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__________________________________________  ________________________________
Justin Moeller  

__________________________________________  ________________________________
Professor Russell McMahon, Faculty Advisor  

Date  

Date
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Abstract

The Sales Web site and Store Application for Jetsoft Development is a completely integrated retail Web store solution that is designed to provide the company with an easy-to-manage system for their software retail site, ScanHelp.com. The current store system Jetsoft has in place is disjointed from the Web site, and is no longer standards-compliant since it is nearing eight years of age. The experiences by the main user groups are very important to the design of this product. The Customer is greeted by a user-friendly front end where they have the ability to browse, compare, or search products using several different methods. Then they have the option of adding items to a shopping cart and checking out securely. The Administrator has full control over the Web Application using the built-in Administration Center. Results expected from the implementation of the new Web Store system are improved accessibility, security, and an increase in employee productivity. The system eliminates the need to write code to update Web Site content through a rich text/HTML editor. Previously, using a code editor was the only way to make updates. This method was not only time-consuming but was error-prone. Payment processing also takes place securely using the Authorize.Net payment gateway system over a secured connection. It is important that Jetsoft Development use much newer technologies so the lifespan of the product is maximized. The major technologies used are ASP.NET with C# on the .NET Framework 3.5, developed in Visual Studio 2008. The relational database system used is Microsoft SQL Server 2008.
1. Problem Description and Intended Use

Jetsoft Development is a company who provides two main software services. They provide custom software development services – often including web development – in addition to selling desktop scanner software and document management software via their website, ScanHelp.com. However, their website is several years old and in need of a rewrite on the front end and the back end. It has had minor updates throughout the years, but it has been patched so many times it is not feasible to update it anymore.

ScanHelp.com has an online store, but it has outgrown the out-of-the-box system that was implemented (but not integrated) into the site. A new store will be written and integrated with the new site. It will share the same database (as opposed to the previous version) so that updates will only need to occur in one place.

1.1 Statement of the Problem

Currently, the store is disconnected from the main site, which is made of static HTML pages. When a product update is required, not only does the information in the store have to get updated, but every page that will need to contain this information as well (which is usually more than one) requires a separate update. The current process requires a file to be downloaded using an FTP client, updated with a code editor, and uploaded back to the server. The new store will manage all content in one place, and will affect all pages using the same data. The current store uses a Microsoft Access 97 database file which will need to be migrated to SQL Server 2008. (1)
1.2 Constraints

The owner of Jetsoft Development requires that when updates are needed, it should not require anyone to write code. (2) The interface should be easy to understand, so when new employees (typically people fresh out of a 2-year college program) are given the task, they can administer the store with minimal training. The project will have to utilize the current technologies that their dedicated server is using, which are Microsoft SQL Server 2008 and the .NET Framework 3.5. The current store is using Authorize.net as the payment gateway. The new store will need a method to use the current gateway to process transactions.

1.3 Description of the Solution

The solution to the problem is to develop a new system from scratch. This is the best approach since most of the code in the current system is not reusable. The current site uses at minimum five different major languages or versions (none of which were developed using the .NET Framework 3.5) and also includes many elements hard-coded in each page as static HTML. Many of these code samples were also developed years ago. Since then, standards have changed greatly and much of the code that was formerly acceptable has been deprecated and no longer a best practice. (3) During development, if any part of the current system can be used in the new system, code would be ported over and updated to meet today’s standards. (4)(5) The new site will use C# for .NET Framework 3.5 and SQL Server 2008 for the database. (6)

The new application and store will consolidate some existing logic used in the current site into a three-tier application that will be easily updatable when upgrades
become required in the future. This will eliminate the need for the company to have an occurrence such as this where a complete website needs to be rewritten.

1.4 User Profile

There are two main groups of users who will interact with the system: Administrators and Standard Users. The third “user” is the Authorize.net payment gateway through the use of the implementation of their API. The user descriptions are provided below.

1.4.1 Administrators

Administrators (designated entry-level Jetsoft employees) will have the required knowledge and experience to use a Web browser to conduct all administrative tasks (including all related business procedures and product knowledge – not specifically related to the usage of the application). All administrative tasks can be accessed through the main control panel in the Administration Center. Administrators will be responsible for monitoring sales on the order summary page as well as removing transactions that may need to be canceled. The orders must be monitored regularly to make sure no problems arise from suspicious transactions. They can also update the site content (which mainly consists of product content and descriptions) that will be modified using a what-you-see-is-what-you-get (WYSIWYG) editor on the Product Edit page. Promotions and sales can also be created with various discount levels. The administrator can create special reseller rates via a coupon code for companies who wish to distribute the company’s products. Administrators should not be required to know or understand the
code or database structure as they should never have to run Visual Studio or SQL Server Management Studio to update or manage content.

1.4.2 Standard Users (Customers)

Standard Users are the Customers who are interested in browsing and possibly purchasing software from ScanHelp.com. No technical expertise is required of them to use the site, however it can be beneficial. The type of user who will use the site ranges from individual hobbyists to experienced IT professionals in large enterprises, to small distributors wanting to resell Jetsoft’s products. The site will need to cater to all varying groups of people. It will be easy enough for the least experienced users to find what they need but not simple to the point that experienced IT professionals can’t find the specific details they want. Users will be able to browse the site and add any products they wish to buy to their shopping cart. At checkout, all items will be purchased and if digital download products are ordered, a download link will be sent to the purchaser.

1.4.3 Authorize.Net

The Authorize.net payment gateway processes payments ScanHelp.com sends automatically to it through the API over a secure connection.

2. Design Protocols

Jetsoft Development has a dedicated server that uses an SSL certificate. Currently, ScanHelp.com uses this certificate to provide a secure connection between the server and the user when the user is accessing pages with sensitive content, mainly payment information. This ensures the Customer has confidence that they can submit orders through the system with their information protected. The new application will use
the reissued SSL certificate over an HTTPS connection to continue providing the same security to Customers.

   The store at ScanHelp.com will use Authorize.net as a payment gateway. This will be achieved by implementing the Authorize.Net API Advanced Integration Method, which is the most flexible option when using their software. Customer credit card information will not be stored in the store database for maximum security. The site will use a secure connection with an SSL certificate in order to pass encrypted payment information through the API to Authorize.net. (8)

2.1 Use Case Diagram

   Each user group can interact with the system in various ways. The following figure shows a use case diagram, which represents the different actions the Administrator, Customer, and payment gateway can perform while using the system (See Figure 1, page 6).
2.2 System Requirements

The next sections describe the system requirements for the web server, development machine, and client machine.

2.2.1 Server Requirements

The application and store will require the use of .NET Framework 3.5 and SQL Server 2008, which are the current technologies installed and in use on the server where the new site will be hosted. Portions of the current site use the .NET Framework 2.0. Since .NET Framework 3.5 is an extension of 2.0, no additional upgrades will be required. (9) The server that is hosting the site is a dedicated server controlled and
maintained by Jetsoft’s hosting company, Codero. It hosts many other websites and will be ready for the job without any further hardware modification.

2.2.2 Development System Requirements

The project will be developed using Visual Studio Professional 2008, which is already available for use through the company’s Microsoft Developer Network (MSDN) subscription.

2.2.3 Customer Software Requirements

The Customer can use any cookie-enabled web browser (to keep session state for shopping cart) to use the application. Users who use a JavaScript-enabled browser will take advantage of a more presentable user interface optimized using JQuery. (10)

2.3 Class Diagram

The classes contained within the program are broken out logically. This will give developers (including myself) easy-to-understand units from which objects can be created when coding future versions of this software, such as Products or Orders (See Figure 2, page 8).
Figure 2. Class diagram
2.4 Database

The SQL Server 2008 database backend for the web application is normalized and relational. Many one-to-many relationships exist, requiring data to refer to a record (foreign key) in another table. This prevents error when certain records get deleted. Many tables function as domain entities to force their related tables to use pre-defined values so that all values are consistent (See Figure 3).

Figure 3. Database diagram

The Products table is the main focus of the database, and is the most complex. Each Product holds data about every item that is for sale on ScanHelp.com, which then is used to generate friendly and viewable information on the web pages the Customer will interact with.
Most all columns in all tables are fully normalized, with the exception of a few columns from the Orders and OrderItems tables. There are computed columns in the Order table (Subtotal and Total) to increase the speed of certain queries. Although this data is duplicated (since it could be derived from the OrderItems table), it is useful when viewing a sales reports page. This prevents all data that is generated for display from being calculated every time, thus reducing load time and stress on the database. In the Orders and OrderItems table, it is important to note that any column where a monetary value is stored (PricePerUnit, Total, etc) simply stores a copy of the original Price values (or calculation). This ensures that when a Product’s Price value is updated, it does not change how much a Customer has paid for an item in a past order.

A couple of tables are not linked to others, because they only act as repositories for valid values that may not be required but provide a preset selection if required. Any processed data involving these special tables are handled programmatically. For example, a row in the State table represents one of the 50 States in the US (or District of Columbia), and is selectable on the order form. However, if the Customer lives in a foreign country where a US State value is not valid, they do not have to choose a State and no value is acceptable.

2.5 User Interface

The following sections describe the user interface design in regard to navigation, icons and graphics, color scheme, and help.
2.5.1 Navigation

The web application will be easy to navigate. For maximum accessibility and ease of use, there will almost always be a menu to on the left side of the screen containing the major areas of the application. The only exception is the View Cart/Checkout page, where forms require the entire width of the page. However, that doesn’t mean it won’t be easy to use – it will have navigation links placed in the center of the screen that are easy to find. Which menu items that appear on the side menu will depend on where the user is currently in the application and what access level he/she has. If the user is an Administrator and is using the Administration Center, they will see an entirely different menu, although it is in the same style for visual consistency.

The Administration Center works slightly different in navigation than the main face of the web application. To provide maximum speed in the browser and flexibility in the code, AJAX is used to change the contents of the inner area. When the Administrator clicks on a menu item, the main page display stays the same, while only the inner area gets loaded. Customers may not have the luxury of using a JavaScript-enabled browser, so the main pages the user will see will use standard links for navigation.

2.5.2 Icons/Graphical Symbols

Most icons and graphical symbols will be reused from the former website, including company logos and banners. Other button colors and shapes will be styled with CSS.
2.5.3 Color Scheme

The application will follow a simple yet effective color scheme, mostly using shades of blue and gray, with a simple logo made with red and yellow. To comply with accessibility issues, the colors themselves are not required to be recognized in order to use the site. Text is contrasted well with its background for maximum readability.

2.5.4 Help

The user will be provided with a link on the main menu that will take them to a Frequently Asked Questions page, where help information can be found. A form for requesting sales information or technical support will be provided on the Contact Us page.

3. Deliverables

A number of deliverables were defined in order to ensure the project was well-rounded and complete. The completed deliverables are listed here.

- An application that will provide an entire web store solution with a single code base.
- The application front end will be created so that the user has an interface that they can use to browse store products, place them into the cart if desired, and check out.
- A Shopping Cart will be included to keep track of the items a user wishes to purchase.
• A secure transaction system will be in place with the Authorize.Net API so that the user can place an order safely using their credit card.

• Forms for requesting technical support will be included.

• An Administration Center that will provide administrators (Jetsoft employees) a way to modify and manage all store content and promotions.

• Administrators will be able to create and modify data without a code editor. A WYSIWYG (What You See Is What You Get) editor will be included to save HTML data.

• A printable screen (generated HTML page) will be included that will provide a generated custom purchase order to be saved for redistributed products that require them.

There was also one deliverable that was originally optional, but was not included in the final project. The License Manager may be included in a future release.

• (Optional) A License Manager may be included if there is ample time during the project development process.

4. Project Planning

During the course of planning and development, there were a great number of tasks to be completed. The outcomes and expectations are described in the following sections.

4.1 Schedule

The complete projected process of the project is detailed in the following Gantt chart (See Figure 4, page 14).
Each element of the project has been completed in sprints of at least one week long, most always ending on a Monday to be consistent with the Senior Design schedule. The largest task involved in this project is completing the modules for the web store. This is because it is the most important, and will need to be the most polished part of the entire application since it will be the main tool Administrators will use to run the application. Not only is it important for the store to be well-made, but the front end visible to the Customers will be directly impacted by the store content created and managed by the Administrators. Note also that there are several weeks dedicated to testing the front end and the back end, not only by myself, but by a sample group of users. A significant amount of time was also required to integrate payment processing into the site. The security of the system needed to be evaluated because payment security is important and ample testing time was required. The individual quarterly projections (See Figures 5 and 6, page 15) can be compared with the complete timeline from Figure 4.
4.2 Resources

The resources for this project mainly consist of myself for an estimated 10-20 hours every week and my notebook computer for development. Several other people,
including peers and those who work at Jetsoft, will sporadically aid me when entering a testing period. Finally, the server which currently hosts ScanHelp.com (hosted by Codero) will be the other resource for this project.

4.3 Budget

The table below shows the projected cost of development. All elements used in the system and its development have already been licensed or paid for through the company’s MSDN subscription. Although the MSDN subscription has other purposes within the company aside from this project, the cost is still listed (See Figure 7).

<table>
<thead>
<tr>
<th></th>
<th>Company Cost</th>
<th>Personal Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSDN Subscription (Renewal of existing subscription)</td>
<td>$799.99</td>
<td>$0.00</td>
</tr>
<tr>
<td>Visual Studio Professional 2008</td>
<td>Included in MSDN Subscription</td>
<td>$0.00</td>
</tr>
<tr>
<td>SQL Server 2008</td>
<td>Already licensed for other purposes – no extra cost</td>
<td>$0.00</td>
</tr>
<tr>
<td>**Total</td>
<td>$799.99</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

Figure 7. Budget

5. Proof of Design

The next sections prove the success of the project by showing how each of the promised deliverables have been met.
5.1 Complete Web Store Solution

This deliverable includes the other deliverables and is the main purpose for the project. Without a storefront, shopping cart, or a way to administer the web site or store, the Web Store would not be considered a complete solution. The Administration Center is the backbone of the application and is described in Section 5.6.

The home screen for the Web application is the main entry point for most users. Here, Products marked as “featured” in the database will appear. This is also where anyone can gain access to the various elements of the site, including the Product search, shopping cart, and checkout (See Figure 8).

Figure 8. ScanHelp.com home screen
By clicking on the View More Products link or the Software menu item, all active Products will be shown. From here, the user has the option to search the products using either of the search functions (explained in Section 5.2) or view a Product from the current listing (See Figure 9).

![Figure 9. Products (all) page](image)

When the user decides on a Product to view, they will click on the View Product link. This will take them to the Product details view, where they can view all information about a Product, register for a free trial version (this form can be seen in the Appendix), or add it to the shopping cart (See Figure 10, page 19).
Figure 10. Product details view

The user can also access their personal information (the My Account page can be seen in the Appendix) to view up make updates if they wish. If the user has an account with ScanHelp.com and are signed in, they will access this page by clicking on their username on the top menu bar.

To sign in, the user will click the Sign In link at the top of the screen. They will be presented with the sign in screen (See Figure 11, page 20).
Once signed in successfully, the user will be signed in for as long as they are active on any ScanHelp page or until their session times out. For security, the sign in session will timeout after 60 minutes of inactivity. Notice that when a user signs in, they begin using a secure connection over SSL (See Figure 12).

5.2 User Interface

The User Interface was designed to provide an easy and accessible way to find Products quickly without having to browse many selections. Two search options are presented to the user at the top of the Products (Software) page. The first search function is the Category search. The user can click on the drop down menu to limit the Products
available for sale to a specific Category (defined using the Administration Center). Results are returned when the selected Category changes (See Figure 13).

The second method of search is by using a keyword. For instance, if a user were looking for a product with Optical Character Recognition (OCR) capabilities, they could enter that keyword into the search box and click the Search button. All keywords assigned to a Product are defined using the Product edit screen in the Administration Center. All Products with the specified keyword (or similar keyword) are returned (See Figure 14, page 22).
If the user is deciding between two Products, they also have the option to compare Product features to decide which one best fits their needs. On the Product Comparison screen (accessible from any Product or search result page), two drop down menus are displayed with default selections, representing Products available for sale. Comparing Products is easy. The user will need to change one Product at minimum to show a Feature comparison chart. All Features that either Product (or both) have will be shown in the table (See Figure 15, page 23).
5.3 Shopping Cart

The Shopping Cart contains each item a Customer wants to purchase, along with the quantity of that item desired. The Cart page automatically gets displayed when a Product gets added to the cart. It is also accessible by clicking the Cart link from the top-right corner of the page. From here, the Customer can remove or change quantities of items in the cart. Also, if a Discount Code is known, they can enter the code in the provided box. After making changes to the Cart, the User will need to click on the Recalculate Totals button to update the Cart totals. The cart can be seen in the next Figure (See Figure 16, page 24).
5.4 Secure Transaction System

When shopping online, security is very important. This issue is addressed by using an SSL connection to encrypt sensitive data passed from the client machine to the Web server. When checking out (or signed in with any other page), the lock icon is displayed in the browser, to indicate a secure connection is being used (See Figure 17).
Below the Shopping Cart items, the checkout section of the page is shown. This is where the user will enter their billing and payment information. All fields in bold are required. Once the information has been filled out, the Customer will click the Place Order button. If a returning Customer has signed in prior to checking out, their information (excluding payment information) will be filled out automatically. If any required fields are not filled out properly, they will be prompted to correct the issues before trying again. Once this measure has been passed, the information from the form will be submitted to the server. If there was any problem with the information provided, the Customer will get a friendly error message describing the problem. This includes payment declination messages related to error codes returned from Authorize.Net. If an error was found, the Order will not process until valid payment information has been provided. The next Figure shows this page (See Figure 18, page 26).
Once an Order has been placed successfully, the Customer will be directed to a Thank You page. This page also will display a success message along with important details about the Order, including the Order Number and download links to digital files (See Figure 19, page 27).
5.5 Technical Support Form

If a Customer cannot find the information they are looking for, or have a technical problem with a Product, they can visit the Contact Us page via a menu selection on the left-hand part of the screen. From here, they can submit an email to the sales or tech support email addresses (selected with the radio button on the form). Once the form is filled out, the Customer can click the Submit button. This will generate and send an email to the appropriate email address with the information provided (See Figure 20, page 28).
5.6 Administration Center

The Administration Center is the backbone of the Web application. It is a tool used to create, modify, or delete almost any content found on ScanHelp.com.

5.6.1 Sales Overview

When an Administrator signs in (using a different login screen), they are immediately presented with a general monthly sales report. The home screen gives the Administrator a quick glance at how sales are doing for the current months versus previous months (See Figure 21, page 29).
Another reporting tool is included in the Administration Center: the Orders page. This page lists each individual order in the table, sorted by order date, with the most recent order at the top. Only the most important details are shown at this level. From this screen, the Administrator has two options to manage the orders: view the details of a specific Order or delete it (See Figure 22, page 30).
To delete an order, the Administrator will click the Delete link and a confirmation prompt will appear. If confirmed, the Order will be removed (flagged as removed in database, not actually deleted) and will no longer appear on this screen or be calculated in the sales report on the initial report screen.

5.6.3 Order Details

If the Administrator needs to view the details of an Order, they will click the Details link. A new screen will be presented, showing all details about an order, including totals, payment and delivery methods, and basic customer information (See Figure 23, page 31).
Figure 23. Admin – Order details

From here, the Administrator can return to the Orders overview screen, or print any applicable purchase orders (PO) by clicking the Print PO link. The purchase order functionality is explained in more detail in Section 5.8.

5.6.4 Products

The Products screen is one of the main features of the Administration center. From here, the Administrator can add, edit, or delete Products for sale in the store (See Figure 24, page 32).
Many properties of a Product can be set on the Product edit screen. The available categories, license types, companies (first or third party), and supported features/operating systems are loaded dynamically from the database. These selections are all defined on their respective screens, accessed from the main menu on the left-hand side of the screen. Since there can be multiple supported operating systems or product features assigned to a product, the Administrator can make multiple selections from the list box in the appropriate area. Any selected features (or operating systems) can be moved from the Available (not selected) to the Selected box, and will be updated when the Update button is clicked (See Figure 25, page 33).
When adding a new Product, the same screen is shown with a blank form. However, products must be ‘activated’ manually, meaning it won’t be immediately visible on the storefront at the time of creation. Each Product has a description, which must also be edited after creation. The Product description editor is a WYSIWYG form that allows an HTML description to be generated without actually writing any code. This feature is explained in detail in Section 5.7.

5.6.5 Domains (Simple Types)

A number of screens (Payment Methods, Shipping Methods, Categories, Product Features, License Types, Supported OS, and Companies) are designed to modify selections that are required by other, more complex types, such as Products or Users.
These simplistic screens are designed to allow quick modification to these lists. Upon viewing, the Administrator is presented with the current list of items, plus an empty row at the bottom, ready to accept a new entry. When editing or adding, the changes are immediate when the Edit/Add/Update links are clicked. The Product Categories screen is a good example of this type of screen and is shown in the next figure (See Figure 26).

![ScanHelp.com Administration Center](http://example.com/admin.png)

Figure 26. Admin – Categories

Since the other screens of this type are very similar to this one, the others are not shown here, but can be seen in the Appendix.
5.6.6 Promotions

To view the current coupons (active or inactive), the Administrator can go to the Promotions page. A quick overview of each promotional code (including the standard reseller discount) is seen initially (See Figure 27).

![Figure 27. Admin – Promotions](image)

Much like editing a Product, the Edit link will take the Administrator to the Promotion edit screen. From here, details about the Promotion can be viewed or changed. The start date and end date lets the system know if a current discount code can be used during checkout on a specific date. This is good if the Administrator wants to set up a future promotion, but not be available yet. The amount box determines how much money is deducted from the total price of an order (in US Dollars). The “Is Percent” check box
determines whether or not the Amount is a percent taken from the order or a flat Dollar amount. The Update link can be clicked to save any changes to the database (See Figure 28).

![Figure 28. Admin – Promotion edit screen](image)

**5.6.7 Users**

The Users screen is much like the Promotions or Products screen. An existing User can be modified, or a new user can be added here (See Figure 29, page 37).
Although it is unlikely an Administrator would add a new Customer profile to the system, they can specify who gets Administrator privileges. All Users created by any other manner (placing an Order through checkout, etc.) do not get Administrator privileges by default. These privileges and other properties can be set on the User edit screen (See Figure 30, page 38).
5.7 WYSIWYG Editor

The Administration Center includes CKEditor, a what-you-see-is-what-you-get (WYSIWYG) editor, to perform any content updates for product descriptions, which is the main purpose of the site, second to selling products. If products are not described properly, people will not likely know what they are looking at, and the business might lose a sale. Plain text is not enough to grab the attention of the user when browsing various products (See Figure 31, page 39).
When an Administrator is on the Product Edit page, they can click the Edit button to display the Editor in a pop-up window. The Editor window provides the Administrator with many options in creating rich text (as generated HTML), from highlights and font styles to hyperlinks and image references (See Figure 32, page 40).
Although the goal of this addition is to eliminate the need to write HTML, the Administrator still has the option to so by clicking the Source button to toggle HTML view and rich text view. When content is submitted, it is validated and cleaned to prevent malicious code (intentional or not) from penetrating the system.

5.8 Printable Purchase Order Screen

Sometimes when an order gets placed that contains an item that is resold by ScanHelp.com, it needs a purchase order (PO) before the transaction can finalize. From the Order Details screen, a printable PO can be generated automatically by clicking the Print PO link (See Figure 33, page 41).
Figure 33. Order details: print PO

Each product that is being ordered from a specific company is generated and itemized on the form. A new screen appears, showing the completed form with all relevant information about the order, including costs, quantities, and shipping method (See figure 34).

Figure 34. Purchase order
6. Testing

Frequent tests have been a fundamental part of developing this system. These tests have been performed on each page of the web application as well as when the database was modified. This happened every time I completed a page, form, function, or stored procedure. This is to ensure that the system can handle the application as it is intended. User acceptance tests also took place to make sure the client was satisfied with the solution I provided.

6.1 Stress Testing

The procedure for testing a new page consisted of several steps. First I would navigate to the newly created page to check if it loads and displays the correct data generated from the database. If forms were included on that page, I inserted nonsense or invalid text into each field to make sure the form validation worked properly, ensuring that the data submitted was in the correct format and that no unwanted data such as a SQL command or other malicious code was submitted. When successful at preventing incorrect data submission, a proper error message was displayed on the screen and the database remained unchanged. After testing form submission, the database was always checked to ensure that it remained free of unwanted or inconsistent data. Bugs were tracked and recorded so that any module with an issue could be debugged, fixed and retested to ensure the problem no longer existed. All UI tests took place in every major web browser: Internet Explorer, Firefox, Opera, Chrome, and Safari. Cross-browser compatibility is very important. If any function did not work in a particular browser, the code was updated or rewritten until desired results were achieved in every browser.
Other elements that were less critical, such as hyperlinks and UI elements were also tested, such as navigation links and CSS styles. Although nothing such as this should have caused a page to crash, basic usability needed to be ensured. Hyperlinks were tested to make sure they redirected the user to the right place. New images and styles were tested in each browser to make sure they load correctly and were aligned properly.

6.2 Usability Testing

General usability testing was performed to ensure that user performance has increased over that of the original Web site. Tests were run on the original ScanHelp.com Web site and the new version to compare the differences between the two.

An employee from Jetsoft Development ran a simple test (on each system, original and new) to measure how long it would take to update the text of the brief description of a Product (which is shown on the home page) and add a single line of text to its full description (which is shown on the Product detail page). The data for this test is shown in the following table (See Figure 35).

<table>
<thead>
<tr>
<th></th>
<th>Original ScanHelp Site</th>
<th>New ScanHelp Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Time to Edit</td>
<td>6 min. 30 sec</td>
<td>&lt; 2 min</td>
</tr>
<tr>
<td>Lines of code written or modified</td>
<td>3+</td>
<td>0</td>
</tr>
<tr>
<td>Programs used</td>
<td>3 (FTP client, code editor, Web browser)</td>
<td>1 (Web browser)</td>
</tr>
<tr>
<td>Files modified</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 35 - Usability testing results (update content)
As the table indicates, a significant amount of time was saved by using the new ScanHelp Web application. Not only was the amount of time spent less than one third of the original, but no lines of code were written, no files were modified, and only the Web browser was used to make the changes. When updating the original Web site, an FTP client was required to download multiple plain HTML files from the server. A code editor was then required to edit the files, and then the FTP client was used again to upload the modified files back to the server. Changes needed to be verified in a Web browser to make sure there were no errors. Note: the timed results for the original system only include the time to update the HTML; it is not including the time required to modify any content in the original Web store system.

Even when performing the simplest of tasks, it is clear that the new Web application makes updating site content much faster, more reliable, and also greatly reduces risk of error. The time saved is much greater when performing larger updates where there are many more changes that need to take place, especially if the content from the original Web site would have needed to be modified in multiple files or its store system.

6.3 User Acceptance Testing

User acceptance is also very important in a sophisticated (and highly visual) application such as this. Various demonstrations to the owner of Jetsoft have proved the success of this project. While there have been some suggestions for improvement along the way, the overall outcome of this project has been positive and promising. He seemed
to be impressed with the general flow of the application, especially when comparing this system to the previous system.

7. Conclusions and Recommendations

7.1 Conclusions

This project was designed to suit the growing business needs of Jetsoft Development. It was intended to replace the dated and inefficient Web store system they were outgrowing. A number of key deliverables were set for this project and each promised deliverable was met. This project took the span of three Senior Design quarters, with each being more intense in workload than the last. As deliverables were being met, testing took place, where I was able to fix the bugs in a reasonable amount of time. The experience gained in the areas of development, project management, and communications have been incredibly valuable as I have been forced to think about aspects of these areas I might not have thought of or experienced otherwise.

7.2 Recommendations

I have several recommendations based on my experience with this project. Some are technical and some are project management-related.

7.2.1 Project Management

Do not wait to get started. The earlier you can begin working on the project, the less stress you will have to endure during each Senior Design term. You do not want to wait until the last minute and run a coding marathon without having ample time to test.
Document everything. When deadlines are approaching and there is still more work to be done, it is easy to stop documenting entirely just to get the code written in time. This can be dangerous because a piece of code that has gone unseen for three months and hasn’t been documented may be very confusing to understand. If you stop documenting temporarily, make a note to go back and finish after you get caught up.

7.2.2 Technical

If using AJAX, use JQuery. In my experience with this project, JQuery made AJAX calls much more manageable than when using the standard .NET AJAX controls.

Use master pages when developing pages in ASP.NET. This saves a lot of time when you have many similar pages to create. Also, for a more customized layout, I suggest nesting master pages if you have similar designs.
References


Appendix

Figure 36. My account
Figure 37. Demo registration form
Figure 38. Admin – Payment methods
Figure 39. Admin – Shipping methods
Figure 40. Admin – Product features
Figure 41. Admin – License types

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Description</td>
<td>Number of PCs per License</td>
<td>Transferable?</td>
<td>Action</td>
</tr>
<tr>
<td>1</td>
<td>Single User</td>
<td>1</td>
<td>True</td>
<td>Edit</td>
</tr>
<tr>
<td>2</td>
<td>Server License</td>
<td>10</td>
<td>True</td>
<td>Delete</td>
</tr>
<tr>
<td>3</td>
<td>Network License</td>
<td>25</td>
<td>False</td>
<td>Edit</td>
</tr>
<tr>
<td>4</td>
<td>Enterprise License</td>
<td>500</td>
<td>False</td>
<td>Delete</td>
</tr>
</tbody>
</table>

*Add*
Figure 42. Admin – Supported operating systems
Figure 43. Admin – Companies