RAPID WBT DEVELOPMENT WITH TEMPLATES

Gary Hegenbart USCG Training Center Petaluma Instructional Support Team Leader Soza & Company, Ltd.

ABSTRACT

Converting classroom based courses to web based delivery can be difficult, time consuming, and costly. Classroom instructors often lack the skills needed to develop online materials using traditional development tools. The U.S. Coast Guard is facing these challenges as they work to convert courses to web based formats. The problem is often complicated by reductions in instructor staff and small development teams. Faced with these challenges the Instructional Support Team at U.S. Coast Guard Training Center Petaluma developed a template based approach to course development that allows instructors and subjects matter experts to populate course content using Microsoft Word. The Web Development Template was initially developed to assist in the conversion of one course to webbased training. The template sought to meet very specific criteria for the course and the instructors. However, once the project began the team quickly realized how the template could be applied to other courses to reduce development time.

This paper will describe the goals of the template, the processes employed to develop courses using the template, how the template works, and the requirements for implementing this approach. Also discussed are the skills required by instructors and the amount of assistance required from media developers. Data on the development time of the template and development for courses will also be presented.

BIOGRAPHY

Mr. Gary Hegenbart is an Instructional Technologist and Media Designer for Soza & Company, Ltd., and a staff member of Training Center Petaluma's Instructional Support Team. He has served as the center's primary instructional media and interactive courseware (ICW) developer for the last four years. As project leader, he has successfully developed a wide range of highly cost-effective technology based training products. A recognized expert within the Coast Guard's human performance technology (HPT) community, Mr. Hegenbart is a regular presenter at Coast Guard ICW and HPT conferences and workshops. He also provides training for other Coast Guard personnel on the IT/PT tools used at the center. He has a B.A. from California State University, Chico and a MAEd from San Francisco State University.

OVERVIEW

The Web Development Template was initially developed to assist in the conversion of Yeoman "A" School from a self-paced, paper based course to an asynchronous web delivered course. The paper-based course was comprised of six books totaling over 800 pages of printed materials and 240 hours of instructional time. The Yeoman instructors' desire was to move the course to an online format, but they lacked the skills and time to develop the course. The course manager asked the Instructional Support Team (IST) to help develop a solution. Using traditional development methods, the course would have taken years to develop given the limited personnel resources available. The IST had been researching template-based approaches to CBT development and decided this course was an ideal project for a template.

The main goals of the template were to allow instructors to easily update content and speed up development time. Several factors influenced the decision to created a template-based course:

- The development team consisted of only three people, so they could not manually convert the content to web pages.
- The Yeoman instructors lacked the web development skills necessary to covert content.
- The Yeoman "A" School schedule did not allow the instructors time to learn web development, and afforded very little time between classes to work on the conversion.
- The course changes frequently, so the instructors needed control over the content to make updates without assistance from the IST.
- Several instructors were due to transfer during the conversion process so any training given to the instructors would be lost.

Yeoman Course Design

Prior to starting development of the online course the Yeoman course was already self-paced and the instructors wanted the online course to run basically the same way as the existing course. As students worked through the course they had to complete numerous selfevaluated exercises and then see the instructor when testing was required. Students did not have to complete a test before moving to the next section, but most students did work through the course in the sequence presented and took tests before moving on.

A key component of the course was the counseling each student received from an instructor prior to testing.

Basically, when a student felt ready for the test they would walk up to an instructor and request the test. The instructor would then ask the student questions about the content to determine if the student was prepared. Often, instructors would role-play scenarios based on the content. This one-on-one interaction with the student did not take much time, but was a critical factor in the course because it allowed the instructors to see how students interacted with people asking questions, especially in role-play situations. Yeomen in the field spend much of their time interacting with customers and answering questions, so the instructors wanted to make sure these counseling sessions remained in the course as a way to ensure that students would interact appropriately with customers. Other than counseling there were no other interpersonal interactions required in the course. For students taking the online course from their home unit the counseling takes place over the phone, which is actually how Yeomen usually interact with customers. Tests are emailed to the students and completed work is emailed or faxed back to the instructors.

Another concern was that students often used the course books as references in the field, particularly the exercises. The course materials were especially useful in studying for Service Wide Exams, the tests the Coast Guard uses as part of the advancement process. In the paper-based course students took all their course books with them when they finished. Rosenberg (2001) states that often computer based training courses are worthless after the initial use because they do not allow students easy access to the information as a reference. Instructors wanted students to be able use the online materials as a reference after the course was completed. The online course does allow students to come back and go through the material again. Even student exercises are stored for future reference.

The Yeoman course is extensively reference based. During the training students will refer to over 10 different references, all of which are online. Students in the course require access to these references during and after the course. As a result, a link to all the online references appears on every page of the online course and on the home page. When students click the "References" link a new window opens listing all the references. The new window allows students to keep their place in the course while looking up information in the reference.

DEVELOPING COURSES WITH THE WEB DEVELOPMENT TEMPLATE

The Web Development Template has three components: the Content Document, the Content Web

Page, and the Course Management System (CMS). The Content Document is used by instructors or Subject Matter Experts (SME) to author the course content. The Content Web Page displays the content authored in the Content Document. The Course Management System allows instructors to create exercises, view student progress, and update student information. Typically the course has a web site that links students to the Content Web Pages and instructors to the CMS.

How It Works

The heart of the Web Development Template is the Content Document and the Content Web Page. These two pieces of the template allow the instructors to manage content without assistance from any web developers, as long as some standard guidelines are followed. The easiest way to explain the how Content Document and Web Content Page work together is to start by explaining how the content is displayed on the web page.

The Web Content Page is an Active Server Page (ASP) that dynamically pulls in content exported from the Content Document. When a student clicks a link to a

course page the link always goes to the Content Web Page along with a variable that specifies what content file to display. The Content Web Page evaluates the variable, retrieves the appropriate content file, and displays the content file in the content area. The Content Web Page also displays a table of contents for the current section and assigns values for to the navigation buttons (see Figure 1).

The content files that get pulled into the Web Content Page are generated by the Content Document. A macro built into the document allows the instructor to export the content whenever changes are made. The macro performs three major functions: First, it inserts the necessary html code into the document so the content displays correctly and all associated media files (e.g. pictures, sounds, etc.) are properly linked. Second, it exports the content into a series of text files that are pulled into the web page. Finally, it creates an index of all the exported files that is used to generate a table of contents.

Development Process

Developing courses using the template is really a

Figure 1 - Content Web Page



Navigation Buttons

partnership between the instructors (or whomever is responsible for the course) and the development team. In the Coast Guard instructors don't typically have web development skills, but they are experts in their respective fields. Because of this the IST takes responsibility for the web development while the instructors are responsible for all content and data entry. The IST uses a standard set of web pages that speed up the development of the web site. The site employs Active Server Pages to pull content authored by instructors into the site. Most of the work for the development team is in the graphic design. We don't expect the instructors to do any of the web development work, but rely on standardized procedures to reduce development time. As a result the process of developing a course involves less than 80 hours of work for the IST.

The development process has six phases:

- 1. The instructor or instructional designer creates the content outline. A typical curriculum outline usually works well.
- 2. The IST uses the outline to setup the Content Document. The Content Document is a Microsoft Word document that becomes the shell for authoring content. If the course content already exists in a Word document, the existing document can be modified to become the Content Document.
- 3. The IST sets up the web site with input from the instructor. This includes setting up the Content Web Page that displays the course content.
- 4. The IST also sets up the CMS based on the instructor needs. The IST uses a template for the CMS and template web pages that include the ASP code necessary to dynamically update the CMS database. If a lot of modifications are necessary the development time will increase.

- 5. The instructor or SME works on populating the Content Document while development of the web site and CMS takes place.
- 6. Once the content is ready the instructors run the macro that is built into the Content Document to export the content for inclusion in the Content Web Page. The instructors then directly upload the content or work with the web server administrator to upload the content.

Development Time

The IST spent 436 hours developing the Yeoman course and the template. That is a lot of hours, but considering the course is 240 hours the ratio of development time to instructional time is still less than 2:1. Much of that time was spent developing the template and refining the process, but a substantial amount of time was spent on tasks that would not be repeated by the IST for other courses. The total time spent by the IST to develop the template and get the course online can be broken into five major categories: macro development, formatting content, ASP and CMS development, web development and graphic design, and other activities (see Table 1). Just taking into account the development time of the macro and web site, the actual time spent on development was 305 hours.

To develop another course the IST estimates it would require about 25% of the actual development for the first course, or about 76 hours (see Table 2). Remember that the content development is separate from the presentation development. In reality, there probably wouldn't be much time spent on the macro, but more time on web development and CMS modifications.

The development time does not account for time spent

Development Categories	Hours	Actual Development Hours
Macro Development	79	79
Formatting Content	100	0
ASP Development & CMS	141	141
Web Development & Graphic Design	85	85
Other - Meetings, Planning	31	0
Total	436	305

Table 1 - Development Hours for Yeoman Course

Development Categories	Actual Development Hours for first course	Estimated development hours for additional course
Macro Development	79	20
Formatting Content	0	0
ASP Development & CMS	141	35
Web Development & Graphic Design	85	21
Other - Meetings, Planning	0	0
Total	305	76

Table 2 - Development Hours for Other Courses

by the instructor or content author. The content for the Yeoman course was basically completed before the project started. The content just had to be formatted to work with the macro. Data on the amount of time instructors spent formatting the content is not available. The amount of time spent by content developers will vary greatly depending on the length of the course and whether or not the course already exists. Existing courses will probably take less time to develop because the content is already complete and will only need to be put into the Content Document and reformatted.

Updating Content

Because the content is separate from the web site and is stored in the Content Document, instructors can make changes and updates whenever necessary. For the Yeoman course the instructors update the content on a continuous basis, but only run the macro and copy the files to the web server once before each class starts. Content updates are not posted to the server during a class, thus ensuring all students in a class see the same content.

In order for the instructors to update content, they have been given access to the web server and can copy files directly onto the server. This works for the Yeoman instructors because they are on the same local area network as the web server. This arrangement was set up before development began. If access to the server had not been an option, then FTP access could have been set up.

Prior to the implementation of the web-based course instructors typically spent about two weeks preparing for a class. Also, in order to ensure the printed materials were ready by the time class started instructors had to deliver the materials to the print shop two weeks in advance. With the online course instructors can copy the files to the server the day class starts. Instructors estimate an 80% savings in prep time for each course, mainly because they do not need to worry about formatting content for the printed page.

SKILLS REQUIRED

Instructor Skills

One of the major goals of developing the template was to not force instructors into development roles they were not accustomed to and required skill sets they didn't have. Since the paper-based course was developed in Microsoft Word we assumed instructors had basic skills in that tool. Many of the references used by Yeoman to do their job are online so we also assumed instructors would be familiar with Internet Explorer. Those two programs comprise the minimum skill set for instructors. Other development skills are desirable and will help in the development of online courses.

Web Development Since the courses are online, obviously web development skills are useful. The content of the course is displayed in the Content Web Page as previously described, but there are several other pages that do not include dynamically generated content. If the instructor has basic web development skills or can use programs like FrontPage or Dreamweaver, they can make changes to web pages in the site.

Computer Graphics Having a basic understanding of computer graphics programs and how to prepare images for the web is desirable, especially for courses that require large amounts of images and graphics. The Yeoman instructors prepared most of the images used in their course with very little assistance from the IST. The image preparation included scanning, cropping, resizing, and saving as GIF images and JPEG images.

Nurturing Instructor Skills While instructors can't always be expected to be proficient multimedia and web developers, the more skills they acquire the more empowered they become. The IST's goal is to develop products that the customer can manage. Sometimes that involves providing the instructors with some training on a particular piece of software. When the instructors are part of the development process and feel they have some control of changing the course, they have more ownership in the project and work harder to make sure it is a success. With the Yeoman course we noticed a radical change in instructor enthusiasm about the course conversion as they became more involved in the development, even when they were just scanning and resizing images.

The IST had developed products in the past where instructors were not involved in the development process and had no way to make changes on their own. The result was the instructors felt disconnected from the content and the maintenance of the course became a burden to the IST. Using a template approach, the instructors stay connected to the content and the IST has a very small role in maintenance. This basically means the IST can work on more projects for more customers even with a small staff.

From the instructor perspective, working with the template is very easy. Initially it was a shift from the way they had traditionally developed and maintained the course, but once they spent a few hours working with the Content Document and then transferred the files to the server they saw how easily they could maintain the course. The IST worked with two Yeoman instructors for a couple of hours showing them how to format content in the Content Document and how to enter exercises in the CMS. After the initial session those two instructors were able to work independently on the course, and then go back to show other instructors how to maintain the course.

Developer Skills

Since some changes to the template, CMS, and web site are necessary for each course using the template, the developers must have certain skills. Primarily, advanced web development skills are required. This includes a thorough knowledge of HTML and Cascading Style Sheets. The major web development technology used is Active Server Pages. ASP is used in virtually every web page and is the core technology used to display the content and communicate with the Access database that is part of the CMS. The ASP pages were coded using VBScript, which is very similar to JavaScript. Most of the coding was done using FrontPage 2000 and Notepad. Other web development tools can be used as long as they allow you to edit the HTML code of the page. Very little work was done in "Normal" view in FrontPage.

Having a good graphic designer is a must if you want professional looking interfaces. Just knowing how to use Photoshop is not enough. The person must have an artistic sense. The graphic design and image preparation was done in Photoshop, but could be done in another graphics programs.

The only other technologies used in the Yeoman course were JavaScript for validation and browser detection and Flash for animation. Depending on the needs of the course other media development skills may be needed. The template has support for Flash SWF files, GIF images and JPEG images, but can easily be adapted to accommodate any plug-in based technology or Java applets.

IST personnel are well rounded in basic development skills such as web development, Photoshop, and Flash, with individuals specializing in specific areas. This helps spread the routine development burden among team members and allows everyone to contribute in individualized ways. For example someone specializes in graphic design, another person specializes Flash, and another in ASP.

Technical Requirements

The initial template was developed for use on U.S. Coast Guard workstation, but can be run in other Windows computing environments. The initial course and template files were developed on Windows NT 4.0 workstations and Microsoft's Internet Information Server (IIS). There are several software requirements for the templates (see Table 3) as well as computer

 Table 3 - Software and Server Requirements

Development Software	Server Requirements
 Microsoft Word 97 (or 	 Microsoft IIS 4 (or
later)	higher)
 Microsoft Access 	 Active Server Pages
 Web development tool 	 ODBC
(i.e. FrontPage or	100 Mb of disk space
Dreamweaver)	

requirements for students and instructors.

Server Requirements Since the web pages associated with the template are Active Server Pages they require a web server that can process Active Server Pages. Also, because the CMS uses an Access database the web server must be able to connect the web site to the Access database. Thus far, all the courses developed with the template have been run from Microsoft's Internet Information Server. No attempts have been made to run the courses from any other servers.

Instructor Computer Requirements The main consideration for instructors is the Content Document, which is a Word 97 file. To this point the Content Document has only been used on Windows NT 4.0 workstations running Word 97. The computer should have at least a 500 MHz processor with a minimum of 32mb of RAM. A faster processor and more RAM are desirable. The macro was been tested on a 166MHz processor with 32Mb of RAM, and although it was slow, there were no problems encountered. The instructors must also have Internet Explorer 4+.

Student Computer Requirements The only requirement for students is Internet Explorer 4+. The web pages use an IFrame that only Internet Explore 4+ supports at this time. The IFrame is used to display the Table of Contents for the current section of the course. The IFrame can be removed to make the web pages compatible with Netscape Browsers, but the Table of Contents will not show up in the upper left portion of the screen. In two courses developed by the Coast Guard the IFrame was removed because the designers did not feel it was necessary for the courses.

Technical Support

For any web based course technical support is one of the key success factors. Most of the technical support for the template-based courses involves setting up the web server that will store the course. The web server administrator must create a directory structure for the course, to include creating a student exercise directory with proper permissions. The instructors must be given access to the course directory, either via a network share or via FTP. The web server administrator must also set up the connection that ties the CMS database to the web site. This is usually done via ODBC on IIS.

Beyond that, the web server administrator must be available anytime students are in class should an emergency arise. The ongoing support for Yeoman school has been very minimal. There have only been two emergencies that required the web server administrator's help, both of which took less than 15 minutes to fix.

Occasionally the instructors may need assistance with the course for a variety of reasons. Usually assistance is needed because the macro did not format some text properly or the exercises are not functioning properly. The IST has helped the instructors work through the problems and make modifications to the macro when necessary. Many questions came up when the macro was first implemented because the instructors were not accustomed to the process. Most of the problems were resolved with some coaching and improvements to the documentation.

IDENTIFYING COURSES

The Web Development Template can be applied to many different courses, but care should be taken in selecting courses. The criteria for using the template is pretty much the same as the criteria for choosing asynchronous web based training. Some of these characteristics include:

- Self-Paced material
- Individual work
- Small instructional chunks that don't require a lot of on screen reading
- Knowledge based content
- Low media requirements
- Student/Instructor interaction can be done over a distance

The major factor in deciding what course to use with the Web Development Template is whether or not the course is self-paced, or can be self-paced. Existing self-paced courses are generally good candidates for this development approach because the content is already set up for individual instruction. Group activities and interpersonal communications can be done in web based courses, but the activities must be carefully planned and should allow students to proceed through the course without being held up by other students or the instructor. When group activities or communication between students is required, a threaded discussion forum or email list can be set up. Additionally, a chat room can be utilized to facilitate communications and group discussions.

The interaction between the student and the instructor should also be able to be done via a distance, and ideally not in real time. If real time interaction is required, a telephone is probably the best solution, if appropriate. Real time interaction can also be accomplished through chat rooms, as mentioned above. For many courses all interactions can be done via email, and often only involve the instructor providing feedback to the student or answering questions. These types of courses are the easiest to convert to asynchronous delivery. However, there should be some regular communication between instructor and student to make sure students are staying on track and completing the course work.

Another major consideration is the amount of media required for the courses. Courses with large amounts of video or audio are not well suited to a web format. Video and audio can be included in the template, but they should be kept to minimum so students are not forced to wait for content. The template can easily be adapted to incorporate various types of media including Real Audio, Flash, or other plug-in based media.

The instructional design of the course is also a consideration. In general, forcing people to read large amounts of text on the screen is not desirable. Text should be edited into short, simplified chunks (Berry, 2000). Students will be more inclined to print the pages if they must read a lot of text. The Yeoman course was successful even though the course is text based because the text is broken into small chunks and there are a lot a activities and exercises. If a course does require large amounts of reading, the reading should be broken up by some kind of activity. Student centered instruction that makes the learner a more active participant in the learning process works well for web delivered courses.

Screen Design

An important aspect of online courses is the design of the screen. In order to focus student attention on the content, the screen design must be transparent and support the learning environment. The Content Web Page was designed to focus student attention on the content while allowing easy access to navigational elements.

The Yeoman course screen is divided into three areas, as mentioned earlier (see Figure1). These divisions help the students organize and process information on the screen (Berry, 2000). Providing a consistent screen design with repetitive navigation allows students to quickly focus on content without having to think about the different areas of the screen. The design also minimizes the use of graphics. The graphics are used to divide the screen into the three main areas. Berry (2000) also notes that using simplified visuals on web pages helps students organize the content and reduces confusion on the part of the user.

The Content Web Page also simplifies the presentation of textual materials by using Cascading Style Sheets to

format all the text in a consistent manner on all web pages. Sans serif fonts were chosen to increase readability and legibility (Thornley, 2001).

USING THE TEMPLATE FOR OTHER COURSES

The Web Development Template can easily be adapted to work with other courses in the Coast Guard and other organizations. The templates use standard technologies that many organizations already own. The Content Document is a Word 97 file, which means that anyone with Word 97 can create content. There is no requirement for the Content Document to be on the same network as the web server. Content authors can work from home or laptops and transfer the files to the server when they are ready.

The web server used is IIS. Any organization running Windows NT or Windows 2000 will have an IIS server available, the project manager just has coordinate the set up of the course web site with the server administrator. The server side technologies used by the web pages are standard component of IIS so no special software installations are required.

The only portions of the template that may be difficult to implement are creation of the web site, modifications to the macro and customization of the CMS. Fortunately the web site uses ASP, which is widely used in web development. There are numerous training options available for learning ASP, including many books and web sites. The macro was written in Visual Basic, a language very similar to the VBScript used in ASP. The macro developer learned Visual Basic while creating the macro. Including learning time the total development time for the macro was only 80 hours.

PROS AND CONS OF TEMPLATE BASED COURSES

Perhaps the greatest advantages to using templates to develop course are that templates save time and money. Time and money are often the main reasons for not creating web-based training. While the templates do not eliminate the time spent by SMEs developing content, they drastically reduce the amount of time spent by media specialist to develop a course. For many organizations saving time directly translates to saving money. The templates also eliminate the need spend large amounts of money contracting out development of online courses.

Another advantage is the low level of skills required by the content author. Basic Microsoft Word and Internet Explorer are the only software skills needed to author and maintain courses using the template.

Since the template eliminates the routine development tasks the developers can focus on the specialized needs of the course and higher level development tasks. For example, developers can concentrate on creating animations, interactive exercises, or producing video and audio to include in courses. This is a huge advantage for small development teams.

The template is also expandable and instructors can easily blend in other online technologies. Chat rooms, discussion forums, or live classroom tools can be used to facilitate interactions among students or between students and instructors. The template could also be used solely for publishing materials that accompany classroom-based courses.

The major downside to template usage is that it is geared toward traditional programmed instruction and "page turner" type courses. While the content is presented sequentially, the students can be allowed to jump around, but the courses do have a definite structure that is set by the Content Document. The template makes it very easy to create low level, "page turner" courses. The challenge is for the instructional designer and content authors to create more meaningful activities and exercises.

From a technical perspective, web server administrators might have some concerns over the access given to students and instructors. Some administrators might not want instructors to have direct access to the server. Also, students must be given a higher level of access to the server than the typical web browser would be allowed.

Another disadvantage is that the macro is written in Visual Basic. Many web developers might not have experience with Visual Basic, so modifying the macro could be problematic. An introductory course in Visual Basic could provide all the training required to modify the template.

FUTURE PLANS AND ADAPTATIONS

Flexibility is really the best characteristic of the template. The template has been used to set up the content for four courses and one informational brief. The template was adapted to fit the needs of the specific project. Some of these adaptations included incorporating Flash content and narration. The template can be adapted to many types of information.

The IST has recently adapted the template to export XML documents and Rich Text Format (RTF) files for use in Director. The XML document was used to provide the structure and outline of the course while all the content was included in the RTF files. The XML and RTF files were dynamically pulled into a prototype Director movie that displayed the content. A similar approach has also been used to pull content into Flash. While these were just prototypes, they show that the template can be adapted work with other programs and technologies.

The template could be adapted to output many types of data files. To date Text, RTF, XML, and HTML files have been successfully exported from the Content Document and incorporated into presentations and courses. The IST will continue to pursue other adaptations to the template as a way of simplifying development.

CONCLUSION

The implementation of template based courses for the U.S. Coast Guard has sped up development and deployment of web based courses while enabling content experts the flexibility to update courses as needed. The template allows instructors or content developers to create and maintain courses without web development skills. The templates work well with self-paced courses and can be used to develop new courses or convert existing courses to on line training. With minimal assistance from web developers, courses can be deployed quickly and easily. The template separates content from presentation, allowing content experts to focus on content with worrying about web development. The template has proved to be an efficient and effective way to develop online training.

For more information on the template please contact:

Kathy Thore, Computer Systems Branch Chief U.S. Coast Guard Training Center Petaluma 599 Tomales Road Petaluma, CA 94952 (707) 765-7513 kthore@d11.uscg.mil

REFERENCES

Berry, L. (2000). Cognitive Effects of Web Page Design. In B. Abbey (Editor), <u>Instructional and</u> <u>Cognitive Impacts of Web-Based Education</u> (pp 41-55). Hersey, PA: Idea Group Publishing.

Rosenberg, M. (2001). e-Learning. McGraw Hill.

Thornley, K. (2001). Principles of Screen Design

(online). http://www.santarosa.edu/~kthornle/apgr72/PSDintro.ht ml.