Developing Web-Based Computer Lab with InfoPath

Li Chao

University of Houston - Victoria, 3007 N. Ben Wilson, Victoria, TX 77901, USA, chaol@uhv.edu

ABSTRACT

This paper considers an IT solution for Web-based teaching. It discusses issues in consuming data posted by the instructor on the Web through XML Services. We will compare the XML data consuming tools. We will discuss the reasons why InfoPath is an ideal tool for teaching database application development related courses. In the article, we will also demonstrate how to develop InfoPath based database applications. We will discuss the hardware, software, and issuers in developing teaching materials. As a hands-on example, a brief demonstration is provided to illustrate how to create an InfoPath form as part of the Web-based computer lab for on-line courses in the computer science information system curriculum.

WHY INFOPATH?

When teaching database application related on-line courses, one of the difficulties is how to consume data posted by the instructor through the Internet. Nowadays, the Internet has been widely used to assist teaching. For most Web-based courses, instructors post lecture notes, images, and assignments on a Web site. Students read the on-line course content or download the files and read the materials off-line. For the database application related courses, this type of on-line courses is not adequate. Hands-on practice is a very import part of the curriculum for computer science majors. Web-based database application courses need an on-line computer lab for hands-on practice. An on-line computer lab should include a server at the instructor's office, the Internet, and students' home computers as the clients. It is much more difficult to set up a computer lab on-line so that students can complete their lab assignments on-line at home. To develop database applications on students' home computers, we need to accomplish the following tasks.

- Post partial or an entire database on a Web site in a format that allows the database applications created by students to consume the data through the Internet.
- Make sure that the database applications created on students' home computers have the Internet accessing ability.

For the first task, to allow students to access database objects such as tables or stored procedures from remote locations, we can post these database objects on our XML Web Services where the database objects are converted to the XML format. XML is a platform-independent language for defining and transporting data on the Web. By using XML, database objects can be consumed by various database applications on different types of computers with different types of operation systems. We can transform data from a variety of data sources such as relational databases, word documents, and spreadsheets to the XML format. Students can either download the XML document or convert it to database objects for their own databases if there is DBMS system installed on their home computers or simply let the database applications on their home computers directly use the data and stored procedures on the XML Web Services though the Internet.

There are many application software packages that can be used to consume the database data. The following table gives comparisons of these application software packages.

There are two types of applications, InfoPath and Web page, which can be used to accomplish the second task mentioned above. InfoPath has many other important features necessary for creating sophisticated database applications.

InfoPath provides tools that enable client application developers to create dynamic database applications which can gather and share information across the Internet and an organization's Intranet. InfoPath has the following advantages.

- It is highly flexible. It can gather information across a wide range of formats. Applications created by using InfoPath can be seamlessly integrated into other Microsoft Office 2003 applications.
- It fully supports XML and Web Services. Therefore, InfoPath based database applications can communicate through the Internet with non-Microsoft databases and other middle-tier systems.
- Unlike other Web forms, InfoPath forms have rich text editing, spell check, and AutoCorrect features.
- InfoPath has the ability to work offline to reduce network traffic and (reduce) the (work) load on a Web server. When needed, InfoPath will automatically reconnect to the database or XML Web Services. In such a way, large number of students can access the same Web Service at the same time.
- InfoPath has strict security measures to control the access to a client machine with a form.
- InfoPath is great for developing team projects. With built-in support for form libraries, forms generated by InfoPath can be published in a form library. Forms published in the form library are available to support team-based data collection and collaboration of operation.

Since both Web page based forms and InfoPath forms have the ability to consume data posted on the Internet, let us give some detailed comparison about those two Web based database application development tools.

Unlike the Web page based forms and reports, working on an InfoPath form is just like working a Word file. Our students like this feature which makes the appearance of their project look much better. When developing Web based database applications, possible knowledge needed is scripting languages such as JavaScript or VBScript, HTML, or some third party tools. It requires sophisticated programming skills to embed

Table 1. Features of Different Application Development Packages

Features	InfoPath Forms	Web Forms	Windows Forms	Access Forms	Excel Forms
Rich Client	Yes	No	Yes	Yes	Yes
Structured Data	Yes	No	Yes	Yes	Yes
Rapid Development	Yes	No	No	Yes	Yes
Data Validation	Yes	No	No	Yes	Yes
Internet Accessing	Yes	Yes	No	No	No
Embedded Reporting	No	No	No	Yes	No
Data Analysis	No	No	No	No	Yes

scripting languages in HTML. ASP is often used to get the job done. As to consume XML data posted on a Web Service site, it takes even more effort to deal with interfaces and name space issuers.

One of the great features of InfoPath for teaching and learning is that it can be processed on-line and offline; this means students do not have to be on-line all the time. They can save the partially completed assignments on their home computers. Students only need to reconnect to the XML Web Services when data need to be updated.

Web page based database applications are created with HTML and scripting languages. It is not easy to convert this type of forms into database applications with the format compatible with Microsoft Office, or vice versa. On the other hand, it is easier to convert InfoPath forms to other types of forms in Microsoft Office or vice versa. In this way, students can reuse their previously developed database applications.

Usually, it requires our students to take one decent Internet Programming class to handle Web page based database applications. On the other hand, InfoPath is relatively easier. It will automatically generate the HTML code for the forms created in InfoPath. For some simple assignments, students can use the Wizard provided by InfoPath. For consuming XML data, InfoPath provides some GUI tools to assist the data accessing to XML Services. InfoPath partially reduces the difficulty of the assignment.

However, InfoPath has is own disadvantages. Comparing to other database application tools such as Microsoft Access and Excel, it takes longer time to learn how to use InfoPath. When developing forms, there are more controls that are available in Access than in InfoPath. InfoPath still requires some programming skills in Jscript or VBScript for highly interactive Web applications. It may not be the choice for those developers who do not have solid knowledge in programming. Another disadvantage is that it is relatively new; there are few well written textbooks on the market, though there are some books for professional development.

From the above discussion, InfoPath is an ideal tool for teaching database application related courses. It is especially important for our computer information science majors who have less training on programming. For readers who world like to gain some hands-on experience on how to create InfoPath forms as part of the on-line computer lab, please read on. The following gives a brief example on how to create InfoPath forms that can be used to consume data posted on XML Web Services. For in-depth coverage of InfoPath, readers may study the books listed in the References.

EXAMPLE ON CREATING INFOPATH FORMS
InfoPath is a member of Microsoft Office components. If you have installed Microsoft Office 2003, InfoPath is part of Office. Academic users can download it from the Web site http://www.msdnaa.net/ through the MSDN Academic Alliance (MSDNAA) program. To run InfoPath, you need a PC with the following minimum requirements.

Hardware Requirements:
• An Intel Pentium 233 MHz CPU. Inter Pentium III is recommended.
• 128 MB RAM or greater.
• 100MB available hard drive space and a CD ROM drive.

Software Requirements:
• Windows 2000 Professional with SP3 or Windows XP Professional.
• Internet Explorer 6.0 or later.

As you can see, InfoPath is not a large package, most home PCs will meet the requirements.

Suppose that the homework assignment is to create a form for a computer company which sells computers at multiple sites. The form

Table 2. Controls Included in the InfoPath Form

Control Name	Usage
lstSystemId	A drop-down list box used to select a computer system
txtType	A textbox used to display the computer system type
txtDesc	A textbox to display computer system configuration
lstPartId	A list box to display the part ids included in a computer system
lstPartName	A list box to display the part names corresponding to the part ids listed in the list box lstPartId

will be used to display the configuration of a computer system selected by a user at a remote location. At first the instructor places the following information on an XML Web Services site.

• Tables containing information about computer systems and information about the parts used by the computer systems. The relationships among these tables will also be included.
• Functions, GetSystemId, GetSystemInfo and GetParts, used to query the configuration information based on the selection of computer systems by the users.
• Students need to create a form with the controls described below.

The drop-down list box is used to allow the user to select a computer system. After a computer system is selected, the system type and description will be displayed in the textboxes. The related part information will be listed in the two list boxes. In the InfoPath design window, the form can created as shown.

Figure 1. Design of Assignment Form

Figure 2. Preview of Assignment Form

• Connecting to the Web Service with the GUI tools provided by the list box controls and adding the VBScript code for the OnAfterChange event in the drop-down list box to update the textboxes txtType, txtDesc, and the list boxes lstPartId and lstPartName, you should have the system information displayed as Figure 2.

You can see that, instead of directly pulling from the database, InfoPath consumes the data posted by an XML Web Service which provides data in the XML format and allows students to run the functions posted by the instructor on the server side. In such a way, the students are able to design and test database applications on-line using the data provided by the instructor. What has been shown is just a small part of InfoPath and XML Web Services. Due to the size of the paper, we won't be able to give an in-depth coverage about this field. For further information, please refer to the books listed in the References.

CONCLUSION

The InfoPath technology provides a convenient tool for Web teaching and learning. It allows us to develop a Web-based computer lab for teaching database application related courses. A Web-based lab is convenient for computer science instructors and students who are conducting their teaching and learning through distance education.

Through InfoPath, students can develop their hands-on skills in creating database applications over the Internet. There are books available to help faculty members develop Web-based computer labs. For example, the book *Building Web Applications with ADO.NET and XML Web Services* by Richard Hundhausen, et al. (2002) gives clear and step-by-step instruction on building XML Web Services based on Visual Studio from the Microsoft .NET technology. For those of you who want to learn more about InfoPath, the books *How to Do Everything with Microsoft Office InfoPath 2003 (How to Do Everything)* (2002) will help you to get a quick start on InfoPath. For readers who want to create more dynamic InfoPath projects and have programming skills, the book *Programming Microsoft InfoPath (Programming Series)* (2004) is very useful in gaining more programming skills.

REFERENCES

Richard Hundhausen, Steven Borg, Cole Francis, & Kenneth Wilcox (2002). *Building Web Applications with ADO.NET and XML Web Services*. Wiley Publishing.

David McAmis (2004). *How to Do Everything with Microsoft Office InfoPath 2003 (How to Do Everything)*. Osborne/McGraw-Hill.

Thom Robbins & Thomas Robbins (2004). *Programming Microsoft InfoPath (Programming Series)*. Charles River Media.

Related Content

Radio Frequency Fingerprint Identification Based on Metric Learning

Danyao Shen, Fengchao Zhu, Zhanpeng Zhangand Xiaodong Mu (2023). *International Journal of Information Technologies and Systems Approach (pp. 1-13).*

www.irma-international.org/article/radio-frequency-fingerprint-identification-based-on-metric-learning/321194

Good Practices in E-Government Accessibility: Lessons From the European Union

Fernando Almeidaand José Augusto Monteiro (2021). *Encyclopedia of Information Science and Technology, Fifth Edition (pp. 1513-1525).*

www.irma-international.org/chapter/good-practices-in-e-government-accessibility/260285

Gamification Design Elements in Business Education Simulations

Torsten Reiners, Lincoln C. Wood, Sue Gregoryand Hanna Teräs (2015). *Encyclopedia of Information Science and Technology, Third Edition (pp. 3048-3061).*

www.irma-international.org/chapter/gamification-design-elements-in-business-education-simulations/112730

Digital Video Watermarking Using Diverse Watermarking Schemes

Yash Gupta, Shaila Agrawal, Susmit Senguptaand Aruna Chakraborty (2018). *Encyclopedia of Information Science and Technology, Fourth Edition (pp. 4872-4883).*

www.irma-international.org/chapter/digital-video-watermarking-using-diverse-watermarking-schemes/184191

The Impact of Technology Anxiety on the Use of Mobile Financial Applications

Cheon-Pyo Lee (2012). *Knowledge and Technology Adoption, Diffusion, and Transfer: International Perspectives (pp. 231-243).*

www.irma-international.org/chapter/impact-technology-anxiety-use-mobile/66947