meaningful development. The objective of the paper is largely defined by the diverse nature of the requirements in the hospital Information systems ranging from managerial to clinical aspects. There is a desperate need of an integrated information system that can help the policy makers to make better policies and will help the clinical actors to perform well and give the maximum to the society. *The system under study can service 228 Primary Health centers of the valley and 47 sub-district hospitals along with 9 district hospitals running under DHSK*

3. IMPLEMENTATION APPROACH

There are important reasons why existing healthcare systems are not integrated. Those that have tried know how hard it is. A certain critical mass of complexity is always reached beyond which it is virtually impossible to achieve full systems integration[4]. To attack the total healthcare systems integration problem all at once is virtually impossible and to do so in an incremental way requires the use of software development tools not previously available. No one person, or group of people, is capable of defining and building a totally integrated healthcare system with all of the required functionality at least not by using traditional technology. This means that if healthcare is to be integrated, it must happen in some new and different way. A major problem has been one of approach. Just following the path toward industry standards, i.e., ASCX12, NCPDP, HL7, ASTM, etc., is not the answer. Hundreds of healthcare standards have been established, yet no significant level of system integration has taken place. Existing standards are fragmented, primarily addressing the electronic interchange of data within very narrow areas of use. They are more directed at establishing systems interfaces than systems integration. This is a situation precariously dependent on the adherence to common and constant industry standards, something no industry has ever achieved. Until standards address the underlying structure of healthcare data in a common and unified way, they will remain largely ineffective. A new approach to healthcare systems development should be taken in the future. Healthcare systems are not currently designed using common data modeling constructs resulting in different database designs; there is a different database design for each application. The paper presents an approach which can lead to the better usage of the information resources. There needs to be a single database implementation for all the hospitals running under the direction of DHSK. Each hospital can have a working copy of the database which can be a snapshot of the centralized database. There can be a common interface between different hospitals of the directorate so that the information exchange between any two hospitals or two sections of the hospitals is seamless. The Integration of the system will surely be defined by the following processes

4. REQUIREMENT ANALYSIS

The requirement analysis has to be done keeping under view the functioning of the whole directorate with respect to the hospitals instead of making the hospital as the center of attraction for the requirement analysis. We need to have a detailed requirement analysis encompassing every small activity of the DHSK. The database design of the existing operational systems in various hospitals should be taken into consideration while analysing the requirements for IHIS. It will help in developing the common design for future systems and then the inter hospital information can be exchanged seamlessly.

5. CONCEPTUAL DESIGN

Conceptual design is an integral component of communication among systems. This process is very vital as this will identify the common attributes among the hospitals and directorate and will provide the base for designing the architecture of the IHIS. The conceptual design involves the database design of the system which is at the real heart of the system. There is a need of a strong database design which should address all the needs of the hospital information system and also the diverse needs of the DHSK. The system can have multiple databases for multiple purposes, but all the databases need to be centralized. So, a much general databases are required to design for addressing the needs of the directorate and hospitals associated with them[6]. The database design needs to be highly normalized and we may have to allow some controlled redundancy in the databases, so as to produce the fast searching mechanism. There needs to be a secondary table for every primary table which shall be used as a history table and will thus be used for establishing the base for the data warehouse and finally will lead to the efficient decision making system. The database design of IHIS should incorporate every important required entity from the operational databases of hospitals working under DHSK. Such mechanisms should be followed in which the information can sink easily from operational databases to the IHIS database The structure of the database will be discussed minutely in the enhanced version of this paper.

6. SYSTEM ARCHITECTURE

The third and very important aspect of the proposed system which is the top most reason for the current systems for not full filling the needs of the health provider institutions. There is a strong need of a common platform by virtue of which the information can be interchanged seamlessly and with accuracy[7]. The proposed system will facilitate the data shearing by virtue of web services which are based on SOAP protocol and utilize XML services for the information interchange(as shown in the figure1).The system can use other web services as well like CORBA and DCOM but DCOM and CORBA provide rich application-to-application communication. This is usually complex and symmetrical (need same platform...etc.). SOAP promises to overcome these problems. SOAP gives us greater platform and location independence. This is due to the fact that SOAP uses HTTP as transport protocol and the data carried is in XML format, which is human- readable, whereas DCOM or CORBA use their own binary format to transport data which is much more complicated to debug or understand. This also means that they need special infrastructure[8]. The main drawbacks of CORBA and DCOM are the configuration complexity and the relatively complicated security model that render them tough to get to work within a LAN, and nearly impossible to deploy over firewalls i.e., **CORBA** Can be difficult to use if server and/or client is behind a firewall or if network address

translation is being used. This is what SOAP promises to solve and does it excellently. It mixes the power of remote procedure calls (RPCs) with the flexibility of XML, using HTTP as the underlying protocol that can be used from almost anywhere. DCOM is highly efficient and flexible, but also highly complicated. One of the primary benefits of SOAP, on the other hand, is that its power does not come at the expense of simplicity [8]. The system architecture needs to be highly documented so as to averse any confusions that may arise while implementing the system.

7. SYSTEM IMPLEMENTATION

The final stage of the proposed system will be the implementation of the system that should be done with at most care and after proper testing of the whole system. The system should be implemented for two hospitals before implementing it for the whole DHSK.
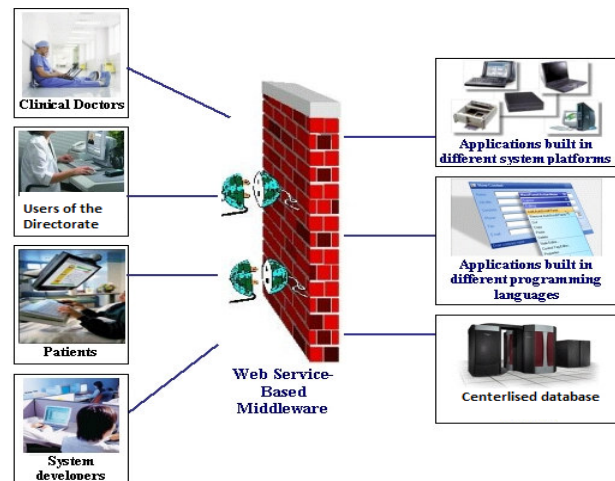

Fig. 1: Web service based common interface that depicts different users ofthe system with its different functionalities and facilities

8. BENEFITS

There are numerous benefits of the above proposed system some of which are listed below:

✓ Organized view of the data

✓ Resource sharing

✓ Cost cutting

✓ Common maintenance

✓ Effective Referral Management

✓ On time decision making

✓ Proper planning

- ✓ Proper medicine distribution

- ✓ Proper preparation for of incoming referred patients

- ✓ Disorder distribution ratio.

- ✓ Proper fund utilization

- ✓ Proper management of the staff etc.

9. CONCLUSION

The paper proposes the integrated health information system that can be utilized by the hospitals to manage its activities but under the direct control of the directorate of health services Kashmir. The idea of having the single centralized database services is to enable the directorate to run the hospitals effectively and to cut down the cost of independent implementations of Hospital information systems, apart from numerous other important benefits which otherwise are not available with the ordinary hospital information systems. This concept is fit enough to be implemented across all the states of the country and will certainly prove beneficial for health care monitoring and planning.

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