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A Practical Approach to Teaching eBusiness System Concepts

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Abstract. Introductory courses in Electronic Business (eBusiness) must emphasize end-to-end integration of information flows from the marketing of products and services and the acquisition of customer orders through fulfillment, production, and supply chain management. A tutorial uses Microsoft FrontPage, a Microsoft Access database, and a set of utility Active Server Page (ASP) programs to demonstrate how these capabilities are implemented. In a series of five assignments students develop a Web system focusing on customer registration, order acquisition, payment, and order tracking. An Intranet site is provided to illustrate the fulfillment processes. This paper discusses these components and how they are used to illustrate and demonstrate important eBusiness concepts. A server environment utilizing Microsoft FrontPage Server Extensions enables each student to remotely create their Web system with its own database. Process visibility is supported through point and click database accessibility. Overall student time to create the system is seven to eight hours, approximately one and one half hours per assignment. All tutorial materials and assignments are available at http://SalMarch.com/eB.

Keywords: e-business technology, web storefront, e-sales order processing, e-fulfillment, back-end-integration.

1. Introduction

One of the key challenges in introductory courses in Electronic Business (eBusiness) is communicating how technology can be used to accomplish end-to-end integration of information flows through the marketing, sales, fulfillment, production, service, accounting, and supply chain management functions (Turban et al. 2002, Schneider 2002, Kalakota and Robinson 2001). Hands-on experience with the development of a Web system is an effective mechanism for meeting this challenge (Denning 1997, Menasce 2000, Rob 2002). Such experience is a crucial component of information systems education (Tanniru and Agarwal 2002).

For this purpose we have developed a hands-on Web storefront tutorial (March 2002). In a series of five assignments students develop a Web system focusing on customer registration, product display, order acquisition, payment, order tracking, and fulfillment processes. This paper discusses these components and how they are used to illustrate and demonstrate important eBusiness concepts.

The development environment itself illustrates the technology of eBusiness (Napier et al. 2002, Rob 2002). A server utilizing Microsoft FrontPage Server Extensions enables each student to create their Web system with its own database. The server can be located at any physical location having an Internet connection. For illustrative purposes access to such a server is provided via a link at http://SalMarch.com/eB. Hence, an educator can demonstrate these principles without needing to manage a server for this purpose. All that is necessary is a computer with Microsoft FrontPage, Access, and an Internet connection.

Process visibility (Yang, Mason, and Chaudhury 2001) is supported by utilizing the point and click database accessibility available through FrontPage and Access. Students can register and enter orders into their Web system and then open the database through FrontPage to see the results. Conversely students can enter customer, product, or order data directly into the database and see the results displayed in their Web system. The instructor (or TA) can register and shop at each student's Web site providing additional data for sales analysis. Plug-and-play database capabilities and database server concepts are illustrated by providing a Microsoft SQL Server database with the same schema definition as the Access database. Students can use FrontPage to create a database connection object for the SQL Server database. Once the database connection object is created students can use the SQL Server database rather than the Access database without changing any of the storefront Web pages.

The principles of customer interaction, order acquisition, electronic payments, and order fulfillment are foundational to the business information systems (Amor 2002). Among the difficulties of communicating these principles in a classroom setting are the programming and technical details required for implementation (Rob 2002). We have addressed these by using Microsoft FrontPage as a development environment, Microsoft Access as the database layer, and providing a set of utility Active Server Page (ASP) programs (Reynolds 2000, Zhao 2003) integrated with that environment to enable the creation of the system with minimal programming effort. Microsoft provides support sites for these products (Microsoft 2003). Introducing these sites enables a discussion of how Microsoft utilizes the Web for customer service and the price / performance ratio of using Web self-service rather than, or as a supplement to, human customer service representatives.

The tutorial is organized into ten sections completed in five assignments:

1. Web Site Creation and Navigation Structure,

2. Database Structure, Connection, and Main Shopping Page,

3. Customer Registration, Logon, and Personalization,

4. Shopping Cart Display and Checkout, and

5. Order Tracking and Customer Information Maintenance.

Each assignment is designed to be completed in approximately 90 minutes, including working through a section of the tutorial in which a part of the Web site is implemented and completing exercises in which the capabilities of the Web site are extended. The tutorial, assignments, an Access product images, and utility Active Server Page (ASP) programs are available at http://SalMarch.com/eB. Accounts and FrontPage Webs can be set up by a professor for his or her class by contacting the author for appropriate authorization.

Pedagogically, technical concepts are introduced as they are needed to support eBusiness requirements and the design and implementation of the Web site (Denning 1996, Denning 2001). The technology necessary to create a Home page providing a Web presence and the navigational structure of the site. The second presents the technology necessary to access the database and display the products offered for sale. The third presents concepts necessary to capture customer data, record it in the database, and use it to provide customers with a logon capability and a personalized experience. It also introduces the technology necessary to track customer activity on the Web site. The fourth assignment reinforces these technology concepts by requiring database retrievals and updates utilizing FrontPage and utility ASP programs. It also introduces the Web technology necessary to link to an outsourced electronic payment (e-payment) vendor (simulated using a utility ASP program). The final assignment completes the functionality of the Web site using technology concepts introduced earlier, requiring one Web page to access the database, obtain, format and display the logged on customer's orders and a second Web page to obtain and format the customer's profile data so it can be updated by the customer. After concluding the tutorial students are prepared to engage in project-based learning experiences as advocated by Rob (2002).

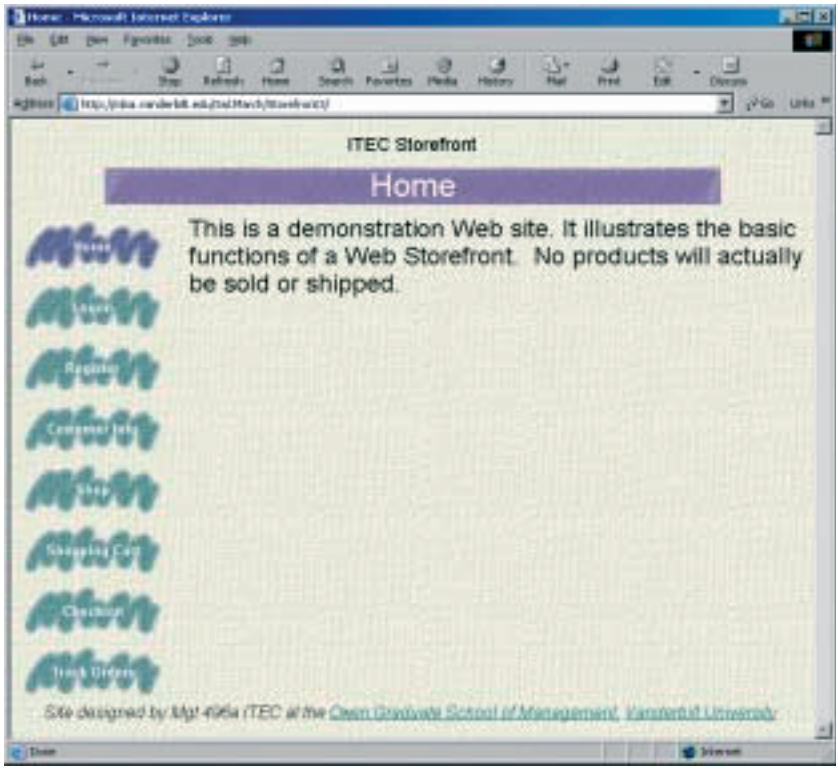
In the first class, before discussing eBusiness concepts students complete an online survey. This insures that all students can access the Web and demonstrates how data are captured. Survey results are immediately displayed to illustrate the real-time nature of Web information (see Appendix A). This process is most effective if students have Internet access in the classroom, complete the survey in class, and immediately see the resulting class profile. Viewing the survey results provides an opportunity to discuss how customer profiles are used for marketing purposes. For example, capturing students' birthdays (day and month only) provides an opportunity to e-mail birthday greetings. If family data are collected it provides an opportunity to send electronic reminders and product recommendations to a spouse. A FrontPage

Web survey tutorial is provided at http://SalMarch.com/eB. It is made available to students who may wish to develop a Web survey as part of their course project. Doing so is not a requirement.

After completing the survey discussion, basic eBusiness concepts are introduced beginning with online shopping. Students register and shop at a completed Web site created by the instructor. Its home page is illustrated in Figure 1. This in-class exercise enables students to see the overall architecture and use of the Web site they will develop. It also provides a database of students and a set of purchases to illustrate the online sales analysis capabilities made possible by these technologies. Visit http://mba.vanderbilt.edu/WebStore to see the completed Web site.

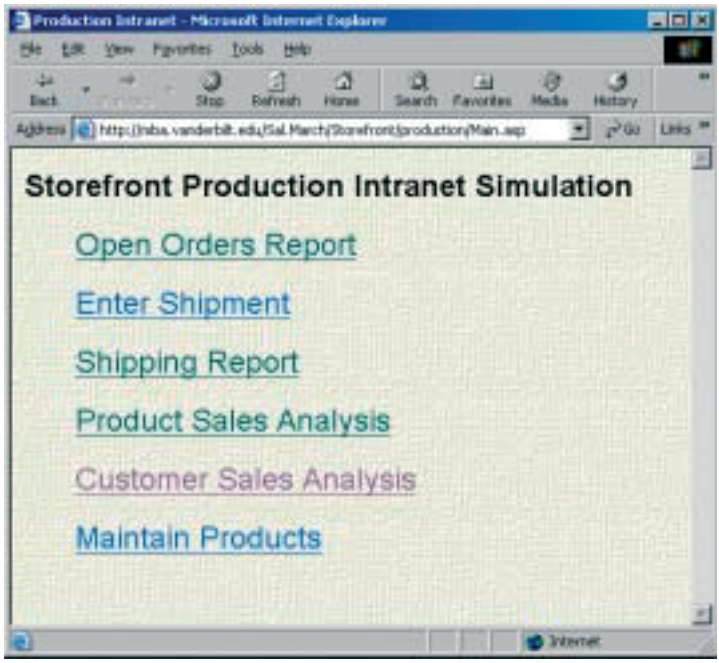
After students have registered, shopped, and "paid" for their purchases, online order fulfillment and sales analysis are illustrated using a simulated sales analysis, and product catalog maintenance. Students use this site in the last assignment where they play the role of an outsourced fulfillment partner. They must simulate the "pick, pack, and ship" process. This demonstrates how the fulfillment process can be outsourced using orders they have entered.

Figure 1: Web Storefront Home Page



The Intranet home page has six links (Figure 2). Each opens a separate window for the specified function. The Open Orders Report link lists orders that are ready to be filled. This enables students to see orders that should appear when the Enter Shipment link is selected. The Enter Shipment link opens a window that enables shipping information to be entered for specific orders, thus simulating the fulfillment activity. After an order has been shipped it no longer appears in the Open Orders Report. The Shipping Report link lists shipments that have been made. These capabilities are mentioned at this time as a forward pointer to the fulfillment process but they are not discussed in detail. Nonetheless this provides an opportunity to raise issues related to fulfillment, production, and inventory management, particularly in an environment where there are multiple sales channels (e.g., Web, telephone, fax, salespeople, retail, etc.). Such issues are addressed in more detail in the last assignment, which deals more explicitly with fulfillment.

Figure 2: Simulated Production Intranet

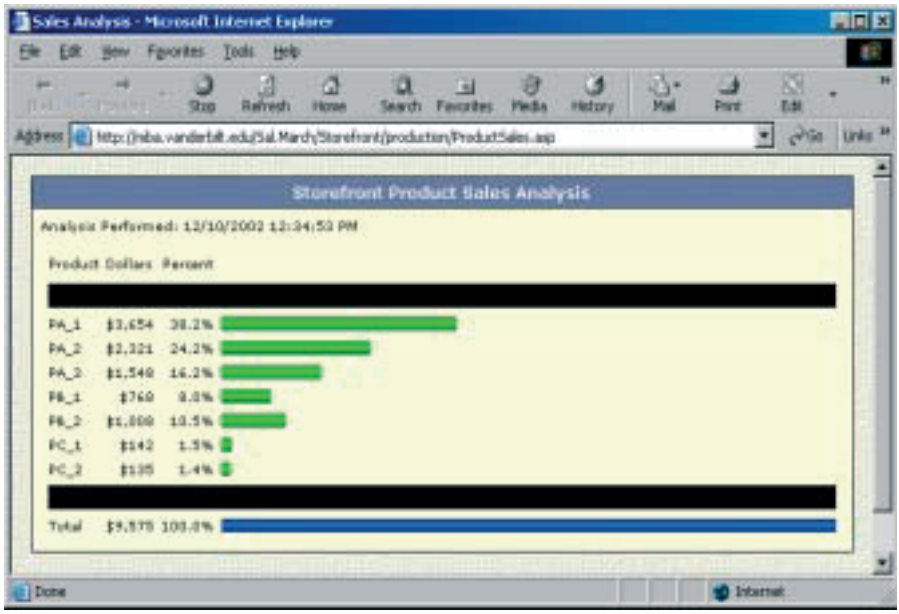


The ability to immediately analyze sales activities is illustrated by selecting the Product Sales Analysis link. A sample analysis is illustrated in Figure 3 below. It is in graphical form and shows the dollar value by product

of the shopping done so far by the students in the class. Students are then asked to do additional shopping and an updated Product Sales Analysis is produced.

The analysis does not differentiate orders from shipped orders. It does not formatting requirements of various stakeholders relative to sales analysis. Students are asked to brainstorm how they would like to see the data presented, assuming the role of marketing, production, finance, and senior management. As a result of this discussion a preliminary set of analysis dimensions is developed by which the Web sales and fulfillment process can be evaluated. These typically include date of sale (year, quarter, month, day), type of product, length of time between order placement and fulfillment, units sold, and profit margin. It also provides an opportunity to introduce the basic concepts of data mining and recommendation systems.

Figure 3: Sample Product Sales Analysis Screen



The customer sales analysis capability is illustrated by selecting the Customer Sales Analysis link. This analysis is similar to the product analysis but shows a graphical analysis of dollar value of purchases by customer. Hence it shows student names, rather than products, thereby offering an opportunity to engage students in this class exercise. Discussion of the Customer Sales Analysis provides and opportunity to address issues such as customer value and the problem of identifying customers who use multiple

channels for purchasing. It further reinforces the concepts of data mining and recommendation systems by recognizing the need for a combined customer and product analysis. Finally, the Maintain Products link illustrates how product data is maintained over the Web. This contrasts with the second assignment in which product data are modified directly in the database.

It is emphasized that, while it may seem a daunting task to implement such a Web site, it is relatively straightforward and will be done in relatively small assignments and, due to the graphical interface and Wizards offered by FrontPage and the availability of the utility ASP programs, it will require minimal programming effort. Furthermore, when complete, the entire Web site including HTML and ASP files, images, and the Access database could be published to any Web hosting service that supports *Microsoft FrontPage Server Extensions* and, with relatively little modification, it could be commercially used. It is also emphasized that the functionality provided by completed Web site is comparable to that provided by commercial electronic commerce packages such as Federal Express' Main Street Stores (http://mybiz.mainstreet-stores.com/apps/smb/clients/FedEx/), Yahoo! Store (http://store.yahoo.com/), Miva Merchant (http://www.miva.com), Mercantec Soft Cart (http://mercantec.com/) (both are offered by DellHost / Sprint http:// dellhost.com), and Verisign (http://www.networksolutions.com/en_US/build-it/).

In the following sections each of the assignments is discussed in more detail emphasizing the opportunities afforded to illustrate conceptual and technical eBusiness issues.

2. Web Site Creation and Navigation Structure

Web site creation is straightforward in tools such as FrontPage. FrontPage provides a graphical interface and various wizards that generate a combination of HTML and Visual Basic code utilizing the capabilities of the FrontPage Once the Web site has been created, a page is created and appropriately named for each of its seven major functions, Logon, Register, Customer Info, Shop, Shopping Cart, Check Out, and Track Orders. These are added to the site navigation structure using the drag and drop capabilities of the FrontPage navigation view.

For site consistency a template is defined that all Web pages share. This template includes a shared border that contains the navigation bar for the site as well as a shared header and footer. Finally a *Theme* is added to make the site a bit more interesting. Here it is emphasized that the capabilities available in FrontPage to create such templates are representative of Web development environments.

After the site and navigation structure have been created on the Web server, the entire Web site is backed up to the student's local computer (laptop or floppy disk) using the Publish Web function. Students are instructed to publish their Web as a backup after each assignment. In this way they have a copy of their Web site in case there is a problem with the server or in case they have a problem with a function in FrontPage from which they cannot recover. They can also use this function to publish their Web on any web hosting service provided it supports Microsoft FrontPage Server Extensions.

As an exercise each student creates a personal Web page including a picture, contact information, and links to their resume and to their Storefront.

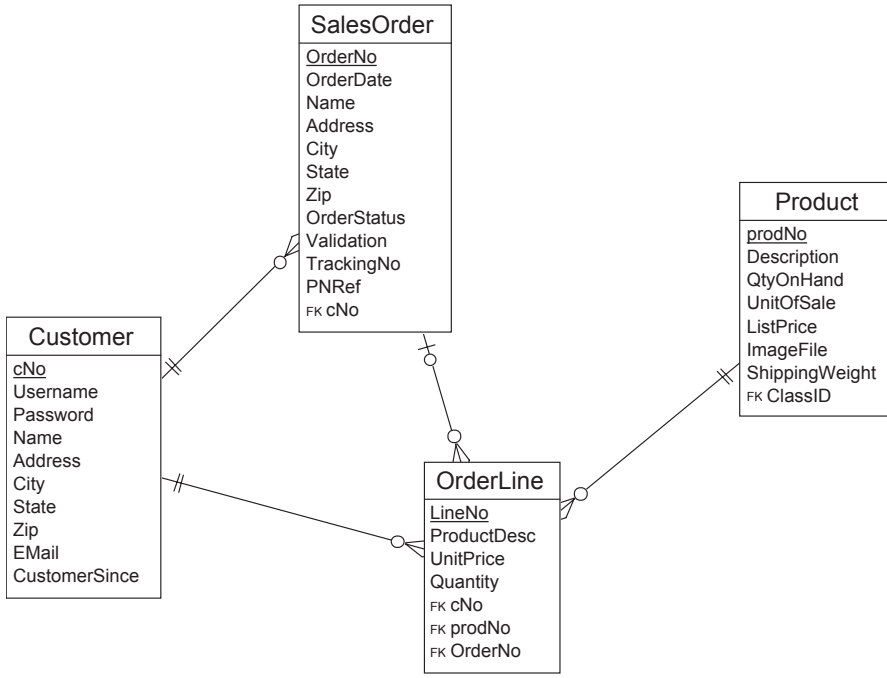
3. Database Structure, Connection, and Main Shopping Page

In the second assignment, the database (ITEC.mdb), product images (PF_Imafes.zip), and utility ASP programs (FP_Utility.zip) are downloaded from the class Web site[1] to a local computer and imported into the student's FrontPage Web. The image files are dragged into the automatically generated FrontPage 'images' folder separating them from the Web pages generated. When the database is dragged into the Web, FrontPage automatically creates a
database connection object and an appropriately secured folder for it.

The database contains four tables, Customer, SalesOrder, OrderLine, and opportunity to introduce basic concepts of data models, relational database, and SQL. As illustrated, customer may have zero or more sales orders. Each sales order has one customer. A sales order has zero or more order lines. Each order line has zero or one sales order. A product has zero or more order lines. Each order line has one product. A customer has zero or more order lines. Each order line has one customer. The direct relationship between Customer and Order is used to capture the customer's shopping cart. Any order line that is not related to a sales order is, by definition, in the customer's shopping cart.

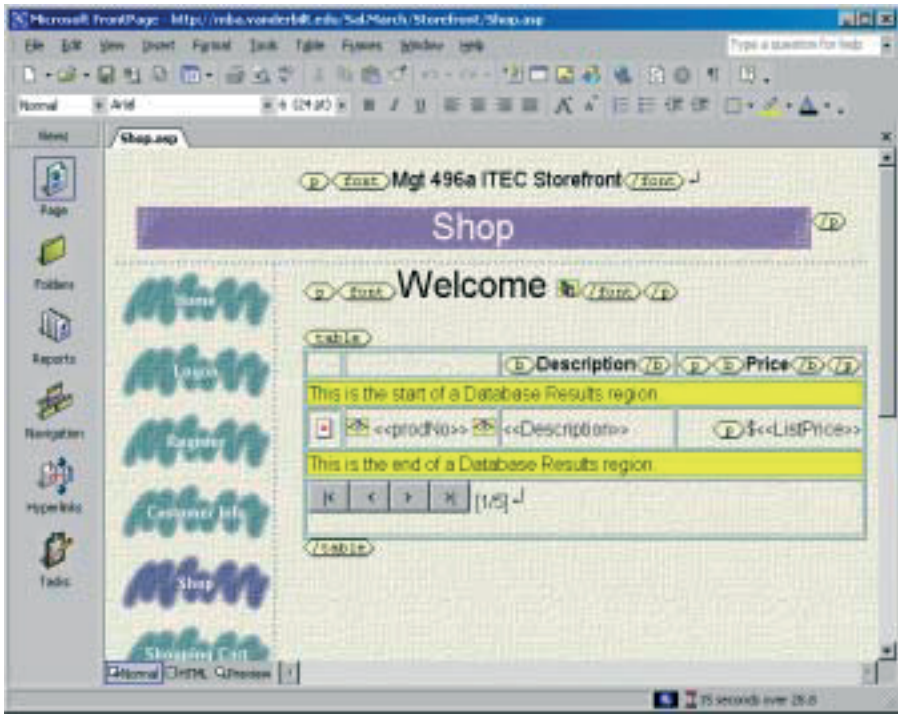
1. As discussed above, all of these are available at http://SalMarch.com/eB.

Figure 4: Data Model of Storefront Database



The Shop page (Shop.asp) enables customers to display a product list, including an image of each product, its description, and its price, and an "Add to Shopping Cart" icon. This page is painted in FrontPage utilizing the Database Results Wizard (Figure 5 below). The Database Results Wizard utilizes the database connection created when the Access database was imported into the Web. It generates the appropriate SQL query to obtain the required data specified in its graphical interface. This provides an opportunity to discuss database connections and the "plug and play" nature of relational database management systems. The Access database can be replaced by a SQL Server or Oracle database by redefining the database connection.

Figure 5: The Shop Page in FrontPage



The database result for the Shop page must be modified to display the proper image and to enable orders to be captured. The imageFile column is mapped to the appropriate image in the FrontPage images folder and HTML added to the prodNo column to create a hyperlink to the Utility ASP AddToCart.asp (the user entered HTML is designated in FrontPage by the <?> tags surrounding that column in the Database Results region as illustrated in Figure 5).

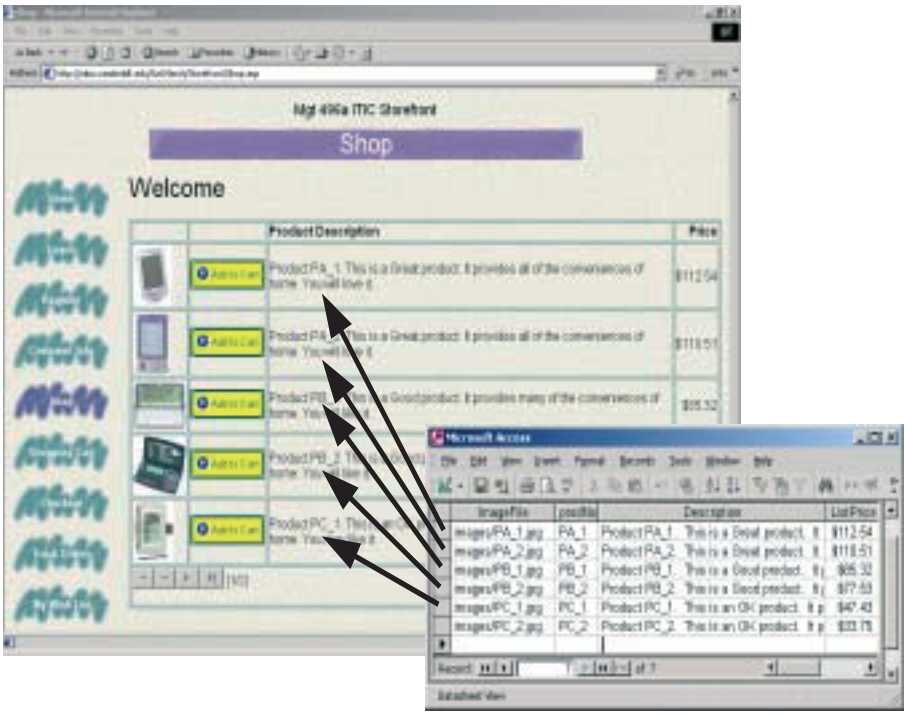
This provides an opportunity to introduce HTML and to emphasize that FrontPage generates HTML code for the painted page. It also provides an opportunity to address the question of how data are passed from one Web page to another and the general concepts underlying XML and Web Services. Although AddToCart.asp is not a Web service, it provides similar database update services and illustrates the basic concepts.[2]

The mapping between the Shop page and the Product table in the database is illustrated in Figure 6. It is crucial for students to see the connection between

2. The utility ASP programs could have been implemented as Web services. However, each provides a very simple service and data passed is not complex enough to require XML. Hence simple ASP programs provide sufficient capability for purposes of this exposition.

the Product table and the display of its data in the Web page. As an exercise students first open their Storefront Web site and display their Shop page. They then open the database in Access and add three new products to the Product table (extra image files are provided for this purpose in the FP_Images.zip file). They then refresh their Shop page to insure that the new products are displayed. It is emphasized that adding products or changing product descriptions (particularly price) are necessary database updates. It is further emphasized that, although they entered the data directly into the Product table, an update screen can be developed in several ways: in Access itself, as a separate application program developed in a language such as Visual Basic or Java that connects to the database, or as a Web page such as that in the Production Web site discussed above.

Figure 6: Mapping Between the Shop Page and the Product Table



At this point the question of how to identify the customer who has added the product to their shopping cart is raised. This provides segue into the next assignment where the Registration and Logon pages are produced and the Shop page is personalized for the logged on customer.

4. Customer Registration, Logon, and Personalization

The Registration page (Register.asp) allows new customers to register at the Storefront site. It captures customer name and address data and stores it in the database. It allows customers to create an identifying username and password. It includes an e-mail address so their username and password can be e-mailed to them when they forget it. Capturing the customer's e-mail address also enables e-mail marketing. Promotions and other advertising materials can be e-mailed to customers based, for example, on past buying behaviors. As a forward pointer to the fulfillment Web site it is pointed out here that an Intranet or B2B site would likely not allow customers to register directly but would provide them with a username and password to appropriately restrict access to the Web site.

The Register page is painted in FrontPage using a form and textboxes. Submit and Reset buttons are automatically generated for the form. This provides an opportunity to discuss additional HTML elements and positions FrontPage as an HTML generator. The textboxes are mapped to columns in the Customer table using the database object. This again emphasizes the connection between Web page components and the underlying database. It also reinforces FrontPage as a Visual Basic generator capable of producing the code required to connect to the database and execute the appropriate SQL query to insert a new row into the Customer table. After producing and saving the Register page. Students are instructed to register at their own site and then examine their database to insure that their data has been appropriately recorded. This provides visibility to the site and the registration process.

The Logon page (Logon.asp) uses a utility ASP, ValidatePW.asp, to validate the Username and Password and to obtain customer identification information used during the customer's shopping "session". This enables the introduction of the concept of a "session", created on the server when a client (browser) first requests a page. The session remains open for that browser for a specified time period. So called "session variables" hold data about the browser and about the customer. ValidatePW.asp stores the customer number and customer name in session variables. In this way the Web site can be personalized to display the "logged-on" customer's name and the customer's number is available to each ASP, insuring that only data appropriate for that customer is displayed and to associate entered orders with that customer.

Noting that customers do not want to be bothered logging on to the site each time they visit provides an opportunity to introduce the concept of cookies. The utility ASP ValidatePW.asp can be modified to write a cookie on the customer's computer the first time a customer logs on. Then the main page, default.htm, would be changed to an Active default.asp) and appropriate Visual Basic code added to read the cookie, set the Session variables, and display a personalized greeting when the customer

visits. This affords an opportunity to discuss security issues related to usernames and passwords and the problem of cookies on shared and public computers.

In lieu of implementing cookies, the Shop page is modified to display a personalized greeting. This requires one line of Visual Basic code to be entered using the FrontPage HTML view. It is noted that the Shopping Cart, Checkout, and Customer Info pages should not be displayed if the customer has not logged on. The FrontPage HTML view is also used to add one line of Visual basic code to each of these pages redirecting the customer to the Logon page if the Session variables have not been set.

As an exercise students create a "Contact Us" page that uses the FrontPage e-mail capability to send an e-mail message to the Store manager (i.e., to the student). This requires students to create a new page, add a form and textboxes, specify that the form contents are to be sent as an e-mail message (rather than be stored in a database as in the tutorial), and link that new page into the navigation structure of the Web site.

5. Shopping Cart Display and Checkout

The Shopping Cart page (ShoppingCart.asp) displays the logged on customer's shopping cart and an order total for all items in the shopping cart. It allows the customer to remove items from the shopping cart using a "Remove" link. A customer's "shopping cart" is defined as all rows in the OrderLine table having that customer's number in the cNo column and a value of 0 in the order number (OrderNo) column. Similar to the "Add to Cart" link on the Shop page, the "Remove" link uses the utility ASP RemoveFromCart.asp, reinforcing the concept of passing values from the database result to another page that uses that data to perform a database update.

The shopping cart page requires a second query result to calculate the total for the shopping cart. In this case the student must enter an SQL "Group By" query. This illustrates how custom queries can be used. The query itself is provided, along with explanation in the tutorial. This provides an opportunity to discuss the generality of the SQL language (and its universality) without going into excruciating detail or requiring extensive class time.

After examining the shopping cart, a customer is ready to place the order. The checkout page (Checkout.asp) is created for this purpose. This page displays the customer's name and address taken from the Customer table as the "ship to" name and address but allows the customer to change these for this order. This enables the customer to send items as gifts or to an alternate address without changing their name and address in the database. In a real Web site the customer would also specify shipping method and freight and tax

would be calculated. For simplicity, shipping method, freight and tax are not included.

This page contains a button to access the utility ASP PlaceOrder.asp which simulates an e-payment capability such as Verisign's PayFlow Link verisign.com/products/payflow/link/index.html). This provides an opportunity to discuss e-payments including the services provided by e-payment vendors and merchant banks, security issues, costs, and the financial infrastructure that supports e-payments. In the simulation the customer is forwarded to the e-payment site where a simulated Secure Sockets Layer (SSL) page is used to obtain and validate the customer's credit card information. The simulation assumes that the credit card is validated and returns a validation number to another utility ASP (Payment.asp) which sets the order status to 'Credit Approved' and stores the validation number.

It is emphasized that for Web sites with a large volume of transactions outsourcing e-payments in this way could be prohibitively expensive. Hence it also provides an opportunity to discuss the security infrastructure required to capture and maintain this sensitive data in our Web site. This includes public and private key encryption mechanisms, SSL and its associated certificates and use of encryption,Transport Layer Security(TSL), Secure Electronic Transactions (SET), and virtual private these methods are well beyond the scope of this tutorial, summaries can be found in, e.g., Napier, et al. (2003), Schneider (2002), and Amor (2002).

As an exercise students create a Web page to display the customer's past purchases. This requires them to construct a database result similar to that in the Shopping Cart page further reinforcing the database result concept.

6. Order Tracking and Customer Information Maintenance

The final assignment completes the storefront and "closes the loop" by enabling customers to track their orders and maintain their registration (profile) data. Tracking orders for a customer is analogous to displaying the customer's shopping cart. It uses a database result to display all rows in the SalesOrder table for the logged on customer. The Track Orders page (TrackOrders.asp) reinforces the database connection, query, and display concepts introduced in that page. It produces a query result containing data about all of the customer's orders.

Updating customer information is analogous to entering a ship-to address on the Checkout page. The Customer Info page (CustomerInfo.asp) reinforces the database connection, query, display, and user interaction concepts introduced in that page. It displays all of the customer's data in text boxes, allows the customer to modify that data as necessary, and then passes that data

to the utility ASP UpdateAccountData.asp, which performs the appropriate database update.

7. The Production Intranet

As a final exercise students use the production Intranet discussed above. This provides an environment in which to discuss the interface between the Web system and the fulfillment process, i.e., physical system required to deliver purchased products. The Intranet is located at http://mba.vanderbilt.edu/WebStore/Production. The username established for this exercise is Partner and the password is PW (both are case sensitive).

As discussed above and illustrated in Figure 2 there are six functions supported by the Production intranet: Open Orders Report, Enter Shipment, Shipping Report, Product Sales Analysis, Customer Sales Analysis, and Maintain Products. Each has a link on the Intranet home page. Each link opens a new window to enable that function to be performed.

The Open Orders Report shows all orders that are ready to be filled. This is determined by the order's status. Four events are tracked relative to an order's status. When the e-payment vendor authorizes the customer's credit card the order's status is set to 'Credit Approved'. When a warehouse worker (student) selects the Enter Shipment link the first order whose status is 'Credit Approved' is displayed and its status is set to 'In Production'. This insures that an order is picked only once. After filling the order the warehouse worker must press the Ship Complete button. At this point the system obtains a tracking number from a (simulated) shipper, sets the order's status to displays a packing list that can be printed and attached to the package for shipping. If there are problems with the order, e.g., an item is out of stock, the warehouse person returns any picked items to inventory and presses the Not Shipped button. The system sets the status of the order to 'Hold'. Such orders cannot be shipped until inventory is replenished.

The Shipping Report is designed for management. It displays orders that are currently in process organized by status. As discussed above, an Order Status of 'Shipped' indicates that the order has been shipped complete. 'In Production' indicates that a warehouse person is in the process of picking the order. 'Hold' indicates that the order is waiting for inventory. This facilitates a discussion of order fulfillment policies and the 'fit' of the Web system with corporate policy. The production Intranet requires orders to be shipped complete. It does not support partial shipments or backorders. If these capabilities are required then the software must be modified.

As discussed above, the Product Sales Analysis and Customer Sales Analysis are also designed for management. They display graphs of sales by product and sales by customer, respectively.

8. Conclusions and Directions for Further Development

Upon the completion of the tutorial students are asked to discuss any open issues they can identify with respect to the Web system. These include: returns and credits, site security, site management, backup and recovery, disaster planning, integration of the Web ordering and fulfillment system with an existing information system supporting the "bricks" part of a "bricks-and-clicks" company (e.g., Target and Target.com, WalMart and WalMart.com, or Barnes and Noble and BarnesAndNoble.com), accounting and e-payment reconciliation, partners and supply chain management, alternate forms of payment, and the identification of Web and physical presence customers.

It is emphasized that although this is a rudimentary storefront Web site it could be published to any commercial Web hosting service that supports Microsoft FrontPage Server Extensions and used to run a Web business. Some of the missing components are Credit Card Payments, shipping charges, taxes, and site security. This affords a discussion of acquiring a domain name and Web hosting services, a merchant bank account, an e-payment vendor, and the need to modify the ASPs that handle payments to interact with the e-payment vendor's site.

It is also emphasized that this does not complete the requirements for a Web business. The back-end business processes must also be supported. These include maintaining products and inventories, physical shipments, recording shipper tracking information, handling returns and adjustments, and managing customer relations, aside from basic marketing, finance, accounting, and operations functions. If the Web site is internal to the business the basic distribution functions may be supported by an internal staff and interfaces created within the database (ITEC.mdb). If it is outsourced (hosted), additional Webs must be created to access the database. In addition, if inventory is maintained, it is likely that a Purchasing system exists and must be interfaced with the sales system. If the business has marketing programs that affect pricing or wishes to include "banner ads" on its site or pays other Web sites for "click throughs" or …The Web system, its database, and procedures would need to be modified accordingly.

The fundamental task is to identify problems, opportunities, and tasks for which information technologies can contribute to the business through reducing costs and increasing revenues. These may involve capturing orders or interacting with vendors electronically. They may involve making data available to employees, customers, vendors, banks, government agencies, investors, and the public at large. They may focus on customer satisfaction, compliance, marketing, operations, or finance. The tutorial and assignments have focused on the basic capabilities of "customer side" EC applications and provide a base from which students can participate in the analysis and design of business processes that take advantage of these capabilities.

The approach to teaching e-Business concepts described in this paper can be adapted to a number of different environments, primarily those focusing on person-to-computer interactions. These include selling physical as well as digital goods and services. Templates can be developed to support bidding for online auctions, downloading digital documents or audio / video files, buying or selling stocks and other financial instruments, online bill presentment and payment, etc. Although each presents different interface and interaction requirements, the fundamental concepts of identifying customers, transacting product purchases (bids), managing payments (monetary transfers), and "delivering" the purchased products are analogous.

For courses emphasizing business to business (B2B) electronic commerce, the focus shifts more toward computer-to-computer interaction. Templates can be developed to support the person-to-computer interaction common to early e-marketplaces. These typically require multiple product catalogs and customer-specific pricing. However, it is more difficult to use this approach to illustrate the computer-to-computer interactions, e.g., for purchasing and shipment notification, that are becoming more common in such sites. This requires a more sophisticated development environment such as Microsoft .Net (Platt 2002) or J2EE (Kurniawan 2002).

Finally, for managerially oriented courses, students could *use* rather than develop the Web system to gain an understanding of the fundamental e-business processes and the link between the physical and cyber worlds. Assignments could relate to exploring the characteristics products, markets, customers, and organizations where such e-business processes support the business strategy and where they conflict with it. For example, students could use Porter's value chain (Porter 1985) to identify where e-business capabilities could be used to enhance the competitive position of the organization beyond Marketing and Sales and Outbound logistics. After-sale customer self-service, for example, is a major area where the type of capability provided by a Web system can be effectively used. Allowing customers to track orders and display their past purchases are rudimentary and commonly provided services in this area. However, these can be greatly enhanced and expanded to provide such capabilities as links to the shipper's tracking system, XML formatted shipping notifications, warrantee and use information, spare parts, and standard customer purchases.

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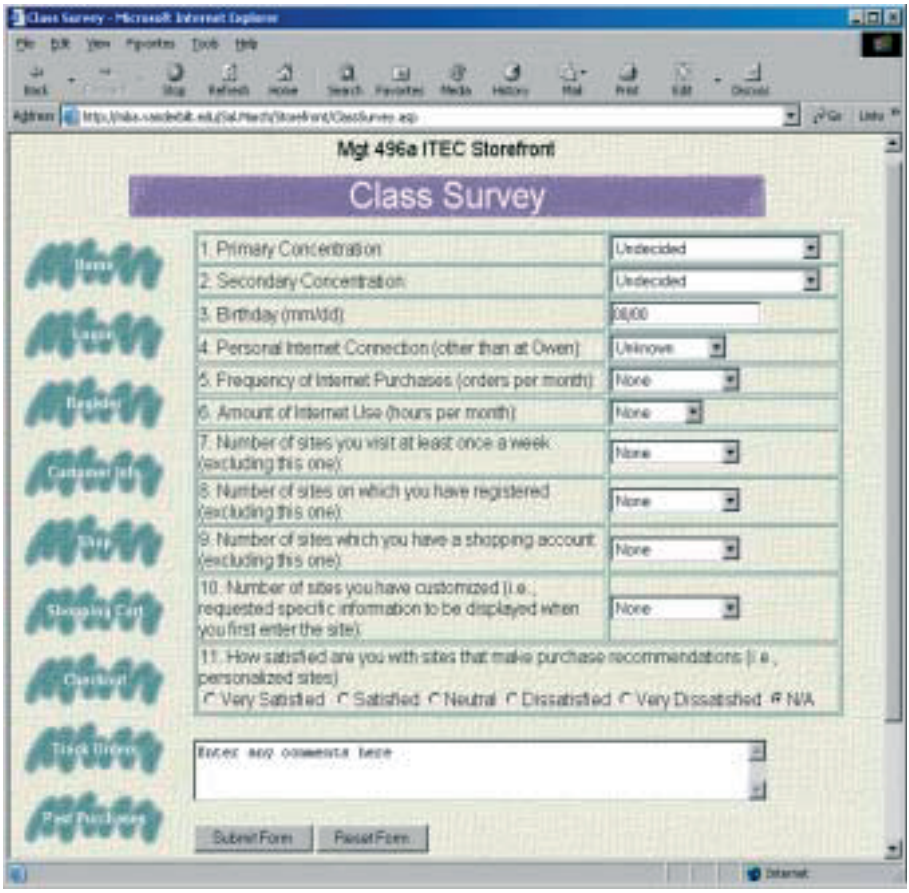
Appendix A. Web Survey and Sample Results

A.1 Example Web Survey



A.1 Example Web Survey Results