

## USE OF AN INTRANET TO MANAGE A TELEPHONE SURVEY

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**Introduction** Internet-based technologies in recent years have been the focus of much discussion for their potential to offer an alternative mode of data collection (Clayton and Werking, 1995). Less explored has been the use of internet-based technologies for managing complex data collections. In this paper, we describe the experience of introducing such technologies for managing the National Immunization Survey (NIS).

Sponsored by the National Immunization Program and the National Center for Health Statistics (both of the Centers for Disease Control and Prevention), the NIS has two main components (Ezzati-Rice et al., 1995). One, the NIS is a random-digit dial (RDD) telephone survey of households having age-eligible children. Two, the study includes a provider record check study that validates self-report data on children for whom consent has been acquired during the RDD interview. The provider record check study also collects facility-level information. Rolling four-quarter estimates are provided of vaccination coverage for all major antigens for each of the 78 Immunization Action Plan areas (50 states and 28 metropolitan areas). Households having children between the ages of 19 and 35 months are eligible. Data collection has been continuous since 1994.

Because the household eligibility rate is relatively low (less than 5%), the NIS screens a large number of households to generate approximately 8,600 completed interviews per quarter. As a result, the NIS requires a very large staff of interviewers and numerous supervisors.

After describing the functionality of intranet technology, we shall discuss the motivation for establishing the NIS Intranet, some development considerations, the key features of the intranet, and shall make a few observations on potential impediments to intranet development and implementation.

**The Intranet as a Private Internet** An increasingly common corporate tool for organizing access to proprietary databases, an intranet is an internal web site

that runs entirely on a private local or wide area computing network. Unlike the usual connection to the internet by analog phone lines or dedicated telecommunications links, an intranet relies on corporate data networks. This means that data transfer rates tend to be far faster on an intranet than on a typical internet connection.

Overall, an intranet site has functionality similar to an internet site. Users access an intranet by starting a web browser (such as Microsoft's Internet Explorer or Netscape Navigator) on their desktop computer or shared kiosk-style terminal. Intranet users access the site by typing in the address or using a "bookmark" that stores the intranet's site address for repeated use. Intranets that are exposed to the internet are called "extranets." These are developed, for example, by corporations interested in vertically integrating suppliers into the manufacturing process. By this means, corporate partners can automate the placement and fulfillment of orders across company boundaries (Bernard, 1998; Bernard, 1997).

Individuals' access to the intranet can be managed by several means. Without a security system in place, any user on the computing network can access any document on an intranet. For some intranets, this is not a concern, while for others, security is a key issue since the corporate intranet is used for managing personnel and financial information. For extranets, a "firewall" is used to prevent unauthorized access to the private network through the internet.

Like the internet itself, an intranet is a powerful tool for data dissemination, reporting, publishing training and corporate policy manuals, distributing software, organizing discussion groups, and otherwise managing the intellectual capital of a work group. The ability to move quickly from document to document—even from intranet to intranet—tends to encourage the use of information. Intranet technology is often heralded for increasing productivity by allowing information seekers to circumvent bureaucratic hierarchies that can impede the flow of information (Schulmeyer, 1997).

**Motivation for Establishing the NIS Intranet** The NIS developed an intranet as a project management tool and to encourage communication and team work by

providing an accessible platform for sharing any kind of information across geographically distributed work settings. Specifically, the goals were as follows:

- To facilitate communication among Abt and CDC management staff (which combined are distributed across six work sites);
- To make easily accessible the study's archive of production and quality assurance reports, deliverables, training materials, papers and publications, policies, and descriptions and user manuals of key systems, and, in the process, to overcome the limitations of the short "shelf life" of hard copy documents;
- To enhance the NIS Quality Assurance Program by empowering phone center supervisors and managers with rapid access to a wide range of dynamically created reports.

**The Process of Intranet Development** Prior to any programming, the NIS management team drafted a systems requirements document and budget. With limited prior experience in web programming, a senior project manager and research analyst who serves as the NIS webmaster designed the intranet and developed its content.

The systems requirement plan specified that maintenance of the intranet should require minimal effort. Automation routines were developed so that key production reports and databases could be posted daily to the NIS Intranet with little effort. In this manner, the key content of the NIS Intranet could be kept current at a low cost.

Early in the development process, the strategic decision was made to place the highest priority in using the intranet to make accessible the study's extensive set of daily and weekly production reports and to provide dynamic access to the study's quality assurance databases. These decisions were made on the basis of eliminating the need for hard copy distribution of many reports and to enhance the effectiveness of telephone supervisors and quality assurance staff by providing timely and ready access to information related to interviewers' performance.

Our choice of intranet development tools was based on product evaluations and cost-effectiveness considerations. We standardized on Microsoft's web survey products (NT Server 4.0, Internet Information Server, and Microsoft FrontPage). Adobe Acrobat was distributed to task leaders so that word processing and spreadsheet documents could be quickly converted to

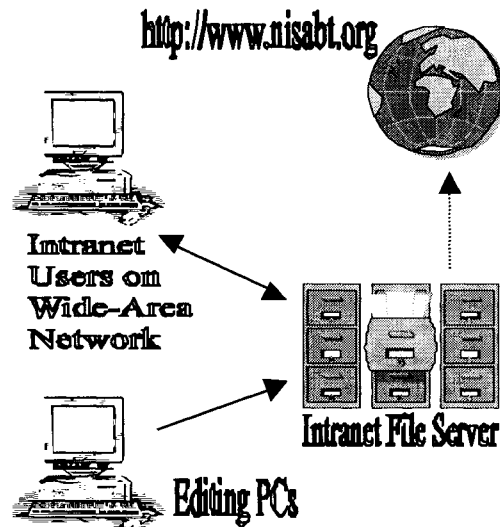
Adobe's proprietary Portable Document Format for posting to the intranet.

As the development process moved forward, we e-mailed informational updates to the base of prospective intranet users. We requested feedback and suggestions for design improvement and new content. The e-mailed updates (which continue) also reminded staff how to access the intranet and educated staff on the intranet's features. We also conducted a seminar on the intranet and provided one-on-one training upon request.

**Key Features of the NIS Intranet** The NIS Intranet has become the project's "information center" by delivering information on demand, guaranteeing that the information is the most up-to-date and accurate information available, and making information sharing seamless across project staff. All project staff have access to the intranet through the wide-area network, while a "mirror" of the key contents of the intranet is available on a password-protected Wide World Web site for access by CDC staff and off-site Abt staff.

As shown in Figure 1, a single file server dedicated to the NIS Intranet contains all intranet files. Certain task leaders on the project have full editing rights for posting content to the intranet, while all Abt staff having access to the corporate wide area network have desktop access to the intranet. The NIS Intranet contains a hyperlink to the corporate intranet for inter-project knowledge management.

Figure 1. NIS Intranet Overall Design

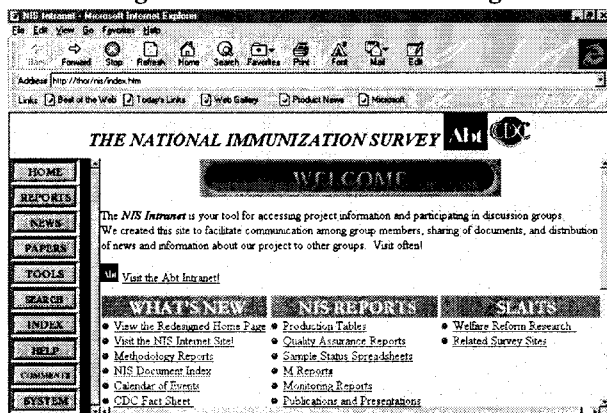


From the outset, we determined that it is crucial for all telephone supervisors to have desktop access to the intranet, reflecting the philosophy of decentralized empowerment embodied in the intranet's mission

statement. We believed that it was very important that these supervisors should use on a daily basis the quality assurance reports available on the NIS Intranet. These dynamically created reports represent a wide assortment of tools for the management of a large number of interviewers. Since each supervisor has desktop access to the NIS Intranet, the study's quality assurance reports are used to inform feedback, monitoring, and performance review meetings with interviewers.

The home page of the NIS Intranet is shown in Figure 2. A three-pane frame design is used so that the left navigation toolbar and identifying banner are always displayed. From the home page, staff can quickly navigate to the major areas of the intranet or can go directly to specific reports of interest.

**Figure 2. NIS Intranet Home Page**



**Enabling Access to Project Databases** The NIS Intranet uses Microsoft Active Server Pages for enabling access to project databases (for more on Active Server Pages, see Cluts, 1997; Microsoft, 1996). In many ways, the Active Server Pages are the heart of the NIS Intranet by "bringing the databases to life" (for a business justification on kind of technology, see Mogavero, 1996). The technology enables "push button" capability for generating real-time quality assurance reports. That is, at the click of a button, intranet users run queries against the project's various databases to generate reports. Since the databases are continuously updated, the reporting process is highly dynamic. Telephone supervisors and quality assurance coordinators, in particular, have found it useful to rely on reports generated by Active Server Pages because they are trusted to be current and comprehensive.

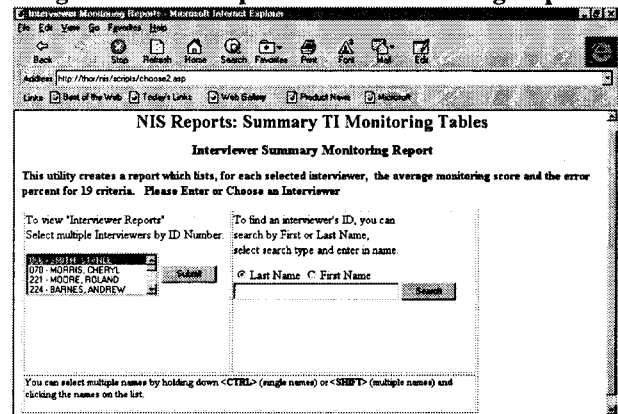
Active Server Pages are used for reporting interviewers' obtained eligibility, refusal, overall completion, and other rates specific to the needs of the NIS. The pages give intranet users the option to view a compiled report for a specific interviewer, or tabulations of results

sorted by interviewers' last names or by numerical ranking. A menu allows users to select from a variety of such reports.

The NIS Intranet and the use of Active Server Pages resolved the issue of how to make available in a user-friendly format the data in the project's interviewer monitoring database. This database contains supervisors' coding of monitored interviewers. As each monitoring session is coded on nineteen quality assurance criteria, the monitoring database represents a considerable store of information on the quality of work performed by each interviewer. The NIS Intranet and Active Server Pages formed a solution for displaying the summary results of the monitoring database in a user-friendly fashion and eliminated the distribution of hard-copy reports which had a shelf life of a week or less. The result has been increased reliance on monitoring data for identifying the weaknesses and strengths of interviewers and the enhancement of the quality of feedback given to interviewers.

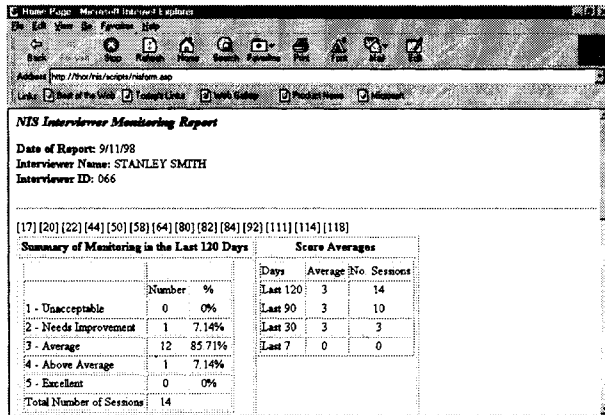
Because of the relatively large number of interviewers on the NIS, a search engine was developed so that intranet users can quickly identify interviewers for whom a monitoring report is to be requested, as shown in Figure 3.

**Figure 3. Look-Up Table for Monitoring Reports**



After identifying the interviewer in the pick list or searching by name, the user of the NIS Intranet then submits a query for server-side processing of the monitoring data, resulting in the presentation of a preformatted quality assurance report. The first part of the output, shown below in Figure 4, presents summary statistics on the overall scores awarded to the specified interviewer during the preceding 120 days and other time intervals. The rest of the report presents the calculated error rates for each of the nineteen evaluation criteria used to grade the quality of work observed during each NIS monitoring session.

**Figure 4. Summary Output for Monitoring Report**



The development of Active Server Pages has been done in an environment of collaboration with the intranet's end users. As a result, we continue to identify additional Active Server Pages and develop user-friendly menus for generating quality assurance and production reports. While in the beginning we required the help of a programmer to develop Active Server Pages, we used the tools at Microsoft's SiteBuilder and other web sites to train our research analyst to develop them independently.

**Critical Ingredients: Intranet Development** Listed below are some of the critical areas for intranet development that are identifiable from the NIS experience.

*Senior Corporate Management Commitment and Understanding:* It is crucial that senior corporate management not only display commitment to intranet development but also understand how it can change the work process by encouraging communication and by expediting the development cycle of products. The intranet can suffer if senior management are overly wary of the potential for abuse by the open dissemination of reports and impose restrictions on access that discourage the use of the intranet. For the NIS, the drafting of the systems requirement document—and the discussion it engendered among management—helped to consolidate corporate support for the initiative.

*Security Issues:* The NIS Intranet addressed the security threat of the internet by choosing *not* to make the NIS intranet available via the internet. Instead, a mirror of key contents of the NIS Intranet is available on a World Wide Web site protected by username/password authentication. Another approach would have been, as noted, to create a firewall that would have enabled users not having access to the

computing network (LAN/WAN) to gain access to the intranet through a standard internet connection.

There are also security issues in regards to limiting access to the intranet among those persons with access to the LAN or WAN. Microsoft NT Server's Internet Information Server and other programs such as HTACCESS provide username/password authentication to prevent unauthorized access to specific files or directories (Microsoft, 1996). These programs, however, require more maintenance by a computing specialist than may be readily available. We place sensitive interviewer-level data in private directories inaccessible to all but the webmaster and those with an immediate need to know.

*Integration with Everyday Work Flow:* Probably the most difficult aspect is integrating the intranet into existing work flows. Developing the "intranet habit" runs counter to the work habits of many senior managers and production supervisors alike who reflexively turn to e-mail and hard copy for information storage and retrieval. Designing an intranet site that is easy to use, intranet training, and educating staff on the functions of the intranet can help to overcome this problem.

*Providing High Quality Content Available Only on the Intranet:* Our strategy for inculcating the "intranet habit" is based on attracting users to high quality content that is available only on the intranet. Examples include the Active Server Pages for interviewer-level reports, the project's data collection diary, and data collection policies and procedures.

*Availability of Computing Support:* Abt found it relatively easy to establish the infrastructure for the NIS Intranet because most desktop computers already were configured to connect to our intranet server (through TCP/IP) and because web browsing software was preinstalled on most computers. However, there were situations where desktop computers were not configured appropriately that required support from network computing specialists across the four work sites. Early coordination with the networking group was important to assure later support when needed.

**Conclusions** The National Immunization Survey was designed and implemented to encourage communication and teamwork. Corporate support for the intranet and previous investments in the Abt computing environment facilitated the development of the NIS intranet. The intranet has proven to be a useful tool, in particular, for disseminating quality assurance reports to telephone supervisors and others who work directly with interviewing staff. The intranet enabled

real-time access to the project's quality assurance and production databases. Other tools are at the planning stage, such as providing on-line training packages and discussion groups through the intranet.

For successful development of an intranet, we stress the importance of corporate commitment and, even more, the appreciation of the intranet's capacity for changing work processes. Similar to the business model based on internet technology, the corporate intranet represents a challenge and opportunity for survey managers to empower all decision makers with timely and relevant information.

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