

E-HEALTH INITIATIVES FOR TODAY'S INFORMATION SYSTEMS

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Introduction

Public vs. Private Presence

Presence Convergence

Web Content Management

Web Application Development

Web Portals

Recommendations

Introduction

It's been a good five years since the Internet and its derived technologies (also known as "e" technologies) such as the web, browsers, intranets and portals, appeared in healthcare organizations and had healthcare information technology (IT) departments scrambling to employ Java programmers and website developers. Even amidst the threats of dot-com busts, "e" hype, and HIPAA, strategic and tactical e-health initiatives began to surface. Today, these initiatives are wisely based on healthcare organizations' commitments to use these technologies to support the organizations' missions, operations and objectives. However, they often lack the technical breadth required to meet the organizations' comprehensive and enterprise-wide "e" technology needs.

Public vs. Private Presence

Simple e-health initiatives began with the appearance of healthcare organizations' Internet or "public" websites. Fueled largely by marketing demands and the need for more exposure, brochureware medical content and authoring / publication tools sprung so quickly that it was all but impossible to distinguish between these web products and their vendors.

Around the same time, technically savvy healthcare organizations realized that the potential of the Internet and its derived technologies was not confined to pretty websites. Referring to the "e" technologies as "e-health" technologies, these organizations began to move their initiatives from external, public web presences to internal, private presences. For example, the organizations developed "private" Internets and web pages by introducing simple web browsers for view only access to the healthcare organization's applications. This included the ability to launch an application from a web page. This step did not require altering any existing systems. The viewer had to be browser independent so that the end-users could choose the Internet browser of their choice. If the healthcare organization chose to create a different presentation layer for its existing applications, such as one based on a web standard like HTML or Java, some software development was required. Consequently, the web browser became the primary desktop

interface for access and presentation of data stored within the organizations' host databases.

Soon it was realized that these internal, private Internets, later called intranets, were able to link every employee within an organization via an easy-to-navigate, comprehensive network devoted to internal business operations and to enhance communication. Basic, internal information, such as message boards, employee handbooks, manuals, mail, cafeteria menus, newsletters, directories, and contact lists were recommended for next-stage deployment of e-health initiatives and provided employee end-users the opportunity to become accustomed to the new user interface.

Presence Convergence

Today, healthcare organization public websites and private intranets are evolving from the "static", brochureware and content-based web pages to "dynamic" web pages. Also, their public and private sites are serving as forms of self-service and enterprise-wide development platforms for consumers, employees, business partners, and patients. This means that public sites must allow authorized users, such as registered consumers, to access and update the organization's scheduling system for appointments, or the human resource system for career applications, and purchase wellness services, such as Lamaze classes, with credit cards. This means that private intranet sites must allow authorized users, such as clinicians or patient accounts employees, to access and update the private network's web-based electronic patient medical and financial record systems from anywhere, at any time, and, increasingly, on any device. As such, healthcare organizations are realizing that the same tools used to manage the access and content in public websites and private intranets should be shared. Consequently, organizations' public and private (or external and internal) web presences are converging.

Here is where e-health initiatives must become not only strategic but also comprehensive and enterprise-wide. For example, a powerful, stable infrastructure is required that can handle the transmission of larger amounts of data and can support dynamic applications during times of peak use. Also, continuous management of all the information / content

on both the public website and private intranet is necessary so users can find what they need to complete their transactions or perform their jobs better and the website and intranet information / content can be kept current.

Web Content Management

Publishing only a few static or dynamic pages on an organization's public and private web sites is relatively easy. Organizing groups of people to create the pages, track the revisions, set up the workflows, and scale and secure the websites' frameworks is challenging. The maxim that the right hand must know what the left hand is doing is simplistic because healthcare organizations have multiple hands.

Web content management systems label and track the exponential increase in and variety of information that is placed on a either a public or private web site so that the information can be easily located, modified and reused. In addition, these systems provide crucial document management functions, such as versioning and globalization capabilities for the unstructured web page data. Versioning enables each of the web site's content components to be tracked individually. Then, as the content changes, each iteration of the content can be identified, and the overall web site can be recreated as it existed at any specific point in time. Globalization enables the general look and feel of an organization's public and private web site to be managed centrally, while specific content is managed for local requirements, such as regional healthcare language or procedure differences.

In efforts to insure that site users and visitors continue to return to the sites, these systems also provide customization and personalization capabilities. Customization provides site users and visitors with tools to personally change the look and feel of the site based on their unique roles and preferences, such as links to sports channels or patient lists.

Personalization provides a means to tailor the information that a public or private website displays to the user or visitor, including catalog data, language, screen layout and even search and navigation capabilities. Thus, personalization enables an organization to leverage user/visitor previous habits and known, observed and predictive profile

information to make automatic decisions on about what data to display and how to display it.

Web content and the challenges of managing it are at the heart of an organization's public and private web sites. And a content management infrastructure is imperative to the e-health initiative's success. As such, consolidating document and web content management is an area where the advantages of an application server environment become apparent. The application server approach consolidates information at one centralized location. This is so that information is not duplicated, sometimes badly, at several different locations, devices and departments within the enterprise. In addition, access to content is distributed and the control of it is centralized through the server. Integrating this server into the enterprise's network IT infrastructure then becomes a technical challenge that underlying technologies, such as Extensible Markup Language (XML) and Java 2 Enterprise Edition (J2EE) help meet.

Web Application Development

Once the requisite private intranet and public Internet website are developed and proceeding with their content suitably managed, the strategic e-health initiative should begin leveraging existing data resources and information systems with e-health technologies and include migrating to e-health programming languages. This entails application development and conversion to native web architectures. This requires an understanding of software development within an e-health development environment, including HTML, Java, XML and others. This allows healthcare organizations to work out the kinks in the existing infrastructure, gain experience with applications developed for an e-health environment, and extend the opportunity for end-users to become accustomed to the user interface and processes for their business-based, transaction and context needs.

Web applications are designed to be modular. They are built on distributed n-tier architecture models that are not that different from the architectures employed in client/server systems. The typical architecture incorporates a standard web browser user

interface on the desktop, as discussed, with the middle tiers hosting the web servers and programs that use standard database connectivity interfaces to backend database servers.

Unfortunately, the process of transitioning existing legacy applications to native web architectures requires a large investment in research and development as well as time and money. There are fundamental differences in the architectures in terms of the business logic. In addition, the knowledge curve necessary to become proficient with web n-tier architectures is not slight. On the other hand, the process of transitioning existing client/server applications to native web architectures is not as large an investment. This is because the business logic layers of these architectures often can be reused. The greatest challenges with transitioning existing client/server systems lie in converting the existing presentation layers for applications that have complex user interfaces.

The natural progression of this initiative is to add the interactive functionality to both the private and public web sites, such as the search functions and /or data entry and update capabilities. For example, capabilities could be provided at this time to allow for the searching of a specific patient or a lab test result or the entering of basic, demographic data. Such capabilities allow end-users to act upon the information they have retrieved and reviewed with their web browser.

Unfortunately, many healthcare organizations do not anticipate the extra work required for this evolutionary and requisite phase of the e-health initiative. Often this becomes a point when the organizations' internal website capabilities begin to lag behind their external website capabilities -- or the intranet-based evolution and development become so encompassing that organizations do not reach native web application development for some time.

Web Portals

Another strategic and evolutionary e-health initiative consists of deploying web portals. Portals offer end-users fast, centralized access to Internet services and information found on either public or private websites. In short, a portal is analogous to a private "web",

just as an intranet is analogous to an private Internet. Both are built to address business needs within a secure environment. Access to data and applications contained within the portal is restricted to authorized users. For example, authorized user categories for internal clinical portals can include a role, such as physicians; an individual, such as Terry Brown, MD; a group of individuals, such as all the physicians in the organization; a department, such as the Internal Medicine Department; or a group of departments.

Portals consist of several enabling technologies / services or capabilities. They, too, provide customization at the role and individual level, allowing users to create individual, relevant views. For the public website, this means allowing consumers or business partners to develop their “myYahoo.com”-type of gateway, replete with, for example, personal health record management capabilities. For the private website, this means that the entire enterprise is served with broad-based applications that provide general functionality across the organization.

True portals also provide simplified, automated methods of creating taxonomy or classifying data. In addition, they provide personalization capabilities, and they have at least one search engine.

Typically, all the enabling technologies / services and applications are staged in an application service provider (ASP) environment, providing the services and applications on demand by either internal resources or an external provider. As such, the security and access management, the single-sign on, the document and content management, and the personalization services can be offered in both website venues. Other enabling technologies / services that can be offered include an information aggregation framework, the creation and maintenance of the organization’s data repository (ies), activity tracking, proactive delivery of data, and metadata management.

Recommendations

In today’s healthcare environment a battle is waging for technology dollars, and all projects must be sold internally on the ability to demonstrate a net positive, hard dollar

Return on Investment (RoI). In addition, achieving a business efficiency or soft dollar RoI requires technology projects to increase the value of services through improved usability, lowered support costs per transaction, and inculcated flexibility for future applications and services.

Planned and performed right, these goals and expectations are at the core of the RoI of e-health technology deployments. But, to date, it's been an elusive target.

Like other, traditional technologies and systems, public websites, private intranets, web content management systems and portals have inherent benefits. However, the issues surrounding the successful deployment of the technologies and systems in healthcare provider organizations are complex. For example, technical hurdles that must be overcome in using intranets and web content management systems are found at every point of the compass -- some are obvious and some are hidden. More importantly, the implementations of the business processes that breathe new life into healthcare organizations via these technologies and systems are difficult. Developing portals and using web content management systems take time and commitment – usually without obvious, up front, hard and soft dollar benefits.

Therefore, CIOs must not construct these technologies not from scratch. Instead, they must leverage and integrate these technologies with existing technologies within their enterprises. The Internet's derived technologies must not be considered mere extensions of what is being achieved in today's healthcare information systems. There are differences in how and what can be done between e-health technologies with their platform independence and the organizations' legacy or client/server systems. It is these differences that are becoming driving forces behind developing and implementing strategic, enterprise-wide e-health initiatives.

Also, CIOs must not acquire the e-health enabling technologies / services in pieces. Instead, they must understand the technical range of these services and how they must be integrated as a whole to achieve better integration of all the applications and systems so

that patients, providers, and stakeholders can process clinical, financial and administrative data and information with less effort.

As with any organization's IT program, the development and use of e-health technologies for public or private purposes requires buy-in from all corners of the enterprise. This requires CIOs to understand employee and customer issues that are normally outside their purview while maintaining awareness of traditional IT issues. Therefore, the following questions should be asked:

- Do new interfaces need to be developed for each new application?
- Are users, including consumers, comfortable with the interfaces to internal systems and applications?
- Are internal applications used frequently or do internal users avoid them due to their complexity?
- Is maintenance of application interfaces more costly than it should be?
- Do users demand more personalization and customization of user interfaces and information than IT can cost-effectively deliver?
- Are most applications legacy-based?
- Can they or should they be included in the portal?
- Does the organization need to create different user interfaces and access capabilities for different constituencies or devices?

Last, the general, migratory approach for strategic e-health technology initiatives outlined in this article should be proposed. (Add Figure) The intent of such an approach is to develop an implementation plan that moves from the simple to a more robust e-health framework. This approach helps to ease the transition to these technologies while protecting investments in existing systems. It provides a means for the healthcare industry, its IT developers, and its provider and payor users to mitigate the financial and technical risks of embracing these new and ever-changing technologies. It helps to build a bridge between the e-health technologies and the legacy and client/server systems.

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