

A Health Care EIS Case Study

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Introduction

Managed competition, managed care, capitation, risk sharing and new kinds of networks of hospitals and physicians are changing the way we think of health care and the way we deliver it. In preparation for certain health care reform, the need to understand markets, products, operations and health care customers are essential if health care providers are to remain competitive.

At North-Carolina Baptist Hospital and Bowman Gray School of Medicine in Winston-Salem, North Carolina we chose SAS/EIS® software to enable our health care executives to monitor our effectiveness and make better decisions. I will present the reasons we chose SAS/EIS® and our experience so far in providing critical information to our executives.

Health Care Changes

Health Care Providers are facing major changes in the coming months. Information systems that answer questions about cost and service trends are becoming as important as billing, patient census and order entry systems that have been automated for some time.

The need to graphically monitor patient volumes and cost trends are critical as health care institutions begin to compete for health management contracts. Patient care is increasingly seen by administrators as an offering of health maintenance product lines. Hospitals are making investments and decisions concerning affiliations, outpatient services, new equipment, physician recruitment and controlling cost.

The Promise of Executive Information Systems

Executive Information Systems are easy to use systems intended for users who need to visually navigate data to seek answers to high-level questions. The early nineties are a time of transition for EIS systems, vendors and implementors. The information industry continues to undergo vast changes. These changes include decisions regarding downsizing, rightsizing, LAN based systems, Client-server architecture, and desk top operating systems.

North Carolina Baptist Hospitals Inc.

North Carolina Baptist Hospitals Incorporated is part of a 806 bed regional medical center associated with Bowman Gray School of Medicine of Wake Forest University. Located in the city of Winston-Salem in the Piedmont section of North Carolina, the medical center has over 8,000 employees including 1,548 nurses and 388 full-time faculty physicians. The medical center serves as a tertiary referral center with 23,545 inpatient admissions and 523,672 ambulatory patient visits last fiscal year.

History of Project

The search for solutions to meet the information need of the hospital executives began in the early part of 1991. The vice-president of Information Services ask the Decision Support group to explore and recommend a strategy for developing an Executive Information System. Hospital upper management

made no formal request, although the demand for more timely and directly accessible information was increasing.

The choice of EIS solutions does not necessarily involve high cost vendor specific software. Reasonable choices of only a few months past are no longer valid. A survey of vendors at the time only increased the confusion. Several site visits were made to institutions in the process of implementing EIS systems and several PC-LAN tools were evaluated in house.

In the spring of 1991, SAS institute announced the release of SAS/EIS® software by years end. This software offered the promise of being able to build an EIS with only an additional module to software we already had in house and were actively using. The Executive Dean of the Medical School was using an internally developed system using the graphic capabilities of the SAS® system to produce charts of trended medical school information. SAS® software was also being used to develop an increasing number of Decision Support applications.

SAS institute produced a working demo of their software for us using our data in late 1991. A prototype developed by our staff was presented to the Executive Staff in June of 1992.

The office of Strategic Planning were early users of the system implemented on our MVS mainframe using a Windows™ based terminal emulation software to connect to the host. Because of problems experienced with the emulation software and our belief that a PC-LAN solution would be the most adaptable, and easy to use, we chose to implement the system for the executives using the SAS® System for Windows™. The first executive user

received the system in December of 1993. The system is currently available to the entire executive staff.

EIS Expectations

We began the process of building an Executive Information System with the following assumptions:

- Upper management must be shown rather than just told about EIS possibilities.
- The development of an EIS does not require the use of an expensive new software development environment for just a few select users.
- A good EIS will compliment established business practices.
- EIS is a component of an organizational information delivery strategy rather than a separate component, and should be closely linked to a Decision Support System.

System Requirements:

An EIS must be able to grow to allow all levels of management access to automated tools to better run the hospital. The process of building an EIS includes identifying and accessing pools of data stored on various database management systems in various file formats and on various platforms. Data deemed important must then be turned into information for the various executive consumers to determine its usefulness. The process of providing executives with information involves getting information to the right people at the right time in a format easy to digest. The information must be appreciated, useful, and easy to use.

Any system that provides information to executive decision makers needs to incorporate the following:

- Monitoring progress of critical goals.
- Provide immediate answers to executive queries.
- Support communication between executives and staff.
- Provide fresh data.
- Provide on-line (interactive) access to graphs, tables and reports.
- Be simple to use.
- Be quick.
- Allow reports and graphs from other applications to be used.
- Provide printed output on demand.
- Be quickly produced and readily maintained.
- Allow rapid development of applications
- Be flexible.
- Process a large variety of data sources.
- Provide a growth path to future technology.

Implementation Plan:

We first built a small, highly targeted EIS for executives. We began with a few select users and are growing to accommodate organizational needs. We plan to migrate all Decision Support and Executive systems off of our IBM mainframe. This approach is possible because of a fiber-optic communications back-bone installed across the campus, a critical mass of PC-LAN installations, and SAS® Multi-Vender architecture.

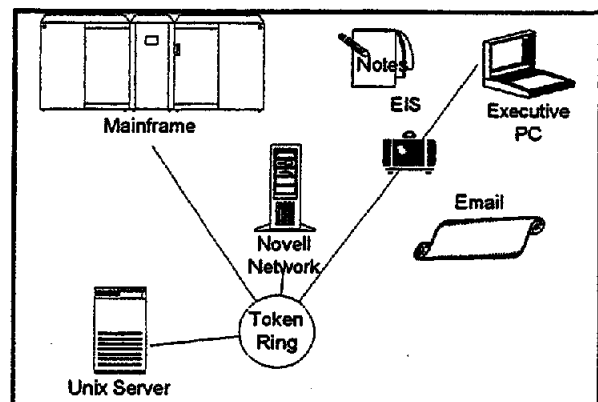
Technical Approach

To sustain an EIS both a data strategy and a desktop strategy are essential. We chose the data warehouse model for storing and retrieving information. The data warehouse

concept will be discussed in a later section.

We also chose a PC-LAN strategy for desktop delivery of the EIS using SAS® for Windows™. Workstations and PC's are best at presenting information of a graphical nature. In addition, products such as Lotus Notes® and Word Perfect Office® are becoming integral parts of our overall information delivery and communication strategy (see figure 1).

Figure 1: Executive Information Delivery



SAS® software worked to our advantage because it is available on several hardware platforms. The danger of developing systems using obsolete or less well known hardware or operating systems decrease by this choice.

SAS® software allows the development of data driven systems. Data driven systems are in contrast to a "sophisticated slide show" approach where a presentation is tailor made from downloaded data. The characteristics of data driven systems are as follows:

- Allows cooperative processing.
- Allows access to a shared central SQL database.
- Allows smooth flow of data from production data or direct use of production data for reporting.

- Displays (Charts, Tables, Drill Down Reports etc.) change with the underlying data and do not require user or programmer intervention.

The ability to run on several vendor architectures allows the development of portable and scaleable systems. Prototypes are tested and approved on one platform and moved to another for full-scale development and production use. The increasing capabilities and lowering cost of PC-LAN systems make them important as a strategic information delivery technology.

SAS/EIS® software provides an object-oriented development facility and a toolkit for building interface and data maintenance tools. It provides capabilities for hot-spotting, drill-down and what-if analysis, graphical reporting, exception reporting and critical success factor monitoring.

Integration with other Systems

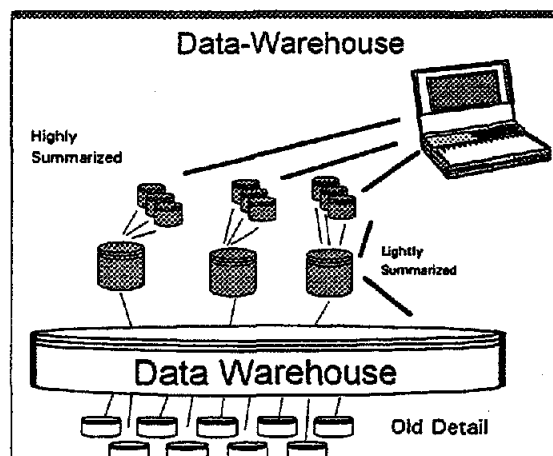
Most of the production data at the Medical Center is stored and processed in vendor specific systems. Dunn and Bradstreet financial systems contain General Ledger, Payroll and Personnel Information. Patient management and patient billing are Medipac® systems and clinical results are reported using Clinipac®. Wake Forest University Physicians (WFUP) uses a system from Cycare® for patient billing. Several ancillary systems run on mini computers or PC-LAN systems. Programmed interfaces are necessary for all systems where data is needed by the Decision Support and the Executive Information System. Software that can harvest data from several systems and

hardware platforms is essential. We began collecting data using SAS programs to read VSAM files from many of the systems and loading the data into a DatacomDB® database. We are currently using IBM DB2 relational database for this purpose. Data from the mainframe "legacy systems" are consolidated in a repository that is commonly referred to as a data warehouse.

Data Warehouse

The term "data warehouse" was coined by William Inmon, vice president of technology for Prism Solutions Inc., a California maker of warehouse management systems¹. The data warehouse contains modeled information that is integrated and consolidated. This allows efficient queries and a shared uniform data source. Data over time can be used for trend analysis. The warehouse concept allows for a secure high integrity design that is movable across platforms.

Figure 2 Data Warehouse Model



Future Growth

We are in the process of moving the data warehouse from the DB2 mainframe environment to a Unix based repository using Sun™ hardware and Sybase™ relational database software. The system is spreading to Director level users outside of the executive suit. The system will be used to follow comparative clinical and financial data from outside sources such as the University Hospital Consortium.

Summary

Here are some of the things that we learned:

Building a prototype is a good way to test any new technology or development tool. A prototype should include information that the executives are accustomed to seeing but in a graphical and more timely manner.

It is estimated that 90% of EIS development is in summarizing data². The process of summarizing the data takes more time than the actual design of the interface. To reduce future maintenance backlogs an object oriented approach making more use of meta-data and the frame technology of SAS/EIS and SAS/AF will have to be implemented.

References

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