

## Moving Forward: Opportunities for Information Technology Advances in the Aging Network

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As the Administration on Aging (AoA) moves toward implementing the Choices for Independence initiative, expanding the Aging and Disability Resource Center (ADRC) initiative nationwide, and partnering more closely with the disability services network and Medicaid long term care systems, this is an opportune time to think strategically about how technology might be used to better serve the needs of older Americans, people with disabilities, family members, as well as the professionals staff and volunteers that compose the aging network.<sup>1</sup> This paper briefly outlines the current use of information technology/management information systems (IT/MIS) in the aging network, presents some experience from the ADRC program, highlights areas of innovation, forecasts future trends in information technology, and recommends how organizations in the aging network can stay abreast of developments in information technology. While this paper primarily uses ADRC examples, the trends and recommendations apply more broadly to the use of IT by the aging network.

### THE CURRENT LANDSCAPE: IT IN THE AGING NETWORK

Traditionally, the AoA has allowed State Units on Aging (SUAs) considerable flexibility in developing programs and services that address local needs and concerns. While an important strength of the aging network, this flexibility has also led to different approaches in the development and management of data and information systems. Decisions about IT and MIS are most often made at the organizational level, or sometimes local level, leading to many differences within regions and states. Great effort has been put into developing information systems that help organizations and grantees to meet reporting requirements, and report aggregate information about programs and services upwards, leading in many cases to siloed IT systems that mirror the funding and program silos in the service system.

Currently, the extent to which organizations in the aging network use technology varies considerably. Some organizations are leading the way, automating old paper-based systems, using specialized software to manage services like information and referral (I&R) and client tracking, integrating multiple information systems, sharing data with partners, and using the Internet to improve consumer access to information and resources. A great deal of information about the aging network and its resources is available online through state Web portals, Area Agency on Aging Web sites, and through interactive searchable I&R databases. Online tools, like the National Council on Aging's *BenefitsCheckUp* have made it possible for consumers to determine their own eligibility for services and benefits.

However, many organizations in the aging network lack the IT capacity and resources to adopt new technologies. Many do not have staff devoted to IT development, or personnel who understand all the various IT options and have time to keep up with trends. As in other human

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<sup>1</sup> The aging network is composed of 56 State Units on Aging (SUA), 655 Area Agencies on Aging (AAA), 233 Tribal and Native organizations, two organizations that serve Native Hawaiians, 29,000 service providers, and thousands of volunteers.

services fields, many organizations in the aging network struggle with out-dated computers, dial-up Internet connections, legacy systems, and paper-based service tools. Many organizations employ multiple IT systems and use multiple reporting systems that cannot communicate with one another.

Under contract with the National Association of State Units on Aging (NASUA), Westat conducted an Aging Information Systems Management Study in 2005, surveying 49 SUAs about their MIS, data collection, and reporting capacity.<sup>2</sup> They identified four key objectives of their study, which indicate areas that the aging network has identified for improvement:

1. Define the common data requirements necessary for policy and management decision making.
2. Eliminate the need for elderly individuals and caregivers to provide identifying information repeatedly to various service providers.
3. Improve data collection methods and systems so as to insure obtaining unduplicated counts of individuals across service providers and geographic locations.
4. Reduce the expense of reporting system fragmentation by taking advantage of network economies of scale for information systems development and management without compromising competition in the marketplace.

Westat found that the use of MIS among SUAs and across the network varies considerably and is currently in a state of flux. Many states are developing new systems, investing in major enhancements to older systems. They found that the most common barriers to IT development and integration reported by SUAs were financial, administrative and technological. A particularly encouraging finding is that political and philosophical barriers were not commonly cited, indicating the willingness and readiness within the network to adopt new technology solutions.

## **EXPERIENCE OF ADRC GRANTEEES**

In 2003, AoA and CMS partnered to launch the Aging and Disability Resource Center initiative, now ongoing in 43 states. ADRCs serve as integrated points of entry into the long-term care system, commonly referred to as “one-stop shops,” and are designed to address many of the frustrations consumers and their families experience when trying to access needed information, services, and supports. Integrated points of entry are aimed at fostering community-wide service systems that reduce consumer confusion and build consumer trust and respect by enhancing individual choice and informed decision-making.

One key requirement of the program is that ADRCs will use a management information system that supports the functions of the program including tracking client intake, needs assessment, care plans, utilization, and costs. The ADRC initiative has brought many opportunities for participating organizations to refine and expand their use of technology. For the most part, ADRCs have targeted their IT/MIS resources toward:

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<sup>2</sup> NASUA's Aging Information Management Systems Study, Westat 2005, brief summary online at: <http://aoa.gov/about/results/Information%20Systems%20Management%20Study.pdf>

- Improving consumers' and family members' access to information and services through professional information and referral database and software systems, dynamic public Web sites, and on-line consumer decision tools.
- Improving service coordination by giving service providers and partners access to information about clients across different levels of government, different organizations and different service systems, through the development of Web-based MIS and data sharing protocols.
- Automating and streamlining client intake, assessment, eligibility determination, and case management processes through the use of mobile technology in the field, integration of IT/MIS across aging, disability and Medicaid service systems, and on-line submission of program applications.

An interesting development that has occurred in the majority of ADRC states is a shift of IT decision making from the local level to the state level. Decisions about IT have historically been locally-driven and even organization-driven in states' long-term care systems. With the ADRC initiative, IT has been elevated such that states are thinking more strategically about the role of technology in their overall long-term care systems reform efforts and about how to coordinate IT development between state and local systems. Furthermore, planning for IT enhancements is more often occurring in coordination with other state agencies and local partners. Many states are designing decentralized programs, managing their ADRCs through partnerships between two or three local level organizations or partnerships of multiple statewide networks of organizations. The capacity to share data efficiently among partners will be critical to the success of these programs.

The ADRC initiative has also uncovered a host of IT/MIS challenges. While the ADRCs have made significant progress in building their technological capacity and infrastructures, they have run into barriers, which we suspect are probably familiar to other human service organizations working on IT/MIS enhancements. These include:

- Insufficient staff time and resources set aside for IT/MIS issues
- Difficulty determining system specifications and selecting an IT/MIS vendor
- Delays due to other project priorities/issues/concerns
- Differences in IT systems and IT capacity across partnering organizations
- Technical issues sharing data across different systems
- Privacy and security concerns involved in sharing data across organizations

## **TECHNOLOGY INNOVATION IN THE AGING NETWORK**

There are notable examples of states and organizations in the network that have embraced technology and used it in innovative ways to make management and delivery of services simpler and more efficient, as well as to improve access to services for consumers and their families. Below we present brief case studies of Arkansas, Minnesota, South Carolina, and Washington, four states that have developed impressive IT systems that cut across different levels of government, agencies, programs, and settings.

**Arkansas'** Web-based case management system includes a comprehensive database, an I&R Contact Record and a Consumer Assessment Referral and Enrollment (CARE) tool. The Contact Record enables I&R staff to record consumer contact and demographic information, referral requests, referral outcomes and follow-up summaries. The CARE Tool, which functions as a single entry point for LTC services, enables multiple agencies to enroll clients and record and track client information using the single system. Case managers are using laptops in the field to fill out and submit level of care assessment forms. They are also using portable printers with scanner capability to copy financial documents for eligibility determinations so that clients no longer have to entrust the originals of their personal documents to a third party for copying. However, in a 12-county rural area of Southwest Arkansas, where Arkansas' ADRC pilot site operates, Internet access is not always available. This was a problem for case managers conducting home visits. To meet this technological challenge, this grantee's IT contractor created a personal computer version of the online application to enable case managers to enter data while in the field, which can later be uploaded into the Web-based system. The application of mobile technology, such as cell phones, notebook computers, and portable printers/scanners has reportedly enhanced communication between case managers and provider agencies, saved time and travel expenses, and sped up the eligibility process for clients.

**Minnesota's** aging and disability services system includes physical access points in different places in the community, an interactive on-line resource database for consumers and providers ([www.MinnesotaHelp.info](http://www.MinnesotaHelp.info)), written materials and toll-free telephone assistance through the Senior Linkage Line and Disability Linkage Line. Access to the network is available in places where people currently seek and receive information such as health clinics, community agencies, hospitals, pharmacies, libraries, senior centers, faith communities, social service and public health offices, and places where they work, in addition to the Web or the telephone. One of the Hennepin County ADRC pilot access points is located in the Brookdale Library. Four computer terminals have been configured to feature aging and disability resources and the ADRC has trained librarians to access long-term care information through MinnesotaHelp and the Linkage Lines. One critical component of their program is the availability of a Web-based "consumer decision" tool that allows consumers to complete an informal assessment to determine their own long-term care needs. Once the user has entered information, a community resource plan can be developed and then saved or printed at the resource center allowing the user to then seek further assistance in implementing the plan either by self directing access to the services, or seeking the services of a long-term care consultant.

**South Carolina** – South Carolina's Lt. Governor's Office on Aging has developed an extensive web-based management information system, SC Access (<http://www.scaccesshelp.org>). SC Access features a searchable database that allows consumers and professional users across the state to find information and resources in their area. Professional users have access to a client tracking and short-term case management system that facilitates follow-up with consumers, tracks their needs, progress, services. This system allows electronic referrals between approved providers, such as between the ADRC and the Medicaid HCBS waiver program staff to facilitate streamlined eligibility determination. In addition, the state is piloting a web-based Medicaid financial application that enables consumers to apply for Medicaid LTC services directly online.

**Washington** – Several innovative uses of information technology can be found in Washington State. Washington's Aging and Disability Services Administration implemented the

Comprehensive Assessment and Reporting Evaluation (CARE) tool in 2003, automating and standardized the assessment process used to determine eligibility for long term care services. All long term care clients and applicants are assessed using the CARE tool, which includes several screening and assessment modules and checklists. The client's eligibility for services is determined based on the result of the assessment, and the tool uses a formula to determine the approved level of services, hours or rate, based on the client's functional abilities and medical need. Washington's Home Care Quality Authority, a state agency tasked with improving the quality of in-home long term care service, developed a worker referral registry that matches worker skills, training, and abilities with consumer needs and preferences. The registry has a Web site ([www.hcqa.wa.gov](http://www.hcqa.wa.gov)) where individual Medicaid service providers can go to find out about jobs in home care and individuals looking for an individual provider can search for a list of qualified individual providers to interview. This tool has been used effectively to increase current and prospective worker knowledge of in-home care job opportunities.

## MOVING FORWARD: FUTURE TRENDS IN INFORMATION TECHNOLOGY

In the next five to seven years in the technology field, we expect some significant new developments and change, as the field has consistently delivered for the past two decades or more. Several of these new developments are likely to provide organizations in the aging network with opportunities for improving their services or internal processes.

Now that Internet access is approaching saturation in the developed world, organizations are rapidly adapting to the capabilities of networked information. This is having a profound impact on the way organizations work, and even on the way they are structured. We are in the midst of a very significant and historic change in the character of organizations, as they move away from the model of classic bureaucracy – the way organizations have been structured for nearly 200 years – and toward the paradigm of the network as an organizing principle of all organizations.

The following are the chief drivers of change that we can expect in the next decade or sooner:

**Broadband speeds up:** Internet connectivity speeds will continue to climb, which in turn will change the content that people can access easily. Broadband has made possible online video sources, voice telephony over the Internet, and the “always on” experience that has led most users to spend considerable time online each week. In the next few years, broadband connections will get much faster, which will make possible new applications and new sources of content.

**Broadband becomes ubiquitous:** In the past few years we have seen an explosion of wireless Internet connectivity, both inside buildings and in public spaces. This has made the Internet mobile; in the past two years, sales of laptop computers have topped those of desktop PCs. Mobile Internet connectivity will continue to expand, with more and faster wireless “hot spots,” wide-area coverage of entire cities, and, eventually, broadband connectivity through cellular telephone networks nationwide. The ability to access information anywhere, anytime, and on-the-go, has a big impact on how organizations work.

**Data sharing and collaboration:** For the past 20 years, computerized data has been largely confined within organizations that collect and use it. The Internet has started to break up this isolation, but there are still many “legacy” computer systems in operation that can't easily share

data with other systems or with people in other organizations. Today there is strong pressure for organizations to share information and even to provide services to consumers in ways that blur the boundaries of organizations. New strategies are emerging that allow incompatible computer systems to share their data, and new business models are appearing that blend the services of multiple organizations together into seamless “one-stop shopping” experiences for consumers. This trend will intensify and affect more organizations in the coming decade. It will become the way to do business for profit-making, nonprofit and public organizations.

**Open standards:** There is already underway a widespread transition from closed, proprietary data standards to open, nonproprietary data standards, which facilitate data sharing and collaboration. Proprietary data standards “lock in” data to specific computer programs that are necessary to access the proprietary data. This has been a common practice in the past, but this is changing, and this change will accelerate because of the need for data exchange, sharing and collaboration. Open data standards, which allow many different programs to share data on an equal basis, are increasingly the best strategy for organizations that need to remain flexible and capable of interactivity with other organizations. Open standards also reduce “vendor lock-in,” in which an organization becomes tied to a single vendor over many years and many system upgrades, simply because its data are in a proprietary format. Adoption of open standards allows an organization to take advantage of many new techniques for streamlining service delivery and business processes, and it enhances the organization’s ability to collaborate with other groups.

These four elements – very high-speed broadband, ubiquitous broadband, data sharing, and open standards – are already having significant impact on the way organizations serve their missions and on the way organizations are structured. This trend will spread throughout the economy in the coming years. It will make possible new ways of doing business, and new services to consumers. Overall, it will break down the silo-like paradigm of individual organizational bureaucracy and begin to move organizations toward a network-like paradigm, a transition that is already well underway among the most advanced private companies.

These elements that are making this change possible will now be covered in more detail.

## **VERY HIGH-SPEED BROADBAND**

Roughly half of all Internet users in the United States use high-speed broadband connections to access the Internet today. Nearly all of these users have either cable or Digital Subscriber Line (DSL) connections, typically through a cable television provider or a local telephone company. These two technologies took hold in the United States because they did not require the complete rewiring of networks already in place, nor the rewiring of American homes. Cable and telephone networks have been incrementally upgraded to provide Internet access, but these upgrades have been built on infrastructure already in place for either television or telephone service.

Now, however, companies are upgrading networks with newer technologies, such as fiber-optic cables, which can support connection speeds tens of times faster than cable or DSL lines. For example, the large telephone company Verizon is beginning to offer fiber-optic service to homes in the U.S. with connection speeds 3 to 5 times faster than its own DSL service, and for roughly

the same price. Other communities are seeing even faster speeds. And in some countries, such as Japan, South Korea, France and others, it is now common to see entry-level connectivity speeds four to ten times faster than what most Americans can buy. Fiber-optic networks, and a few other new technologies, can support very high-speed broadband, the next step in Internet connectivity.

The measure of broadband speed is in digital bits per second, and usually in millions of bits per second. Our first consumer broadband networks operated in the 1-2 million bits per second range. Now most consumers in metropolitan areas can get 3-4 million bits per second, or Mbps. Verizon's new FIOS service offers 15 to 30 Mbps. AT&T's U-Wave service, being tested in a few cities today, supports 6 Mbps. Cable network operators are responding in kind: Time Warner, a major cable network service, has bumped its network to 10 Mbps in a few selected cities.

The prime driver of this trend toward more speed is competition in the video business. Telephone companies want to compete with cable companies in offering television and other video sources as part of their service offerings. They want this new source of revenue in order to make up for losses in the conventional wired telephone market, which has been fractured by many new competing businesses, including mobile telephones and voice-over-IP. Cable companies are responding to this new source of competition in video by increasing their network speeds.

Broadband speeds commonly available today have made possible many new online services, such as YouTube.com for video, or the Apple iTunes store for music and video – each of these online sites has revolutionized the television and music businesses. Broadband also encourages people to stay online for lengthy periods of time; today, young Internet users in the U.S. spend more time online than they do watching television, a fact which first appeared in the past two years. This has led to amazing phenomena such as the explosive growth of MySpace.com, an online “social networking” site that claims over 100 million users worldwide. In short, broadband changes the nature of content, and content drives the demand for faster network connectivity.

With very fast network connectivity available for consumer-level prices, low-budget organizations will be able to do things that have so far only been affordable for the very largest institutions. For example, video chat is a growing phenomenon, made possible by high-speed connections. New Apple Macintosh computers like the iMac and the company's laptops come with built-in cameras that point at the computer user, and which are automatically linked to the Internet by using Apple's free video chat software, iChat. What young people now call video chat used to be called televideoconferencing, and that used to be very expensive for a corporation to afford. Today it's more or less free, as long as there is an available high-speed network connection. Faster connections allow more users to participate in a video chat session at the same time, opening the door to cheap or free video conferences for organizations or groups that are widely dispersed.

Another step that's close to reality is the ability to work in collaborative virtual spaces, meaning the ability to share documents, photos, videos, and data in real-time, while simultaneously talking with and seeing online partners, no matter where they are. Cisco, the large networking company, has labeled this “telepresence,” and sees it as a huge new market for their products.

These two features – voice and video communication, and online work collaboration in real-time – are already changing the way organizations work, and they will continue to do so in the next several years. They obviously help cut down on the cost of business travel. They dramatically increase the communication capabilities between groups within an organization, or between organizations. They will eventually allow new services, such as online, real-time translation using a translator who does not have to be in the same location as the people needing translation. These services allow rich communication between people in a health service organization and a patient or client at home. These techniques expand the opportunities for tele-work, such as working from home, or employing the services of an expert who can be anywhere there's a fast network connection.

Overall, these capabilities change the character of organizations by allowing them to operate as a network of assets and information, instead of solely as a physical place where people come to work. This, in turn, changes the relationships between organizations as well, because it lowers the costs of coalitions, collaborations, partnerships and other strategic alliances. In the private sector, to an increasing degree, companies inter-penetrate each other in complex ways in order to foster profitable partnerships and ways of working together. This approach can become embedded in business relationships that are built on digital communication technologies. Structuring organizations to take advantage of these opportunities will be one of the major sources of change in the coming decade.

## **UBIQUITOUS BROADBAND**

By now, wireless Internet connectivity is familiar to most Americans, especially those who frequent airports, Starbucks cafés, and university campuses. Wireless is now common in businesses, hotels, and even at some outdoor locations, such as parks, highway rest stops and even baseball stadiums. Several U.S. cities are deploying city-wide wireless coverage, including Philadelphia, New Orleans, and San Francisco, among others. We can expect this trend to continue, so that it will be increasingly easy to find wireless Internet access throughout the United States, at least in populated areas.

In the coming few years, wireless availability of Internet connectivity will speed up and become more capable, such as supporting new Voice-over-IP phones, handheld computers, and new devices we haven't yet imagined. There are indications that some companies are exploring the potential for nation-wide wireless services using a new wireless technology called WiMax.

Wireless Internet connectivity obviously fosters mobility for Internet users, but the experience of "cutting the tether" is more significant than such phrases can actually convey. Accessing the Internet is no longer limited to sitting at a desk, at a desktop computer, and this means that using the Internet becomes part of many more daily activities and locations. It means that work-related and non-work activities are blurred. Office spaces can be redesigned in interesting new ways when people are not chained to a desk or a wired network connection. People who work "on the street," or on the road, are just as connected as people in the office. And there is increased demand for access to information via the Internet, which means less dependence on desktop programs and more interactivity through Internet-based applications like a Web browser or an e-mail program. The appearance of online, shared applications that are often available for free – such as Google Docs, or online calendaring programs, or places to share

photos or videos – is a harbinger of things to come. Boxed, commodity software that must be installed on individual computers (and then periodically upgraded) is likely to be replaced, or at least challenged, by online programs that do the same things.

In addition to changing the way the professional world operates, this trend will affect the availability of information for consumers of aging services and their families. There has been some hesitancy among aging network providers to invest too heavily in Web sites and Internet tools because they are not always accessible to the populations they serve, such as low-income individuals, seniors and people with disabilities. However, Internet use among these groups is on the rise. For example, the Iowa ADRC project, which is implementing a largely Web-based program, conducted a survey at the 2005 Iowa State Fair and found that over half of those who responded (63%) used a computer on a daily basis and a notably high proportion of seniors said they would feel comfortable using the Internet to find information about aging and disability services (60%).<sup>3</sup>

## DATA SHARING AND COLLABORATION

In the 1990s we saw data begin to move off of single, isolated computers and towards computers that could be accessed by many users in the same organization, computers that are called “servers” because they “serve” up what people want – databases, e-mail, Web pages or assorted kinds of files. But until recently, data has tended to remain inside the “silo” of an individual organization, shared between users within that organization but not beyond the boundaries of the organization.

The Internet, and especially the Web, started to break down this isolation of data clusters, because it became necessary to display data on the Internet, and that led to strategies to mingle data drawn together from different sources. A familiar example is the typical airline reservation Web site, which allows not only the purchase of airline tickets, but the ability to rent a car or book a hotel room, or even buy theater tickets in the destination city. Those “extra” services aren’t run by the airline; the airline simply provides ways for the car rental companies or hotels to easily hook their services to the airline’s Web site. Likewise, Amazon.com doesn’t enter all the data it displays about the books or music it sells; it just makes it easy for book publishers or music companies to connect their databases to Amazon.com storefront.

A significant problem with sharing data from different sources is that the data is often in a proprietary format that doesn’t match the data format of the source to be shared – in other words, the data are incompatible. This is common in so-called “legacy” systems that use proprietary data formats or programming languages that were abandoned long ago. Those kinds of systems were not designed to interact with users on the Web. And there are many, many of these legacy systems still in use. Moreover, it’s extremely expensive to replace them. Quite often, older legacy systems have been patched and tweaked so often, over so many years, that no one knows how they work anymore; they just do. To try and build a new system from scratch is in many cases exorbitantly expensive and fraught with the risk of failure. There is also

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<sup>3</sup> Seongyeoun Auh and Mack Shelley, “Pre-ADRC Consumers’ Needs Assessment: Summary of 2005 Iowa State Fair Consumer Surveys” Research Institute for Studies and Education, University of Iowa, on behalf of Iowa Department of Elder Affairs.

the problem, and expense, of retraining users who have become accustomed to how a legacy system works within an organization.

Because of these challenges, system designers have come up with an alternative: virtual, or “federated” databases, which are built with software translators that can take data from many different sources, even from old legacy systems, and merge that data into a coherent whole that is useful to someone. This approach doesn’t try to replace the legacy systems with new ones. It doesn’t attempt to retrain users in each organization that may be using a familiar system. It doesn’t try to get everyone to use the same kind of system, in order to eliminate incompatibilities of data. Federated databases are an approach that assumes that the databases to be “federated” are heterogeneous, autonomous, likely incompatible on their own, and probably deeply embedded in the operations of their respective organizations. Instead, the “federated” approach attempts to merge data, for the purposes of sharing and aggregation, but without altering the underlying databases that are being federated.

An example of federated data might be a Regional Health Information Organization, or RHIO, a model that is being implemented throughout the United States. Organizations that collaborate within a RHIO agree to share information, for the purposes of streamlining health care services in a specific geographic region. A patient who visits a primary care physician can have his or her records or test results shared with a clinic or a hospital, or vice versa. Each organization in the RHIO can maintain its own information database, but each database is linked to a virtual, or federated, database, which is in turn shared with other collaborating institutions in the RHIO. The “federated” system may not even be an actual database at all; it could be simply a set of rules for peer-to-peer data exchange, which means that each participant in the RHIO would be sharing its data directly with every other participant, but filtered through a set of business rules and software translators that make each system’s data readable and compatible.

This federated model might also be extended to client services, so that each patient could see some portion of their own medical records online, from a variety of different health care providers, which could be important during travel or an emergency or, as we learned during Hurricanes Katrina and Rita, following a natural disaster or some similar crisis.

There are a variety of techniques and technologies that allow databases to be federated. There are many vendors that offer such services. The subject can, unfortunately, get very technically detailed very quickly.

There are two technological features of importance relevant to database federation: identity management and “single sign-on.” Both of these are likely to become more and more important and commonplace in the next few years.

By now, all Web users are familiar with the tedious task of logging into each Web site where one does business, and often providing the same information requested at every Web site: name, address, phone number, e-mail address, etc. Not coincidentally, this process is often found in health care facilities and social services networks as well; every provider has a separate form to fill out with much of the same information requested.

These Web sites and these health care providers are not using a common identity management system. Wouldn’t it be easier if you could log in once, and have many different Web sites access

your relevant information from an identity service? Or if case managers could simply input some user name and password and get all the information they needed, regardless of the source?

Federated identity management systems have been under discussion and development for quite a few years. In the next five years, we should see the kinds now in use within large corporations (such as Boeing and American Express) start to find their way to smaller organizations and to general public use.

Federated identity management systems are often used with “single sign-on” techniques that allow a user to sign into one system but have access to many other linked, trusted systems. In business, a sales person might sign on once to a corporate network for handling a sale, but then get immediate access to a third-party supplier’s inventory database. Or a doctor’s nurse might sign on once to a RHIO system and get access to many different databases that would otherwise require individual logins.

There are emerging standards for federated identity management, particularly the Security Assertion Markup Language (SAML). This is an open standard that identifies a user as a person or a machine, and it identifies what that person or machine can access. It has been endorsed by the largest industry group for identity management, the Liberty Alliance. SAML 2.0 was announced in March 2005, and it is supported by major vendors such as IBM, Oracle and Sun Microsystems.

In summary, we are on the leading edge of a new wave of technologies for sharing information between organizations, with security and identity management. Federated database techniques allow individual organizations to determine their own system needs, and to retain responsibility for their data and its quality, while giving them the opportunity to share data with trusted partners. Identity management systems with single sign-on provide security while easing or eliminating the redundant and aggravating chore of entering the same information into many different systems, or remembering numerous logins and passwords.

## **OPEN DATA STANDARDS**

The need to share information between many different computer systems has led to a need for common data formats and a way for computers to “understand” what they are being asked to share. For example, if one database calls a record a “client” and another database calls a record a “customer,” there is a need for some technique that “tells” these two databases that these two names can be regarded as the same thing when the database information is combined or shared. One way to do this is to develop standards for how different data elements are named and recorded. Another way to do this is to use an intermediary program that “knows” that “client” and “customer” refer to the same thing.

Today, most system developers are focused on building interoperability and data sharing into their programs from the start, or else on programming “translator” applications that can grab data from incompatible systems and merge it into something coherent. The accepted tool for doing either of these tasks today is the open data standard called XML, or Extensible Markup Language.

XML is often compared to the more familiar Hypertext Markup Language, or HTML, which is used to build Web pages. HTML is a page-description language: it simply tells a Web browser how to display text and where to put images and other page elements. If some text string is meant to be bold-faced, for example, the HTML code is: `<b>text string</b>`.

XML, on the other hand, is a semantic description language. It tells a computer what things are, rather than how they should look. If a Web page includes a book title, for example, the XML code might be: `<title>Little Women</title>`. In this case, everything between the two XML tags is a title, which is information that can be used in computer processing. XML tags can be complex and nested groups of information labels, called "ontologies," which allow for very sophisticated processing of the information based on its *meaning*.

The power of XML comes when there is a consensus XML standard for sharing certain kinds of information. For example, the widely used data standard called Rich Site Syndication, or RSS, is now used by blogs, online newspapers, Web sites, podcast sites, eBay, etc. RSS is powerful because it is an agreed-upon XML vocabulary for displaying a limited range of data elements, which can then be used in RSS reader programs, in other Web pages, or even displayed on mobile phones. Another powerful feature of XML or its derivatives, like RSS, is that, because it is an open standard which is not owned by any company, it can be built into any computer application or data source without paying royalties or securing the permission of a copyright holder.

Today, and increasingly in the near-term future, XML will be the way we build data sources so that they can be shared and manipulated in nearly unlimited ways. Standards groups from a huge variety of different disciplines are hard at work creating XML-based standards for their particular domains of information. For example, in the healthcare field, the most comprehensive XML data standard for healthcare information is called Health Level 7 (HL7), which provides healthcare system developers a standardized vocabulary for data element description, representation of complex interrelationships between data elements, a uniform set of data models, and other features. This allows compatibility between electronic health record systems, as well as the sharing of clinical data. HL7 is managed by a nonprofit organization in Ann Arbor, Michigan. Sub-specialty XML standards groups can be found for laboratory data, radiological data, pathology, and many other fields.

XML is also the basis for a new "toolbox" for Web developers. Using an array of XML-based standards for sharing information and programs on different computers, Web developers can begin to integrate "services" on the Web from a wide variety of partners. Automobile manufacturers, for example, can deal with tens of thousands of subcontractors and parts suppliers through a single Web-based information portal. Travel sites like Orbitz or Travelocity can search for deals on airline tickets or car rentals. Google uses powerful XML-based services that let millions of people display Google ads on their own individual Web sites, and then get a share of Google's ad revenue.

What all this means for organizations and groups of organizations is that XML and its capabilities should be part of their technology planning and development process. There are two reasons for this: one is that XML is already the basis for new information-sharing practices, especially in large-scale, distributed enterprise applications such as a national electronic health

record system. The second reason is that XML is increasingly used for services that are often available for free, or for lower cost, on the Internet, and it's financially smart for organizations to know how to save money by using things that are already developed and adaptable. For example, at this point it's much easier and cheaper to use Google Maps, integrated into an organization's Web pages, than to develop a new, unique mapping application. It's easier and cheaper to take advantage of the power of RSS, rather than to duplicate what RSS can already do. Understanding what XML can do, how it can help organizations collaborate and share, as well as save money, will be critical knowledge for managers in the next five years and longer.

## **CHALLENGES, POTENTIAL PITFALLS, POSSIBLE APPROACHES**

A not-so-well-kept secret in the computer industry is that many software projects fail, and there are a fair number of spectacular, budget-busting failures that have ruined careers and organizations. Software projects are different than most other projects in which things are built, because they sometimes produce absolutely nothing of value to their sponsors, even after absorbing a lot of money and time. For this reason it's reasonable to be wary about the claims of vendors and technology boosters. Even with the amazing things we see computers doing today, there are always examples of colossal and embarrassing failures.

There is an entire field of specialty in keeping a software project on time and on budget, and it's important for organization managers to know something about this field, in order to hold a vendor accountable or to find a vendor with reasonable and expert terms of service. A good track record of past performance is often the best measure of likely success. Success in the same domain of service is also a good sign. A vendor that emphasizes the importance of planning and understanding a task to be computerized is likely to be more successful than a vendor who emphasizes the technology. How many personnel are dedicated to a project is often a good indicator too, because, contrary to popular belief, good software is usually the product of a very small team of competent people. Researchers have demonstrated that the more people involved in a software project the more likely it is to fail or to extend far past its deadline.

The most important element in whether or not a software project succeeds is whether or not the client has a good understanding of what they want to do, and can communicate this effectively to system developers. Getting the functional model of a software project right is often 80% of the work. Using flow-charts and business process modeling techniques can help clarify this portion of the task.

There are advantages to the techniques described earlier, database federation and using open standards such as XML. Database federation can proceed on an incremental basis, as opposed to the approach that requires a complete system redesign and redeployment. An organization can start with a limited set of goals for federation, and then, if these are met, proceed to add more information or more partners to the federated project. The approach also allows the partner organizations to keep their own systems, which removes a huge barrier to success. If the federated project doesn't work or has problems, their individual systems are not affected.

Likewise, XML can be used on an incremental basis, beginning with easy and well-tested implementations such as RSS or the shared-calendaring data format known as iCal. As these are successful, more sophisticated uses of XML can be explored. The easy uses of RSS or iCal can

open the door to how powerful data-sharing can be, and it can start the process of building partnerships and collaborations across organizations. At the same time, organizations can begin to educate their clients about what is possible with simple Internet interfaces.

## **STEPS TO TAKE ADVANTAGE OF FUTURE TRENDS IN INFORMATION TECHNOLOGY**

In considering taking advantage of recent and anticipated information technology development, it becomes critical for organizations in the aging network to carefully consider the use of these developments in the context of their business processes – the day-to-day functions that they need to accomplish. IT/MIS should support and make easier these processes, but this will be possible only if the business processes are well-defined prior to trying to apply new technology to them. A forthcoming paper will explicitly address considering the business process aspects in IT/MIS development.

The following are future imperatives for organizations that want to stay abreast of developments in information technology:

1. Deploy as fast an Internet connection as the organization can afford, and be on the lookout for improvements in speed and capacity.
2. Deploy wireless connectivity throughout your organizational premises, while ensuring network security. It is also important to integrate mobile, wireless technologies into the organization's resources, so that personnel can be supported with information resources "anytime, anywhere." This includes the use of laptop and handheld computers, mobile telephones, digital cameras, and portable printers and scanners, among other devices.
3. Start a conversation with your partners about data federation and sharing of data, even if you only begin with easy implementations of information like sharing calendars or using Rich Site Syndication (RSS), which can be used to pull information from one Web site and display it on another site automatically. Understand that this needs to be an ongoing conversation that should get more sophisticated and more comprehensive, until your organizations are operating more like a single entity.
4. Find a way to learn about the power of open standards like XML and its derivatives. Think about a way to either adapt or create an XML-based vocabulary and data standard for your own organizational context, your own field of information, if one doesn't exist already. NASUA, AoA, and the Alliance for Information and Referral Services are working now to develop an I&R taxonomy specifically for ADRCs. This effort could be a model for a future discussion among aging service providers, programmers, vendors, and IT administrators about creating a set of XML standards for the aging field.
5. Learn something about how to manage software projects, if only to be able to judge the claims and performance of vendors. A good source of assistance are the national organizations set up to provide technical advice to nonprofit organizations, such as TechSoup (<http://www.techsoup.org>) or NPower (<http://www.npower.org>).

TechSoup offers a useful guide, "Selecting the Right Technology Vendor" available at:

(<http://techsoup.org/binaries/Files/Selecting%20the%20Right%20Technology%20Vendor.pdf>).

6. Learn how to "track" the "big picture" of trends in information technology, or find someone who can help. For the next five to ten years, the big picture will be how to adapt organizations to the power of the network. Keeping this goal in mind, figure out ways for your organization to maneuver through the technology forest without getting distracted by the trees.

## *Additional Resources on Information Technology for the Aging Network*

### **Broadband**

*Essential Guide to Telecommunications* (4th Edition), by Annabel Z. Dodd, Prentice Hall, 2005.

*Broadband Primer*, Indiana Office of Utility Consumer Counselor, June 2006, at <http://www.in.gov/oucc/pdf/BroadbandPrimer.pdf>.

BroadbandReports.com, at <http://www.dslreports.com/>.

Benton Foundation Headlines, at <http://www.benton.org/>.

Broadband Blog, at [http://news.com.com/2060-10785\\_3-0.html](http://news.com.com/2060-10785_3-0.html).

### **Wireless**

*Going Wi-Fi: A Practical Guide to Planning and Building an 802.11 Network*, by Janice Reynolds, CMP, 2003.

*802.11 Wireless Networks: The Definitive Guide*, Second Edition, by Matthew Gast, O'Reilly, 2005.

WiFi Net News, at <http://wifinetnews.com/>.

Muni Wireless Blog, the Voice of Public Broadband, at <http://www.muniwireless.com/>.

### **Data sharing and collaboration**

*Databases Demystified*, by Andrew Opper, McGraw-Hill Osborne Media, 2004.

*Blissful Data: Wisdom and Strategies for Providing Meaningful, Useful, and Accessible Data for All Employees*, by Margaret Y. Chu, American Management Association, 2003.

Databases, Resource Guide from TechSoup.org, at <http://www.techsoup.org/learningcenter/databases>

"The Power of Many: Collaboration for Common Goal," TechSoup.org, at <http://www.techsoup.org/learningcenter/databases/page5222.cfm>.

"Federated Databases and Systems: A Tutorial on Their Data Sharing," by David K. Hsiao, *VLDB Journal*, 1991, at <http://www.vldb.org/journal/VLDBJ1/P127.pdf>

### **Open Standards, XML and Web Services**

"Open Standards," Wikipedia, at [http://en.wikipedia.org/wiki/Open\\_standard](http://en.wikipedia.org/wiki/Open_standard).

"Open Standards: Principles and Practice," by Bruce Perens, at <http://perens.com/OpenStandards/Definition.html>.

"Choosing and Using Open Source Software: A Primer for Nonprofits," by Michelle Murrain, Nonprofit Open Source Initiative, 2004, at <http://www.nosi.net/system/files/NOSIPrimer.pdf>.

"XML in 10 Points," the World-Wide Web Consortium, at <http://www.w3.org/XML/1999/XML-in-10-points>.

"XML - An opportunity for small and medium-sized enterprises," by Marcus Herm, at <http://www.softwareag.com/xml/library/herm.htm>.

"What Is Web 2.0? Design Patterns and Business Models for the Next Generation of Software," by Tim O'Reilly, 2005, at <http://www.oreillynet.com/lpt/a/6228>.

"Web Services Basics," by Anne Thomas Manes, 2003, at <http://www.awprofessional.com/content/images/0321185773/samplechapter/manesch02.pdf>.

*Executive's Guide to Web Services*, by Eric A. Marks (Author), Mark J. Werrell, Wiley, 2003.

## About the Authors

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