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An Innovative Approach to Large Scale Community Health Program Monitoring and Evaluation through the Internet: PROMS and PMDES

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Abstract

Although internet technology and management information systems are frequently used in health promotion activities and health assessment in individual worksite, school, or clinic settings, their use in community settings for program monitoring and evaluation is much less common. The purpose of this paper is to examine the process and technology used in two internet-based applications (PROMS and PMDES) intended for monitoring, data collection, and evaluation of a large scale health promotion programs in New York State. Using the fundamental concepts of program evaluation, we developed a comprehensive Web-based application that used MS Windows Server, MS SQL Server, .NET framework, and Crystal Reports. The end product enables users across New York State to collect and report standardized data, retrieve information, and generate a variety of reports. Program managers in the state capital Albany can monitor individual projects' progress on a regular basis and generate statewide or project specific reports. This initiative has already proven to be user friendly, cost effective, fast, and accurate.

Keywords:

program evaluation, health promotion, internet

Introduction

According to the Centers for Disease Control, program evaluation involves useful, ethical, feasible, and accurate procedures that help improve and account for public health actions [1]. Furthermore, through successful evaluation procedures, health program managers can make decisions on: the best use of time and resources, determining if the program is achieving its stated goals, demonstrating the effectiveness of a program to funders and other stakeholder groups [2]. In the last few decades, program evaluation has gained prominent position as a key component of public health research. Social programs have become increasingly complex with multiple intervention sites, multiple intervention levels, and multiple audiences [2, 3]. In response, program evaluation theory, intervention designs, and methods have improved to reflect these changes. Government Performance and Results Act (GPRA) has also contributed to the proliferation of community health program evaluation efforts with its requirement that agencies set performance targets and track their progress against these benchmarks. It is, however, surprising that despite all the importance that computer and internet technology play in the 21st century, examples of internet based data collection tools and monitoring systems are only occasionally mentioned in the evaluation of community health programs [4].

At its best, the use of technology by large scale community health programs for data collection consists of electronic compilation of data on individual PCs, either in a template in Excel, Access, or in another data base program. Each project site then transfers their data to a central administration office through e-mail.

This process is not only inefficient and time consuming, but also generates less than reliable and consistent data. Individual projects that submit the data ordinarily do not have access to the data submitted by other projects or have the ability to retrieve and edit their own data. Any modifications or updates to the system would require dissemination of new software and training.

In contract with the New York State Department of Health, we developed two internet-based applications (PROMS and PMDES) that streamlined program monitoring, data collection, and report generation activities in sites across New York State.

STEPS to a Healthier New York Program

Steps to a Healthier US is an initiative from the U.S. Department of Health and Human Services (HHS) to implement chronic disease prevention efforts with the goal of helping Americans live longer, better, and healthier lives. Through this 5-year program, states, cities, and native tribes receive funds to implement chronic disease prevention efforts. The focus areas are diabetes, overweight, obesity, and asthma and address three related risk factors—physical inactivity, poor nutrition, and tobacco use [5]. In New York State 13 projects in four counties received funding. Program administrators are required by the U.S. Federal Government to monitor, evaluate, and report on the progress of projects.

NYS Healthy Heart Program

In 2004, New York State Department of Health released "Cardiovascular Health in New York State: A Plan for 2004 — 2010." "This plan has 19 objectives to promote healthier behaviors, further enhance the quality of care and reduce known disease risks. It promotes interventions in four sectors: communities, schools, worksites, and health care settings. Funds are provided to local communities to conduct physical activity and nutrition interventions in schools, worksites and the community, and to ensure people receive appropriate health care for risk factors for cardiovascular disease" [6]. Currently, 27 sites in four counties administer projects. Program administrators are required by New York State to monitor, evaluate, and report on the progress of projects.

Methods

The need for a new system of data collection for evaluation purposes for both projects was clear. The existing paper and a flat, Access data base driven systems and reporting tools were not efficient, effective, or useful. Project managers were frustrated with the rigidity of the system and the lengthy narratives they had to provide; the administrators at the central office were unhappy about the quality of the data. They were spending inordinate amounts of time integrating data from many sites into a single data base and then extracting data for their reports. Satisfied that an internet-based system could fill an important void, the state level administrators provided the funding to the team at Binghamton University to develop the new system.

The technical team consisted of two software engineers and one system administrator. The project lead was a faculty member in the Decker School of Nursing.

To ensure that the monitoring and data collection system could capture the breadth and depth of local intervention projects, all stakeholders provided feedback on content through program managers at the central office. Hardware and software decisions were made on the basis of recommendations from the computing services of Binghamton University and the expertise of the technical team, resulting in SQL server running on Microsoft Windows Server.

For both systems, the initial prototype went through a number of transformations over a two year period. As the program managers and local project managers realized the possibilities with the systems, many components and additional functionalities were added.

System specifications

The system consists of server and client sides. The first layer of the server side is the operating system. We used Microsoft Windows Server. We deployed a back-up Windows Server that has all functionalities of the main server. In case the server ever goes down, the back-up would immediately take the role of the main server. The second layer is the data base. For the data base we used Microsoft SQL Server and designed a relational data base which contains many tables and view. For example, the PMDES consists of 63 tables, 24 views and over 200 fields. The use of SQL Server provided us additional features such as an easy back-up process, replication, and export of data into other applications such as PDF, Access and Excel.

The third layer of the server side is the application layer. This layer consists of .net framework and Crystal Reports. The .net framework includes web forms, xml, ADO.NET, and ASP.NET. ASP.Net provides the commands to show various text, labels, pictures, checkboxes, radio buttons, tables, and graphics in web forms. Behind all these components, we used C Sharp (C #) to connect all applications and to maintain system functionality.

For the report functions of the system, we used C Sharp and xml to extract data. The data was then passed to Crystal Reports for the end user reports. Finally, the clients access the system through the internet. A graphic representation of the technical specifications of the system is in Figure 1.

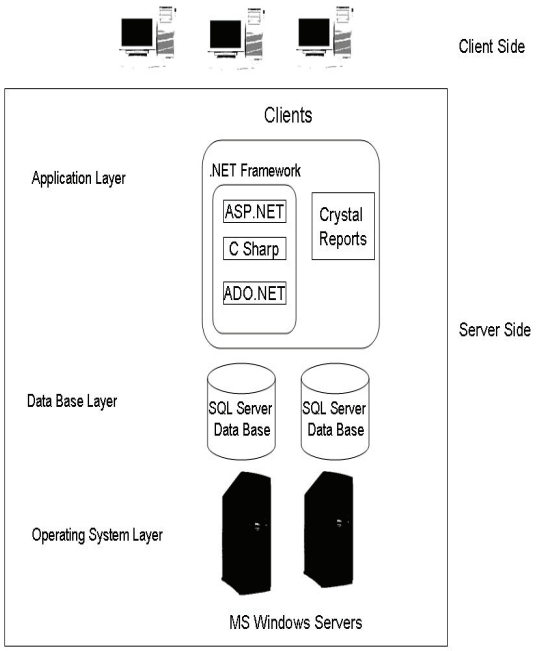

Figure 1 – Technical specifications of the system

Results

User interface

Prior to the full launch of the system, a manual was prepared and on-site training sessions were conducted with clients. The manual was also included on the web page.

Users log-on to the secure web site with their pre-assigned user id's and passwords. All screens following the log-on process are customized for the specific user and project. Since there are different types of roles among the clients, the system is able to recognize the user and his/her role and provide the functions that are appropriate for the specific user.

The decision tree for the user interface is in Figure 2. The users can insert new data into the system or update previously entered data. Alternatively, they can view previously entered data or generate reports for their particular projects.

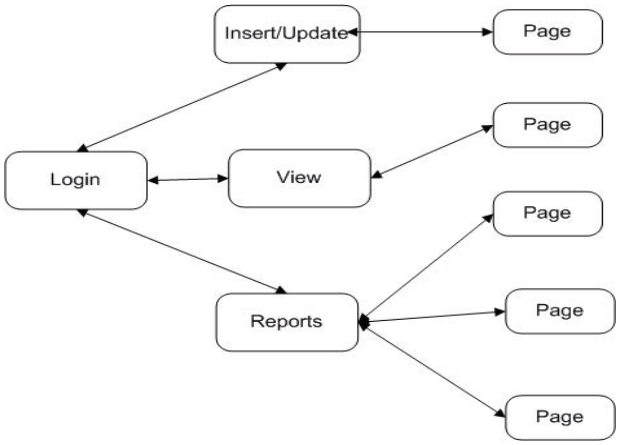

Figure 2 – User interface decision tree

An example of one of the initial screens for PMDES is presented in Figure 3.

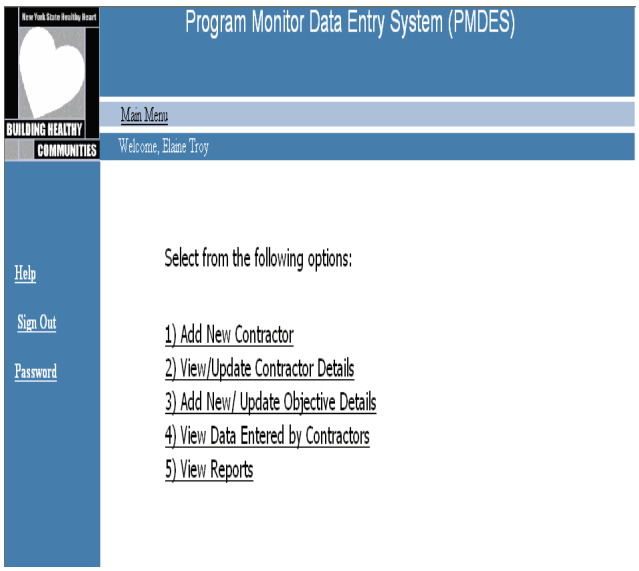

Figure 3 – An initial screen from PMDES

The complexity of the interventions is evident in the number of web forms created for the users. PMDES has over 100 web forms and PROMS has 175 web forms. The following figure (Figure 4) is as sample screen shot from PMDES.

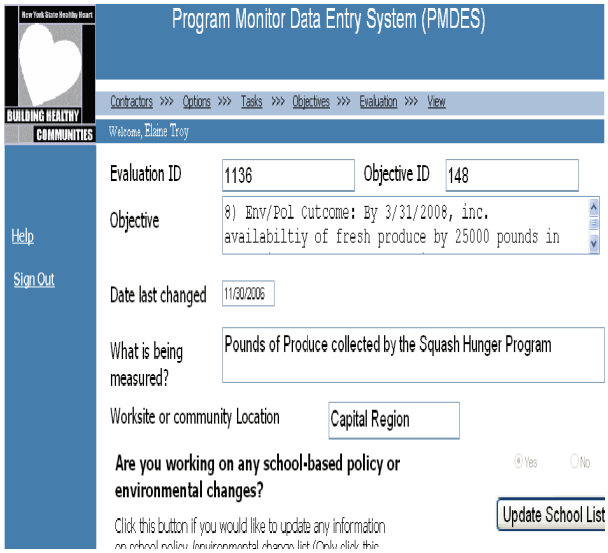

Figure 4 – A sample screen from PMDES

Reports

We used Crystal Reports for the report functionality of the system. PMDES has 20 and PROMS has 30 reports. Different access privileges to the system allow different types and number of reports for various client groups. For example, program managers in STEPS using PROMS can generate statewide or individual project reports, while the

project managers in counties can only generate reports for their own projects. In some reports, data from other counties is presented in an aggregate for comparison purposes. Despite the ease of use for the clients, report generation is a complicated procedure that involves extracting data from the SQL Server feeding it into xml and then into Crystal Reports. The following figure is a graphic representation of this process.

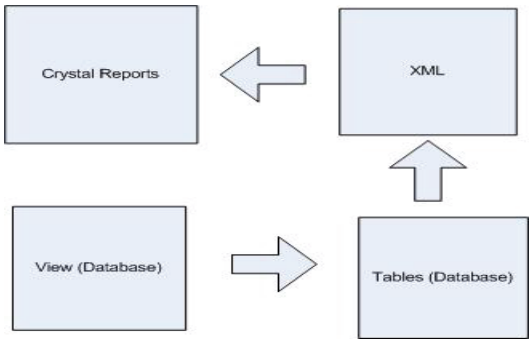

Figure 5 – Report Generation Process

Crystal Reports provides both text and graphics based reports that are presented with a user friendly interface. Through the web interface, clients can select from a variety of parameters to generate highly customized reports. We again use C Sharp in the background for all essential processes. Any report can be printed or exported into a number of file formats including PFD or Word. Figure 6 is an example of a report generated by the PMDES system.

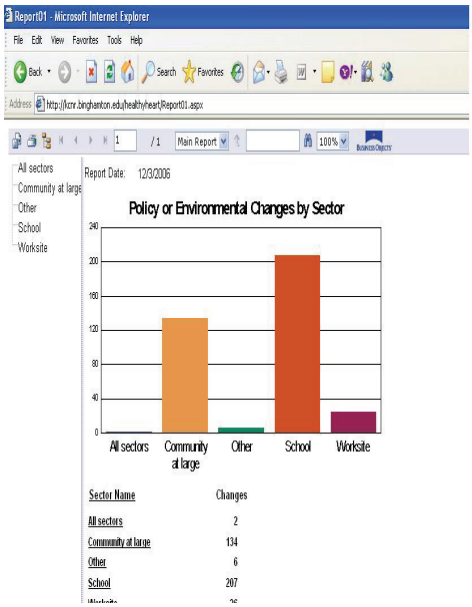

Figure 6 – An example of a report

Conclusion

The applications we developed enable users across New York State to collect and report standardized data, retrieve information, and generate a variety of reports. Program managers in the state capital Albany can monitor individual projects' progress on a regular basis and generate statewide or project specific reports. This initiative has already proven to be user friendly, cost effective, fast, and accurate and met the key requirements of program and project managers with minimum technical assistance. Regardless of the location of individual projects, with internet access, PROMS and PMDES are designed to handle many more clients and potentially go national.

Large scale community health programs that have multiple sites may wish to consider collaborating with nearby academic institutions that can offer the required technical expertise, hardware, and application development.

Some of the lessons we learned through the development of the systems are listed below:

- No system is able to meet all data collection, program monitoring and evaluation requirements for complex community health programs.
- It is not easy to find employees who have the technical expertise to develop a quality system.
- Modifications and additions to the system after initial development should be avoided. Written agreements with funders specifying each field, web form, and reports are highly recommended.
- It is a mistake to assume that anybody can operate a computer and access the internet. We realized during our training sessions that a number of our clients required additional technical support.

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PMDES: http://kcnr.binghamton.edu/healthyheart/
PROMS: http://kcnr.binghamton.edu/steps/

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