

EXTRANET IMPLEMENTATION: A CASE STUDY OF A COMMUNITY HEALTHCARE INFORMATION NETWORK

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ABSTRACT

This paper describes the collaborative development of a community healthcare extranet. The project involved the collaboration of a hospital, insurance carrier and community physicians. The nature of the information shared between the partners required high levels of security. These requirements and the lack of existing infrastructure made the extranet's implementation cost prohibitively high for any single organization. Collaboration not only helped reduce the cost for individual participants but also increased the functionality of the extranet by increasing the amount of information available. The extranet, HInet (Health Information Network), reaches over 95% of the physicians in the community. Its development process offers valuable lessons for the development of extranets in general and community health care extranets in particular.

Keywords: extranet adoption, extranet development process, extranet implementation, community healthcare network, interorganizational collaboration

INTRODUCTION

Although healthcare has benefited from many scientific and technology advances, the healthcare delivery system has struggled to implement effective communication and coordination mechanisms. Care providers frequently “operate as silos, often providing care without the benefit of complete information about the patient’s condition, medical history, services provided in other settings, or medications prescribed by other clinicians” (4).

Information technologies have the potential to play a significant role in reforming health care delivery. Health extranets can allow the sharing of information and applications amongst care providers including: physicians, specialists, nursing homes, hospitals, laboratories, and other health organizations (6). Such information sharing can improve the quality of health care and reduce administrative costs.

Differences exist in the literature on what constitutes an extranet. A review of definitions (1, 7) suggests that an extranet has the following characteristics:

- It is an internal organizational network with controlled external access
- It provides secure communications to exchange and share information and applications with external entities
- The security provisions can vary depending upon the type of information exchange and application access

The benefits of successfully implementing extranets can be tremendous. They can provide more timely exchange of information, increase value, improve service, improve competitive position, increase access to industry information, and lower costs (8).

Despite such noted benefits, the medical community has been slow to realize these benefits. Barriers to successful health care extranets include:

A fragmented health care delivery system – Physicians, hospitals, insurance companies, laboratories, skilled nursing facilities and other players are separate entities. While they all have a shared interest in health care quality they often have conflicting financial interests.

Lack of infrastructure – Physicians offices are the front-line of the health delivery system and are physically located throughout urban and rural areas. Installing computers in individual physician offices and connecting them via a network is an expensive proposition.

Need for security – Patient medical information and insurance transactions require high levels of security. The network must be protected from external security threats. Among authorized users there are many roles, some of which should see only certain information. For example, an accounts receivable clerk in a physician's office should not be able to see a patient's medical records, and a nurse should not be able to modify a patient's account balance.

Lack of standards – There are no standards for insurance claim or payment transactions. There are also no widely accepted standards for sharing patient medical information.

Need for technical support – Physician offices typically do not have technical support personnel.

Information ownership – Physicians can be reluctant to share patient information with hospitals and insurance carriers. There are also potential liability issues if confidential patient information is shared with unauthorized parties.

Tradition – Physicians have been using paper based systems for decades and have learned to live with their limitations. While many can appreciate the benefits of improved information they are often unwilling to invest in the infrastructure and training needed to realize the benefits.

Largely because of these factors there are very few successful community-based health care extranets. The Health Information Network (HInet) developed in Whatcom County, Washington, is a notable exception. This paper describes HInet and the factors that helped it become successful. We first describe our methodology, followed by the details of HInet's development and implementation. The paper then discusses factors that contributed to HInet's success. Finally, we discuss the implications of our case findings from practitioner and research standpoint.

Although there remains a continued focus on extranets amongst the practitioners, the academic community has been somewhat slow to address issues related to their adoption and implementation. There are no accepted development frameworks or principles to guide research and practice and we know very little about factors that are critical for their implementation success.

METHODOLOGY

Our case study is based on data collected from primary and secondary sources. We conducted in-depth interviews with extranet project champions and development team members and reviewed Web documents (5) and other internal documents provided by the organization.

Case study approaches can be useful to provide detailed insights into understanding an under-explored phenomenon. Given our interest in exploring extranets, we approached a local health-care organization that we knew had developed an extranet for the healthcare community. Initial telephone conversations with the vice president of strategic projects in the organization were established to learn more about the extranet and the key players that were involved. Over time we were able to set up interviews with the two project champions and the development team members. Interviews were conducted by three researchers who were present at all times. Each inter-

view lasted about 90 minutes. The interviews were tape recorded. These interviews provided detailed insights into the extranet efforts. In the interviews, we asked questions such as these:

- How was extranet initiated?
- What factors motivated extranet adoption?
- Who played a major role in initiating extranet efforts?
- What process (formal or informal) was deployed to develop extranets?
- What types of project management tools were deployed in developing extranets?
- Who were the key participants in extranet efforts?
- How did their role vary in development efforts?
- What barriers were encountered in your extranet efforts?
- How were these barriers overcome?

CASE STUDY

Need for a Health Information Network

HI-net was developed to serve the physicians, hospital, medical laboratories, skilled nursing facilities and other members of the healthcare system in Whatcom County, Washington. Whatcom County is a largely rural county with a population of approximately 170,000 people and 350 physicians. Its largest city is Bellingham with a population of approximately 68,000 people. Most of the county healthcare system is located in Bellingham, including the county's only hospital, St. Joseph's. That hospital is one of five in the PeaceHealth system, all in small cities in Oregon, Washington, and Alaska. The county's largest medical insurer, Whatcom Medical Bureau, provided approximately 60% of the county's health insurance.

Although some of the health-care providers in the community used practice-management systems, few were connected electronically to the other parties. St. Joseph's Hospital used a sophisticated patient management system (LastWord® by IDX Systems), but physicians were not able to access patient information off-site. To determine patient insurance, eligibility physicians' offices made phone calls to medical insurers and insurance reimbursements were largely paper based. One exception was the county's largest pathology lab, which submitted its insurance claims via magnetic tape. Patient medical records, for the most part, were still paper-based.

Senior executives at both the hospital and the medical bureau realized that a system linking doctors, the hospital, and the insurer would benefit both the patients and the providers. Although many health care communities had discussed the benefits of such a network there were no successful examples to replicate. The hospital and the medical bureau decided to jointly create a system and encourage the medical providers in the area to participate.

The goals of the system were

- To provide a mechanism to allow review of patient medical records (especially in-patient records) and lab results by authorized medical personnel in the county.
- To provide a mechanism for electronic submission of insurance claims.
- To provide a platform for sharing information (e.g., e-mail).
- To provide a place for the collection and access of information about chronic problems (e.g., diabetes).
- To accomplish all of the above within the confines of security and privacy of patient information, as required by Federal and state laws.

Development Process

The idea for the HInet network was first articulated in 1994. Motivated by a State of Washington laws requiring managed care for the entire state, St. Joseph's Hospital and Whatcom Medical Bureau began negotiations on the costs and development of the system. The project had champions in each of the organizations: the Director of IT in the hospital and the Administrator of the Medical Bureau. Both champions were given quite a bit of autonomy at this early stage because the executives of their organizations were not entirely clear as to what the project was or what it would accomplish.

Each of the initiating parties committed about \$1 million dollars to the project which paid for the initial servers, wiring, and physician office equipment. Installation began in 1996, when PCs and printers were installed in 105 physician offices, connecting them with the hospital and medical bureau. To encourage wide physician participation, the hospital and medical bureau paid the full cost of developing, implementing and operating the network for the first 3½ years. On January 1, 2000, the organization became a limited liability corporation whose fees are cost based, and on July 1, 2000, physicians and others began to pay access fees.

Privacy and security requirements in the health care industry are quite strict. At the time of the inception of HInet, general public access to the internet was a new phenomenon and security provisions were quite rudimentary. Rather than attempt to use that technology, the developers of HInet chose to use the facilities of the two major phone carriers in the county. When practicable, each office has a high-speed data connection through frame relay. The more isolated offices connected using modems to dial the servers directly.

A major expense in implementing HInet has been the wiring of individual physician offices. HInet provided the wiring, network connections, desktop PC and software for the physician's offices. HInet contracted out the physical wiring of the offices then its personnel installed the computer and printer, conducted training of the office staff and provided on-going service. HInet operates the e-mail system, provides a help desk, performs hardware and software upgrades, sets up web pages, and manages the LLC's business operation.

The first applications available were Microsoft Exchange E-mail and IDX LastWord® Electronic Medical Record. These allowed the interchange of information, viewing of the hospital's records, and review of those records by the medical bureau.

Evolution of the system

Over time, the applications available to HInet users have increased in three general categories: clinical tools, office tools, and technology services. Clinical tools have expanded beyond LastWord® to include medication conflicts and allergies, prescription submission, online registry of diabetes patients, medical references and journal abstracts, and drug information and condition-specific patient handouts. Office tools are online determination of eligibility and benefits, co-pay requirements, online forms, provider manuals, formulary information, and claims review. Many of the services are embedded in the clinical and office tools. In addition to those, internet access, firewall, and anti-virus protection have been added to the original set which included help desk, training and consulting, installation, and updating.

HInet has is continuously upgrading its network and adopting improved communication and security technologies. Fiber optics now connect many healthcare facilities, especially those in close proximity to the hospital. There is widespread availability of both cable and DSL technology in

the area, and many physician offices and homes are now using VPN to connect to the HInet system. HInet has worked with other local companies to provide wireless connections to its systems when the cost of cabling is too high.

Starting in 2000, “access fees” were charged to the other users. The intent of the fees is to move HInet to a break-even, cost-based model. Fees are based on a formula that allocates cost of operation based on percentage of health care net revenues. For instance, 21% of health care revenues are allocated to physicians, so participating physicians share 21% of the annual cost. Once there is full participation of targeted users, the hospital’s contribution will decline to 41% and the medical bureau’s to 4% (other insurers will participate). The complete allocation is as follows:

Healthcare Provider Category	Percentage
Physician services	21%
Other professional services	6%
Vision products and other medical durables	1%
Drugs and other medical non-durables	10%
Home health care	3%
Nursing home care	9%
Hospital	41%
Laboratory	2%
Private health insurance	7%

Adoption Pattern and Extranet Success

The user base has expanded to include all the categories listed above, except home health care. As of January, 2003, HInet had 1102 PCs connected, with 1550 users at 82 sites. The number of users (logon IDs) is 1550. The staff estimate that they have connected all but four of the physician offices in the county, with very few of those still using dial-up services. A total of 350 health-care providers in Whatcom County, and 22 outside the county, are connected.

The hospital and medical bureau still subsidize about 25% of the operation. The subsidy is necessary because the costs are allocated based on the proportions above, but not all non-physician offices have been connected. The cost to a single physician is quite reasonable: for \$55 per month, a physician receives access to the complete HInet system, including an e-mail account and internet access. Both of the initiating organizations indicated high satisfaction with the system – it provides substantial cost savings for record keeping, care auditing, and communications functions, *and* they feel that the quality of care is enhanced.

Future Directions

HInet was established to support a vision of integrated, patient-centered health care in Whatcom County. It was designed to be a means, not an end, to enable communication not only of medical data but also of care plans and management, eventually including the patient. With this infrastructure in place, the hospital and several community partners (primarily medical practices, clinics, and insurers) submitted a grant proposal to the Robert Wood Johnson Foundation and were awarded a \$1.9 million grant. The purpose of the grant is to “improve the delivery of chronic disease care, starting with diabetes and congestive heart failure.” The grant recipients recognize that they must change interaction patterns among care givers and their patients, and extend the reach of the extranet to include some specific patient access. (For more information on this project, see <http://www.wvpp.org>.)

SUCCESS FACTORS

The case of HInet is interesting in itself; it also can be useful in informing MIS theory and practice in general. In this concluding section, we discuss the process of developing HInet in light of common prescriptions for successful development projects and consider whether the lessons of HInet could be extended to other situations.

Characteristics of the HInet project vis-à-vis other successful projects

HInet provides an excellent example of a successful information system implementation. Whitten, et al. (9, adapted from 2) cite the following factors as important to facilitate the successful implementation of an information system:

- Get the owners and users involved.
- Use a problem-solving approach.
- Establish phases and activities.
- Establish standards.
- Justify systems as capital investments.
- Don't be afraid to cancel or revise scope.
- Divide and conquer.
- Design systems for growth and change.

Many of the characteristics noted above are demonstrated in the HInet project, while some are less evident. The involvement of high-level representatives from each of the sponsoring organizations was a key to the success. Involvement is a two-edged sword, however, and the HInet organization was careful to structure the project so that day-to-day activities were somewhat insulated from organizational politics of either parent company.

The project was clearly divided into phases, commencing with a selected group of physicians and, more recently, including a broader array of healthcare providers. The HInet organization has standards for equipment, connection protocols, and certain software.

In their business plan, the organizers of HInet recognized that the two initiating partners had to make a capital investment in the project that they would not be able to recoup from the provider community. They also considered the alternatives – including cancellation or diminution – should their intended market decline to participate to the extent necessary to yield a comprehensive system.

Other Health Information Networks

Attempts at creating similar health care extranets have been largely unsuccessful. Within Washington state efforts to develop healthcare networks in King County (Seattle metro area) and Skagit County (a small rural county immediately south of Whatcom County) have not been successful. In both cases, there were too many players: more than one hospital and no dominant health insurer. Few, if any, efforts to develop health care networks in other parts of the United States are as comprehensive or have as much physician participation as HInet. For instance, the Utah Health Information Network (<http://www.uhin.com/>) focuses primarily on insurance claims submission. The Partners Community HealthCare Extranet (<http://pchinet.partners.org/internet/>) in the Boston area links a physician network with nine hospitals (3). The project was initiated by two hospitals: Brigham and Women's and Massachusetts General. This extranet does not appear to include the entire community nor the range of care providers that HInet includes.

The HInet model may have more application outside healthcare than within. While the healthcare organizations in a community are often fragmented and sometimes at odds with each other, there are other situations where a set of dominant players could collaborate to provide an extranet that would support their suppliers and customers. For instance, a group of manufacturers who share common suppliers could establish a network allowing efficient ordering and delivery of components. A set of cooperating retailers could do the same for their suppliers, and extend the functionality to their customers as well.

CONCLUSION

The HInet project offers lessons in the development of an extranet based on multiple large and small organizations. Initial agreement of the major players is important. A clear sense of purpose is necessary, and is helped by an evangelical belief in the overall mission of the project. HInet benefited from having a few dedicated persons in each organization that shepherded the project and insulated it from the daily politics of the originating organizations.

A model that assigns responsibility for initial cash flows to the major players allows the system to be put in place and the utility demonstrated before it becomes an expense to the other participants. Once the system was in place, a clear statement of the costs and benefits could be made – with demonstrated success.

The HInet organizational structure and the work it provides are also critical to the success. The mission of the organization is to support the work of the participants – it is not a competitor. It provides technology and expertise that complements the IT staffs of the hospital and medical bureau and is not generally available within the practitioner community.

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