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ص. ب. ٢٠٢٠٠  
بيت المعارض  
المنامة، البحرين  
تليفون: ٥٥٠٠٣٣ (+٩٧٣)  
فاكس: ٥٥٣٢٨٨ (+٩٧٣)  
تلکس: ٩١٠٣ EXHIB BN

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June 26, 1994

Dear Mr. Motan,

**Middle East Infotech 94 - 30 May/2 June 1994**

On behalf of the Organising Committee and Arabian Exhibition Management, I would like to thank you very much for your contribution and participation in the Middle East Infotech Conference. Without your active participation it would have been impossible to hold such an event.

The success of the conference depended largely on the contribution made by speakers such as yourself who worked hard to prepare talks and displays.

Thank you very much and we look forward to welcoming you to Infotech'95 (29 May - 1 June 1995).

Sincerely,  
ARABIAN EXHIBITION MANAGEMENT

Mohamed bin Abdulla Al-Khalifa  
Chairman

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## **Integration of Hospital Information System Applications and Single Workstation strategy**

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Integration of applications running on different platforms and access to information data whether administrative or clinical, which are distributed among multiple satellite information systems is crucial to delivering better care. Five years ago at King Faisal Specialist Hospital and Research Center (KFSH) it was simple; all the Hospital Information Systems (HIS) Applications were running on IBM Mainframe under Customer Information and Control systems (CICS) except for Pharmacy which was running in PICK Operating system on the same Mainframe. During the selection of Laboratory System the hospital had decided to pick a system which met most of the user requirements independent of the Hardware. The Meditech on Data General (DG) MV15000 was selected with the view in mind that, in future, there will be better integrated tools to help access several system from single workstation. Hospital provided the interface between HIS, Laboratory and Pharmacy systems to actually eliminate the redundant data entry of patients. As technology permitted, the Hospital laid Fiber Optics Cable of 2000 Meter which would cover most of the major areas. Replacing the IBM Mainframe monitors and Data General Terminals with Personal Computer (PC) came next, giving KFSH&RC the opportunity to further enhance the strategy of integration; adding Library services and Drug Data Bases of Pharmacy to the same Network. Microsoft Windows was chosen because the application was user friendly with mouse support and simple to learn. The challenge was to setup all these applications into this presentation manager so that it becomes absolutely simple to operate.

**Key Words :** HIS Application Integration,  
Single workstation strategy

### **INTRODUCTION**

Patient care has always been number one priority in hospitals and each one tend to improve their services by automating each department as patient moves around in the hospital for these services. It is important that the patient information also flows with him. In our hospital, like many others when Application were developed in a Multi-user environment it was easier to maintain patient information because same data base was used for all of the applications. However these applications required more and more changes for user satisfaction which became more difficult to

achieve with the passage of time. One reason was it required specialized staff to maintain those applications. This added cost kept increasing with the increase in application complexity. During the automation of Pharmacy Services this strategy was changed to buy application instead of developing them in-house. Yet the condition existed to select the package which would run on hospital Mainframe. Megasource Inpatient Pharmacy system was chosen as it met over 80% of department's requirements. Though Megasource Pharmacy system ran on PICK operating system, the interface was easier since it ran on the same mainframe.

Additionally even though the users were happy with the functionality of the system, the operating environment was difficult to maintain. Though the selection of Laboratory system was in process for quite some time the condition to run on mainframe was avoided during the selection process. This was the first time package was to be selected independent of the hardware with the view in mind that, in future there will be better integrated tools to access several systems from a single workstation. Medical Information Technology (Meditech) Laboratory system was chosen because it met about 90% of the users requirements. Furthermore the hospital required additional customization to meet some of the specific requirements.

### **Methodology for transmission**

At the time hospital users required automatic transmission of patient information to Pharmacy and Laboratory systems so that users of these systems don't have to re-enter the pertinent information. We have addressed the issue of a simple integration of these systems with our Hospital Information system (HIS). Since both systems were on different platforms transmission methods were identified, Data elements, record layouts were agreed upon for both systems, as well as ADT programs were identified where the information will be coming from.

Our HIS applications were running under VSE/CICS, Megasource ran under PICK and both of them under VM helped us to transmit data at operating system level. It was decided to make use of SPOOLWRITE commands in HIS applications which would spool data strings in the queue. VM was notified to look for certain types of queue and if found to transfer these queue members to PICK reader queue. Megasource in turn wrote a simple program to wake up as soon as some data showed up in their queue, read the data and wrote it to a temporary file. This would in turn start another program which would update pharmacy data base. An error log was printed on a Pharmacy printer to handle any errors manually.

Meditech Laboratory system ran on Data General's MV15000 under MAGIC operating system. It was decided to use Protocol converter unit (PCU) as a printer address which would receive the data from CICS using Coaxial cable and on the other end gives it to data general on thin Ethernet. Meditech wrote a customized program to receive this data and wrote it to a temporary file. Like Megasource another program was written to read this file and update the Laboratory patient data base and create an error log. Again this error log was checked manually for any corrections. As time passed by and we identified all the edit rules before transmitting the records this error log was practically empty 99% of the time.

#### Record layouts

Both systems required following data elements to be transmitted :

Medical Record number (MRN)	6 Characters
(KEY)	
Visit number	3 Characters
Patient Name	60 Characters
Birth date	7 Characters
Sex	1 Character
Admit Date	6 Characters
Admit time	4 characters
Location	10 characters
Admitting doctor	6 Character
New MRN	6 Characters
Patient Status	1 Character
(I=Inpatient, O=Outpatient, D=discharge)	
Height	3 Characters
Weight	5 Characters

Diagnosis	20 Characters
Old location	10 Characters

#### Issues to consider

The issues that were raised during Inpatient Pharmacy implementation were as follows :

1. Transmission of all Active Inpatients to Megasource on first day of production.
2. The location of patient was extremely important and old location was passed in transfer record.
3. Swap beds process was handled very carefully using dummy bed.

The issues that were raised during Meditech Laboratory implementation were as follows :

1. Transmission of existing 300,000 patient records.
2. Medical Record change was extremely important so we had to provide new MRN
3. Since Meditech archived data over 90 days a facility was provided on HIS to transmit selective records.

#### SINGLE WORKSTATION STRATEGY

We approached single workstation solution as technology permitted. As Operating systems platforms, applications and data were proprietary we were at the mercy of the Vendors for proper support. As we were able to emulate 3270 sessions on a PC we were able to access our HIS Applications and Megasource Pharmacy application. By the time Meditech Laboratory system was introduced we had introduced Microsoft Windows on the PCs. These PCs were still expensive until 1991 when we first started the strategy to purchase PCs instead of dumb terminals. Slowly and gradually we started replacing existing IBM and Data General terminals with PCs. This way we emulated 3270 for HIS applications, Meditech VT100 for Laboratory and Office automation applications on the same PCs. With the introduction of Network we were able to provide selective users to access Network applications such as Micromedix Drug Data base information and Library Data Bases on CDs. Even though these applications are set up

in windows environment, they tend to be very unstable and require more and more memory.

#### Our Current Objective

Our current objectives are to fill in the remaining health care applications such as Radiology Information system (RIS), Cardiology and Operating room and to replace some of the existing applications such as Blood Bank to meet hospital and international standard requirements. Our strategy to buy instead of development, regardless of platform, stays valid. Besides we are also in a process of utilizing Clinical Data Dictionaries and Expert systems. We are rigorously busy in the expansion of network through out the hospital to reach all clinics and Nursing stations and in future patient rooms.

We are in a process of integrating all the current and future applications through a common box. This box will be running HCI Link, which is a complete, integrated development/support environment and runtime delivery platform, targeted toward supporting a broad spectrum of OLTP applications and system solutions (1). This will help us in uniform, transparent sharing of ADT information and as well as building our Clinical, Research and Administrative Repositories Data Base for Clinicians, Scientists and Administrative staff. This way Physicians, Nurses and other patient care personnel will access repositories for detail analysis of patient related data.

During the long process of selecting health care application its integration with other applications and systems we have come up with the following selection criteria ;

1. The application must follow atleast first three layers of OSI model (2).
2. The application must comply with ASTM1238 of HL7 standards (3).
3. The application must comply with JCAHO standards (4).

#### References :

1. HCI-Link System Functional Description

2. OSI : An International Standard for Open Systems - Computer Technology Research Corp.

- 3.

4. The Joint Commission - 1994 Accreditation Manual for Hospitals