

Running head: Best Practices: Designing and Developing Web-Based



Figure 1. WBT picture obtained from website LearningCircuit.com at <http://www.learningcircuits.org/elearn.html>

**Best Practices: Designing and Developing
Web-Based Training with Macromedia MX's
Dreamweaver, Flash, and ColdFusion**

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Abstract

Web-Based Training (WBT) is a vital learning area for many organizations.

Organizations are planning, strategizing, designing, developing, implementing, and maintaining Learning Management Systems (LMS) to manage the training for their learners. These systems keep track of everything from scores on quizzes to information on the learners. Organizations are implementing these learning solutions to save time and money in an economy that is not doing well. Organizations just cannot afford to send its learners away for training, and with WBT, they do not have to anymore.

There are many different toolsets instructional designers/developers are using to create content or user interfaces for WBT. Macromedia makes many products that help instructional designers/developers to create WBT much easier than they use to be able in the past. With the templates and components that help keep the time of development down their projects can be done faster. Three tools that Macromedia makes that are helpful in creating dynamic user interfaces are Macromedia MX's Dreamweaver, Flash, and ColdFusion. Each of these tools integrates with each other to help the instructional designers/developers to create the dynamic interfaces that users are coming to expect.

WBT and Macromedia tools are going to be a great combination for WBT solutions now and in the future. With higher bandwidths, content for WBT can be much more interactive on the web than in the past. In Addition, the tools that Macromedia is creating for instructional designers/developers will help them produce WBT that is entertaining, interactive, controlled, usable, and customized. After all, it is all about what the organization and the users needs and goals when creating WBT.

Introduction



Figure 2. WBT picture obtained from KeyTrain.com website at http://www.workkeystraining.com/keytrain/ktn_online.asp

This paper will talk about best practices in designing and developing Web-Based Training (WBT) with Macromedia MX's Dreamweaver, Flash, and ColdFusion. When designing and developing WBT it is essential to use best practices in order to create the best possible user-centered experience for the learner. In many ways, creating WBT is as big a project as defining the organization's Enterprise Architecture (EA). An organization needs to know the whole picture of the organization, such as, culture, technology, and have support of top executives for the WBT project. The paper will first give the background of WBT, and Macromedia MX's Dreamweaver, Flash, and ColdFusion. Then it will define and analyze the major issues surrounding WBT best practices using Macromedia MX's Dreamweaver, Flash, and ColdFusion. Finally, the paper will discuss personal conclusions, and recommendations for instructional designers and developers who might want to implement best practices in their WBT projects that use Macromedia MX's Dreamweaver, Flash, and ColdFusion. Other resources at the end of the paper are [Appendix A - Glossary](#) and [Appendix B – Newsgroups and Mailing Lists](#).

General Background

In order to understand best practices for designing and developing WBT with Macromedia MX's Dreamweaver, Flash, and ColdFusion, the following overview will give definitions and descriptions of what these terms mean for the instructional designer/developer.

Web-Based Training (WBT)



Figure 3. Web-Based Training picture obtained from The New Horizons Media Works, Inc. website at <http://www.newhwmw.com/default.php3>

WBT has enabled people to learn anytime and anywhere they want to through the Internet. Instead of going to the normal face-to-face training session, today's learners sign on to their Internet connection and learn whatever they want to right on their computer's browser. William Horton takes the definition a little further by saying WBT is "Any purposeful, considered application of web technologies to the task of educating a fellow human being" (2000, p.2). The meaning of Horton's statement talks about that WBT can come in any form that a developer creates it, and that form might not necessarily be in the browser. PrimeLearning.com relates that some of the other forms of delivery of online learning are web-based courseware, discussion groups, live virtual classes, video, and audio, web chat, simulations and mentoring (2001, p. 2). Overall most learners take WBT courses through the browser on the computer. Three major areas of WBT are critical in the designing and developing process.

Categories of Web-Based Training

Synchronous and asynchronous are the two main ways that online learning is categorized. Both of these learning methods play critical roles in how people learn in the online environment. Mark Steiner defines synchronous and asynchronous as follows (at http://www.macromedia.com/devnet/education/articles/aw_planning.html, 2003):

- **Synchronous**, or live, learning means that communication occurs simultaneously between individuals and information may be accessed instantly, such as real time chats.
- **Asynchronous** learning does not occur simultaneously, and it is often referred to as self-paced learning, such as discussion group forums.

Organizations that want to implement WBT need to take into account which method of learning to use, so that the correct training is developed.

Best Practices of Web-Based Training

Best practices for WBT are very important to a successful implementation of an e-learning project. It is critical to know what the best practices are so that the learning environment is user friendly. Jeffrey Bardzell states that there are seven key features of e-learning environments (at http://www.macromedia.com/devnet/education/articles/aw_planning.html, 2003):

1. Learning is social.
2. The learning environment interface should meet standards for usability and accessibility.
3. Learning outcomes should be diverse and well defined.
4. Learning content should be contained in high-quality, modular chunks.
5. Online learning should be an active, not passive, experience.

6. An online learning environment should facilitate the addition of new content.
7. Learner assessment and course evaluation should be integrated and ongoing.

When considering these best practices, an organization can produce a very engaging WBT experience.

Technologies of Web-Based Training

There are many types of technologies used in designing and developing WBT. This includes dedicated learning website applications like Learning Content Management Systems (LCMC), to varying different kinds of web technologies like HTML. Jeffrey Bardzell gives some definitions for some of the varying WBT technologies (at

http://www.macromedia.com/devnet/education/articles/technologies_elearning.html, 2003):

- Static HTML (Hypertext Markup Language) is a simple language that uses tags to identify the nature and formatting of content.
- Dynamic HTML is the convergence of several technologies that enable a more interactive user experience on web pages. Some of the other technologies include JavaScript, Cascading Style Sheets (CSS), and HTML 4.
- Multimedia Plug-ins helps overcome the inherent limitations of HTML. Plug-ins is software that runs inside other applications. Some of the kinds of plug-ins are Macromedia Flash and Shockwave, Adobe Acrobat, Macintosh QuickTime, and RealPlayer.
- Web applications using middleware help bring together databases and HTML for more interactive content like form processing. Some of the kinds of middleware models include Macromedia ColdFusion, ASP.Net, JSP, and PHP.

- Programmed web applications are built using Java or C++ and are highly complicated, and expensive. This option is usually the Learning Content Management System (LCMS) and is a ready-made system used to track varying learning issues.

Many organizations use a combination of these technologies to create the best solution for their learners. As you can see, a designer or developer of WBT has many choices when creating high-quality learning environments. One of the more popular organizations that create tools to help build training solutions is Macromedia.

Macromedia MX's Technologies



Figure 4. Macromedia product collage obtained from Macromedia.com website at

<http://www.macromedia.com>

Macromedia MX's technologies are the newest products of Macromedia and have many beneficial features for web-based technologies. Frances Himes and Ellen D. Wagner state that Macromedia's MX product line, with its three-tiered architecture, provides a powerful tool set that enables faculty, subject matter experts, developers, and designers to address critical needs in the e-learning enterprise (September 2002, pg. 9). Three tools that Macromedia has created for designers and developers to create a well-rounded WBT application are Dreamweaver MX, Flash MX, and ColdFusion MX.

Dreamweaver MX



Figure 5. Dreamweaver MX picture obtained from Macromedia.com website at

<http://www.macromedia.com>

Dreamweaver is a “What you see is what you get” (WYSIWYG) tool that creates the HTML code for you as you develop your web page, and allows you to see what you are doing visually or in code view. Garo Green and Abigail Rudner state that “Dreamweaver MX is a complete web application development tool, capable of developing advanced web applications, e-commerce sites, dynamic data-driven sites, and much more” (2003, p. 3).

Flash MX



Figure 6. Flash MX picture obtained from Macromedia.com website at <http://www.macromedia.com>

Flash MX is a versatile web development tool and really includes three different applications. Kymberlee Weil states “Macromedia uses the word “Flash” interchangeably to include Macromedia Flash as an authoring tool, as a player, and as a stand-alone projector” (2003, pg. 9). The authoring tool allows a developer to create, edit, and manage content, which is placed into an HTML page for viewing. The Flash player is a plug-in that is downloaded and it allows a person to view Flash content within their browser. Lastly, the stand-alone projector

allows a person to view content of a Flash movie outside a browser. Many designers/developers use Flash MX to create simulation e-learning where the user interacts with the training material.

ColdFusion MX



Figure 7. ColdFusion MX picture obtained from Macromedia.com website at

<http://www.macromedia.com>

ColdFusion MX is as discussed earlier a middleware tool that allows developers to create dynamic user experiences. The ColdFusion code is processed on the ColdFusion server and passed back to the user in HTML format. Kevin A. Schmidt and Nate Weiss state, “When a user requests a page, the web server passes the request to the ColdFusion Server. The ColdFusion Server fills in the various “blanks” in the template by querying databases, performing calculations, using conditional processing, or doing whatever else is specified” (2003, pg. 6). ColdFusion MX like Flash MX also allows the developer to give the user a very interactive learning experience.

Major Web-Based Training Issues

Web-Based Training Using Macromedia MX’s Dreamweaver, Flash, and

ColdFusion

1. Reasons to have a Web-Based training solution
2. Organization strategies for Web-Based training
3. Categories of Web-Based training

4. Choosing a Web-Based training solution
5. Advantages and disadvantages of Web-Based training systems
6. Advantages and disadvantages of Macromedia MX's Dreamweaver, Flash, and ColdFusion
7. Best practices for Web-Based training
8. Security for Web-Based training
9. Implementation of Web-Based training
10. The future of Web-Based training

Analysis of Major Web-Based Training Issues

Reasons to Have a Web-Based Training Solution

WBT is becoming very important to many organizations because they need to keep their learners trained while keeping costs down. There are many reasons why an organization should have a WBT solution because keeping up with how fast information is changing is how an organization stays competitive. PrimeLearning.com says that the Internet provides an organization the most efficient and effective way to distribute knowledge, and to stay ahead of competition (2001, pg. 4).

Convenience

WBT allows learners to train on their own time, anywhere without using specialized equipment or software. Before WBT, organizations were sending their learners to training, and taking away from their work time. David Wilson and Tony Callaghan and Sue Honore state that by creating an online community a specific topic can be delivered and managed as the learner is able to access the information (2000, pg. 7). WBT learning can be accessed in real-time or

through modules at the users discretion. This allows the learner to get their work done, and take the training as time permits.

Enhanced Learning

WBT can take many forms. It can be visual, textual, interactive, and even have audio. However, if an organization does not plan what kinds of training to implement they could be in for disaster. Sometimes the learner just needs minimal information, and sometimes they need to have a full-scale interactive learning experience to get the most out of the training. Nicholas Iuppa says organizations need to ask (2001, pg. 59):

1. Who are the users?
2. What is their role?

When organizations ask the right questions, they can create WBT that is the most useful for their purposes. For example, if an organization wants to create a highly interactive learning solution they can use Macromedia Flash MX. Patti Shank states that Macromedia Flash MX allows you to create interactive solutions that take into account bandwidth while also integrating easily with both learning and Internet-compliant standards (at http://www.macromedia.com/resources/elearning/article/flashmx_authoring/, 2003).

Retention of Learning

When learners are presented with these different forms of training, they are able to retain the knowledge better. Pat Brogan says that a learner processes information verbally, and non-verbally, and when the information is processed both ways this results in increased retention (Using the Web for Interactive, 1999, pg. 24). In traditional training or lectures, learners are less likely to retain the information very long. They have only been able to sit and listen, which only allowed them to learn the information in one way. If the information that was given was

important to the organization and the learner, and the training did not come across, then the trainer has failed to do their job. PrimLearning.com says, “The Research Institute of America found that 33 minutes after a lecture is completed, learners usually retain only 58% of the material covered” (2001, pg. 5). See [Table 1](#) for information on retention rates created by Spitzer in 1939.

Organization Strategies for Web-Based Training

Organizations need to have a strategic plan for the WBT system. The system should closely match the culture in the organization. As with an Enterprise Architecture plan, a WBT system should be thoroughly investigated. Wilson, Callaghan, and Honore state the e-learning program should support existing organization objectives and plans, otherwise it will not be seen as value added to the organization (2000, pg. 10). The difference between an organization that has a strategic plan and one that does not have a strategic plan can be the deciding factor in whether the WBT solution will be successful or not. Heather Shea-Schultz and John Fogarty did a study of companies that are successful and offer these strategies for a successful WBT system (at <http://www.ltimagazine.com/ltimagazine/content/printContentPopup.jsp?id=42799>, 2003):

1. **Cater to the learner.** Your success depends on the learner actually using the learning and improving from it; all else is secondary.
2. **Achieve buy-in.** Make the business case for e-learning to executive leadership and win their commitment. Also, achieve buy-in throughout the enterprise and to all stakeholders by communicating and promoting the new opportunities.
3. **Save time and money.** Take advantage of the built-in time/money savings. The same two benefits that rocketed e-learning around the globe in boom times are even more important in a slower economy...as long as it makes sense.

4. **Tame the technology.** You, your staff, trainers, and learners must be comfortable with the technology. You can beat technophobia.
5. **Orchestrate the three sides of design.** Take into account the learning, aesthetic, and technological design factors of each e-learning module, course, or curriculum. All three must work together in harmony for attractive and effective online learning...or it will be a crash course.
6. **Think globally, but learn locally.** News flash: English-speakers no longer comprise the majority of Internet users. When designing or delivering e-learning to international audiences, be sure you are familiar with every nuance of their language, culture, and customs.
7. **Collaborate with purpose and passion.** Collaborate with outside vendors strategically, intelligently and with commitment. Also, avoid accidental and porcupine partnerships.

Define Organization Needs

When an organization is defining its learning needs it can draw on research gathered from other organizational defining plans, such as the EA plan. Planning the WBT system needs to be based on what the organizational needs are and not what the instructional designers/developers decide that system should look like. Wilson, Callaghan, and Honore state that time and money can be wasted if learning objectives are not defined properly per the organization needs (2000, pg. 10). After the instructional designer and the organization have determined the organization views, then they need to determine the learning needs of the organization. PrimeLearning.com compiles a list of questions to ask when trying to determine organization views that will help tailor the correct learning solution for the organization (2001, pg. 10):

1. Do we need to increase the level of learner productivity?
2. Do we need our learners to perform a broader range of tasks?
3. Do we need to improve our learner attraction and retention figures?
4. Do we need to find ways to reach a wider learner and/or customer audience with information about our products and services?

Defining the organization needs should include determining the organization culture, vision, and technology that is in use. When these needs are formulated, it is much easier to create a WBT system that is suited to the organization.

Define Organization Technology Standards

By defining the organization technology standards, the appropriate WBT system can be developed. The instructional designer/developer needs to create training that is accessible to the company. There are many different browsers that an organization could be using, and many different operating system platforms. Therefore, it is important for the instructional designer/developer to determine what an organization is using or help them to upgrade if necessary to be able to deliver the training the organization desires. Frances Himes and Ellen Wagner state that an organization should consider these questions when trying to determine what the technology standards are and where they need to go (2002, pg. 3):

1. How many learners must be served? Are they working at a single location, or working remotely at distributed locations?
2. Is technology currently used to support distributed learning? Are sites currently networked?
3. Is training typically offered at centralized locations, or does it tend to be site-based?

4. What kind of bandwidth capacity is available?
5. What technology platform standards currently exist?
6. What kinds of resources are accessible for getting the job done?

After these questions are asked, the organization can meet the needs of the learners along with accomplishing the organization needs. For example, if the organization finds that it has high bandwidth they would be able to implement the more network intensive Flash simulation learning modules. Kristi Aho states that Macromedia Dreamweaver MX and Macromedia Flash MX provide professional-quality toolsets, prebuilt templates, and components, making it easy to create online learning (at http://www.macromedia.com/devnet/education/articles/new_frontiers.html, 2003).

Define Web-Based Training for the Organization

After an organization has defined its goals, it is then easier to define the goals of the WBT. Himes and Wagner state that after the organization leaders, and learners define the business goals, and outcomes it is easier to link to effective WBT strategies. Then the next step is to enable the learners to obtain professional growth through individualized plans (2002, pg. 4). An organization needs to know the abilities of the learners in order to have WBT that is suited for the learner. PrimeLearning.com states that the most effective training will be targeted, appropriate, integrated and engaging, which will get the greatest direct return for the organizations investment (2002, pg. 10). With the Macromedia toolset, an organization can deliver this kind of experience to its learners. Brogan says that Macromedia covers everything from the entire process of developing on-line learning that includes creating content delivery, to tracking and reporting learner results (Using the Web for Interactive, 1999, pg. 31).

Categories of Web-Based Training

The varying ways to deliver WBT can be categorized into two main areas called synchronous and asynchronous. Within each type of category, many different types of learning content can be created. Mark Steiner states that computer-supported collaboration learning and experiential simulation help learners to overcome the barriers of time and distance to create synchronous and asynchronous learning (at

http://www.macromedia.com/devnet/education/articles/aw_planning.html, 2003).

Synchronous



Figure 8. Synchronous picture obtained from The University of Sydney Australia website at

<http://www.arch.usyd.edu.au/kcdc/journal/vol1/dcnnet/stream2/paper8/>

Synchronous designed training is real-time or live learning. The learner has instant access to the activity in the learning course. Horton states that a synchronous approach can include the following (2000, pg. 57):

1. Learners need to discuss issues with other learners at length
2. Learners need the motivation of scheduled events reinforced by peer pressure
3. Most learners share the same needs and have the same questions

Asynchronous



Figure 9. Asynchronous picture obtained from The University of Sydney Australia website at

<http://www.arch.usyd.edu.au/kcdc/journal/vol1/dcnnet/stream2/paper8/>

Asynchronous designed training can be performed at anytime the learner wants to access the training. Horton states that an asynchronous approach can include the following (2000, pg. 57):

1. Learners are from a wide span of time zones and countries
2. Learners have inflexible or unpredictable work schedules
3. Learners cannot wait for a class to form
4. Learners have unique individual needs

Blended Learning

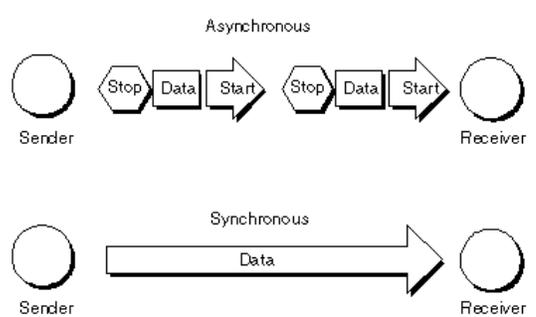


Figure 10. Synchronous, and Asynchronous picture obtained from Webopedia.com website at

<http://www.webopedia.com/TERM/A/asynchronous.html>

While learning designs can be considered either synchronous or asynchronous, training modules are not always just one or the other. Many times the training created is blended with both types of learning. Horton states that courses are made up of a mix of synchronous and

asynchronous activities and events. He says that the more a learner is at a different point than the rest of the learners the learning is considered asynchronous (2000, pg. 56).

Another form of blended learning is when WBT is combined with traditional face-to-face training or any other form of training. Blended training can be beneficial to the company because learners get to access information in a variety of ways, which enables them to retain the information better.

Choosing a Web-Based Training Solution

WBT solutions are a big step for an organization to make and it is often just as big a decision as choosing the EA. An organization's WBT solution can include everything from the software needed to create the solution to a Learning Content Management System (LCMS) that organizes the complete training system.

Learning Management System (LMS)

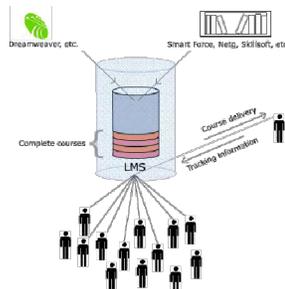


Figure 11. Learning Management System picture obtained from elearningpost.com website at

<http://www.elearningpost.com/features/archives/001022.asp>

Learning Management systems help an organization to manage and administrate the learning system. The LMS can help an organization with not only WBT systems, but also all training the organization delivers to the learners. David Wilson and Carole Laithwaite state that the LMS is concerned with course catalogs, registration processes, approval processes, resource management, and tracking and reporting. The following are the key factors they say the LMS provides for a business (2001, pg. 7):

1. Managing courses and programs
2. Providing and administering course registration
3. Tracking learner registration, access and progress
4. Learning administration and reporting
5. Financial tracking and control of learning

Before an organization can pick a LMS, they need to do the needs analysis discussed previously in the paper. Wilson and Laithwaite give some main issues to consider when picking the best LMS (2001, pg. 10):

1. How much existing domain knowledge do you have regarding LMS's and e-learning?
2. If you do not have existing domain knowledge you should seriously consider getting expert help.
3. What are your primary criteria in selecting an LMS?
4. What is your approach to mapping functional requirements?
5. What timescales are you working to during the selection process?

Learning Portals (LP)

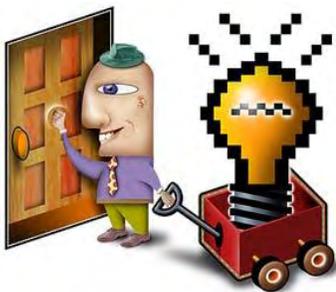


Figure 12. Learning Portal picture obtained from Learningcircuits.com website at

<http://www.learningcircuits.com/may2000/barron.html>

Many organizations want to get on the portal bandwagon, be it an e-business portal or a Learning Portal. There is no real good definition in the learning industry for what a Learning

Portal is or what it does ideally. Tom Barron states that the Learning Portal is a single area online that serves up data from systems throughout the organization and beyond (at <http://www.learningcircuits.org/may2000/barron.html>, 2000). This gives an advantage to those organizations that are spread over large distances a way to disseminate information in one place to all learners. Cornelia Weggen gives a table example of the pros and cons of e-learning Portals see [Table 2](#) at the end of the paper (at <http://www.learningcircuits.org/sep2000/weggen.html>, 2000). A Learning Portal includes the functionality of a LMS along with all the other functionality. Wilson and Laithwaite give some main components that a Learning Portal should include (2001, pg. 15):

1. A Learning Management sub-system managing access, registration and tracking of learning programs, course catalogs, competency frameworks and profiles.
2. An information sub-system providing information on the learning services and organization including the Corporate University (if applicable).
3. A personal portal sub-system – or in current jargon a “My.portal” including personalized preferences, tracking and management.
4. A community sub-system managing communities of interest and practice associated with or facilitated by learning. (This could be managed elsewhere if an organization has a strongly developed knowledge management focus and infrastructure).

Learning Content Management Systems (LCMS)

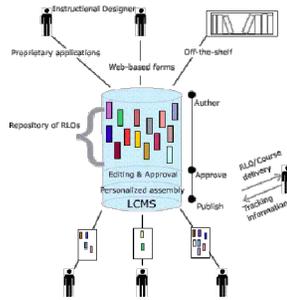


Figure 13. Learning Content Management System picture obtained from elearningpost.com website at

<http://www.elearningpost.com/features/archives/001022.asp>

A LCMS puts everything all together for an organization—content, management, and much more. Maish Nichani states that an “LCMS is a system (mostly web-based) that is used to author, approve, publish, and manage learning content (more specifically referred to as learning objects, which are a stand alone chunk of learning that contains content and assessment based on specific learning objectives and that has descriptive metadata wrapped around it.) (at <http://www.elearningpost.com/features/archives/001022.asp>, 2001). Organizations are more likely to share information with strategic partners now than in the past. Michael Brennan, Susan Funke, and Cushing Anderson state that there many ways that a LCMS can benefit the organization (2001, pg. 5):

1. **Learning in context** – content presented reflects the individual’s needs and the organizations objectives.
2. **Keeping tacit knowledge from walking out the door** – the learning objects contain information that helps other workers to know what previous workers did in their learning objects.
3. **Using one application to educate disparate audiences** – learning objects can be used in different areas, so they are reusable and sharable.

4. **Future-proofing an organization's content** – content is separate from the presentation layer allowing for easy update by non-programmers.
5. **Increasing organizational know-how and performance through massive content conversion** – can use existing content from legacy systems, which save time of rewriting content.
6. **Ensuring consistency of learning in a global enterprise** – the learning object repository ensures consistent spreading of learning messages.

Web-Based Authoring Software

There are many types of WBT authoring software. The ones discussed in this paper are Macromedia MX's Dreamweaver, Flash, and ColdFusion. Macromedia makes many other products that are helpful with WBT too, like Authorware, Breeze, and Director. However, with just the first three an instructional designer can create very effective WBT solutions for their organizations systems. Macromedia MX's Dreamweaver, Flash, and ColdFusion are used to create dynamic, interactive WBT. Dreamweaver is used as the basic authoring tool for the web pages. Flash is used to create interactive simulations, and quizzes. ColdFusion is used to connect to databases for instant access to information. Jeffrey Bardzell states that Dreamweaver is the industry-leading web designer/developer tool that has a twin code environment to help create and maintain websites. Flash is a multimedia and animation tool, whose file-efficient graphics and scripting language (ActionScript) enable rich user experiences to be created and delivered. ColdFusion is a markup language and server package that empowers developers to create dynamic, database-driven websites easily and quickly, with minimal programming (Macromedia MX's e-learning, 2003, pg. 2).

Advantages and Disadvantages of Web-Based Training Systems

Of course, there are many advantages and disadvantages in using WBT systems. The whole decision to obtain a WBT system can be based on the following advantages and disadvantages.

Advantages

WBT has become a big asset to many organizations. Providing training for learners in many different ways allows them to retain the knowledge better. Horton states that WBT combines both the collaboration of face-to-face training and the anywhere-anytime availability of Computer Based Training (CBT) (2000, pg. 19). WBT achieves real value for an organization by enhancing the way learners obtain knowledge, and by saving the organization time and money in the process. Productview.com gives the following advantages of WBT (at <http://www.productview.com/wbt-ilt2/wbt1.htm>, nd.):

1. **Travel costs are eliminated** – With WBT, learners can be trained at their desktop, eliminating all travel related expense from the training program.
2. **A training facility is not needed** – With WBT, learners are trained using the existing hardware and software at their desk.
3. **Self paced** – with WBT, each learner progresses at their own speed.
4. **Available anytime, anywhere** – with WBT, learners will have access to material 24x7, from any location in the world.
5. **Modular arrangement allows you to learn only what you need** – with WBT, the topics are arranged into short 20-minute modules. Learners choose what is specific to them.

6. **Training can be taken repeatedly** – with WBT, learners can engage in repetition of the courses without penalty.
7. **Faster rollouts** – with WBT, all users can be trained simultaneously, which allows an organization to “go live” immediately.

Disadvantages

WBT can have risks for an organization, but with a good design, much of this can be overcome. Gary James gives the following list of disadvantages WBT systems have (at http://www.allencomm.com/pdfs/white_papers/ad_dis_ol.pdf, nd.):

1. Limited formatting of content in current browsers
2. Bandwidth/browser limitations may restrict instructional methodologies
3. Limited bandwidth means slower performance
4. Someone must provide web server access, control usage, and bill users (if applicable)
5. Time required for downloading applications
6. Learners assessment and feedback is limited
7. Many, if not most, of today’s WBT are too static, with little if any interactivity (This is changing with better bandwidth access)
8. Cannot design and develop robust multimedia courses (This is changing with new technologies like Flash MX)
9. The lack of human contact
10. Longer development and designing time until new toolsets are learned
11. WBT has high-fixed costs

Advantages and Disadvantages of Macromedia MX's Dreamweaver, Flash, and ColdFusion

Of course, there are advantages and disadvantages in using Macromedia MX's Dreamweaver, Flash, and ColdFusion for WBT systems. Brogan says, "The Macromedia solutions cover the entire process of developing online learning from creating content to reporting on learner results" (Using the Web to Train, 1999, pg. 25). The whole decision on whether to use these tools can be based on the following advantages and disadvantages.

Advantages

Dreamweaver is a well-rounded tool for web authoring. John Wilker gives some advantages for using Dreamweaver (at

<http://builder.com.com/printerfriendly.jhtml;jsessionid=NUYVOVHQZ3QZPTQAAZCFI?id=u00220021108JTW01.htm&rcode=>, 2002):

1. Integration with ColdFusion MX, Flash MX, Fireworks MX, and Freehand 10 to provide nearly seamless interaction between design, graphics creation, and back-end programming
2. Supports .Net, HTML, ASP.Net, Java, and PHP
3. Roundtrip development between Macromedia Studio products
4. Wizards are easier to use and understand
5. Collapsible panels for more coding room
6. Works with Windows or Mac

Flash has many advantages that especially make it useful for WBT. Minnesota State has a Flash MX overview that gives some important advantages of Flash (at

<http://www.mnstate.edu/instrtech/handouts/Flash/FlashMXOverview.htm>, nd.):

1. Browser independent
2. Platform independent
3. Independent of screen resolution
4. Easier to use than DHTML, Real Media
5. Multimedia for the web with small file sizes that load fast
6. Flash is becoming a standard and is used on many websites and vast majority of web users have the plug-in already
7. Plug downloads / installs very quickly
8. Simplest way to add sound to a web page and it uses MP3 compression which gives good sound quality with small file size

ColdFusion has many advantages that make it useful for WBT. Jeremy Wright gives some advantages for using ColdFusion (at <http://www.devarticles.com/art/1/219/4>, 2002):

1. Simple to learn and use, fast application development time
2. Cross-platform and currently supported on Solaris, Linux, Windows, HP-UX with code compatibility between platforms
3. Comprehensive feature set that includes built in graphing and charting functions, and Verity search engine
4. Scales well to heavy loads
5. Well supported by authoring tools
6. Well documented

Disadvantages

Dreamweaver has some of the following disadvantages according to Wilker (at <http://builder.com.com/printerfriendly.jhtml;jsessionid=NUYVOVHQZ3QZPTQQAAZCFI?id=u00220021108JTW01.htm&rcode=>, 2002):

1. Slow to load, open files, save files, and just in general very slow.
2. So many buttons and tabs that it can be distracting.

Flash has disadvantages that create some problems for using it with WBT. Minnesota State has a Flash MX overview that gives some important disadvantages of Flash (at <http://www.mnstate.edu/instrtech/handouts/Flash/FlashMXOverview.htm>, nd.):

1. User needs Flash plug-in to view the content.
2. Text in Flash movies is not searchable (while text on regular web page is searchable).
3. Problems with accessibility – users cannot resize the text as they can with regular HTML-base web pages.
4. Browsers back button does not work as expected in a Flash movie – does not take you to an earlier part of the movie unless anchors have been placed within the SWF file.
5. Cannot bookmark within a Flash movie – bookmark points only to the page containing the Flash movie.

ColdFusion has disadvantages that create some problems for using it with WBT. Jeremy Wright gives some disadvantages for using ColdFusion (at <http://www.devarticles.com/art/1/219/4>, 2002):

1. ColdFusion's core features are extensive, simple, and effective. However, extending its features can involve added complexity.
2. Costs more than competing platforms. A freeware version is available, but it is feature limited.

Best Practices for Web-Based Training

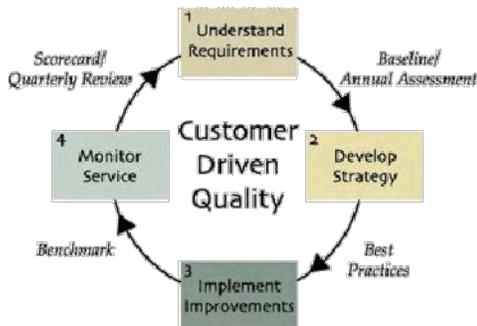


Figure 14. Best Practices picture obtained from CBRE.com website at

<http://www.cbre.com/NR/rdonlyres/e6absnzfzxqydnw3x2nvoz64xcwoiaqwsfwu6uau4c63e4nik6ludaugfspzmypegvuj5q2ac7qddk/customer.gif>

Best practices for WBT are critical for an organization if they are to have quality online learning. Brogan says, “Critically important for the success of online learning and teaching is the design and creation of the instructional material” (Using the Web to Train, 1999, pg. 32). The instructional design/development needs to fit the goals of the organization, and make the learning user experience excellent for it to be useful for an organization. Brogan sites Ron Phipps, from the Institute for Higher Education, for his guidelines of successful instructional design/development (Using the Web to Train, 1999, 32):

1. Employ a high level of interactivity to keep learners engaged.
2. Use multiple instructional methods to improve results.
3. Provide a balance between virtual interaction and direct interchange.
4. Provide a well thought out user interface.

5. Make the instructional navigation simple yet in support of frequent and infrequent user types.
6. Provide ongoing assessment and feedback to reinforce learning.
7. Use audio, video, and animation to support different learning styles, optimize memory, and brain utilization.
8. Limit use of text to business of screens. Learners process text on a display at a rate of about 30% less than that of paper. Use graphics where possible.
9. Let learners guide the instruction, but not get lost.
10. Provide scaffolding to allow learners to fill in gaps of learning through help systems, glossaries, and links to assessment and instruction.
11. Provide options in support of differences in female and male uses of technology.
12. Ensure that the response time of the instructional environment matches that of the learner as best as possible.

Another area where best practices need to be used is when the organization is implementing the technology solution. Organizations need to have the environment ready and for any mishaps that could happen. Brogan gives the following critical issues for successful usage of delivering technical environments (Using the Web for Interactive, 1999, pg. 22):

1. Enduring that the hardware and software are installed and tested prior to the class start.
2. Planning for machine breakdown—have backup machines available for any information that must be made available to learners (management system, website, and syllabus).

3. Having technical support available during the hours learners are working, which typically for distance learning includes early morning hours.
4. Developing a contingency plan for technology failure such as, using a phone system that has information, or even provide information on CD's or other local media.
5. Teachers must be well trained and have their support structure in place. This includes ensuring that teachers are well equipped to do email from mobile locations.
6. Offering an orientation program, preferably using the same instructional mode.
7. Providing feedback processes to monitor success or failure, and alternatives for those who are not able to deal well with technology.
8. Recognizing the technology base that learners will be using and communicate systems requirements. For web environments, understand browser install base and provide clear instructions about supported operating environments.

Macromedia's toolsets have been developed to help instructional designers/developers use best practices easier. There are many issues, standards, and design techniques, and having toolsets that can help you follow best practices easier and faster is a great help. For example, Dreamweaver, and Flash offer help with following the 508 Accessibility standards, which are standards for learners with disabilities. Dr. Alan Foley states that Macromedia offers tools that help support for novice content developers or experienced developers to create accessible pages" (2003, pg. 13).

Security for Web-Based Training

Security is a big issue for an organization and for the learners. Organizations need to be worried about securing the network, and make the learning environment secure too. Edgar Weippi states that a secure WBT platform includes all aspects of security, however it is not a total secure lock down because that would make the learning system unusable” (at <http://www.aace.org/conf/edmedia/tutorials/t4.htm>, nd.). There are several areas of security in an organization. Weippi gives us the following as what the areas of security are (at <http://www.aace.org/conf/edmedia/tutorials/t4.htm>, nd.):

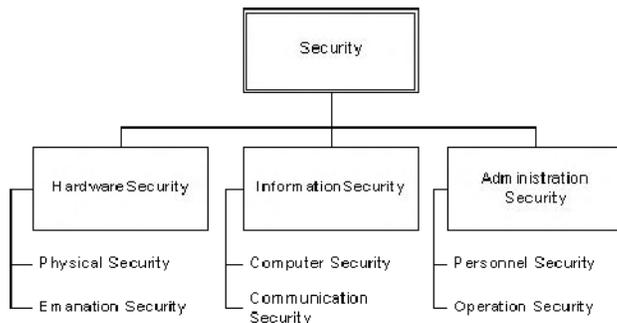


Figure 15. Security picture obtained from AACE.org website at

<http://www.aace.org/conf/edmedia/tutorials/t4.htm>

1. Hardware security is all the physical security and emanation security. Refers to signals that can be intercepted, and then analyzed, which can disclose private information.
2. Information Security includes computer security and communication security. Computer security deals with prevention and detection of unauthorized actions of users of the system. Communication security prevents people who are unauthorized from obtaining access to information derived from telecommunications.

- Administration Security includes personnel security and operation security. Both of these deal with organizational or administrative security.

With so many ways that an organization can be threatened in the security area, it is very important that a security solution be implemented. Symantec.com states that threats to the organization continue to evolve. While virus protection, firewalls, and content filtering technologies can help, it is also important to monitor end-user behavior (at <http://enterprisesecurity.symantec.com/article.cfm?articleid=613&EID=0>, 2001).

Implementation of Web-Based Training

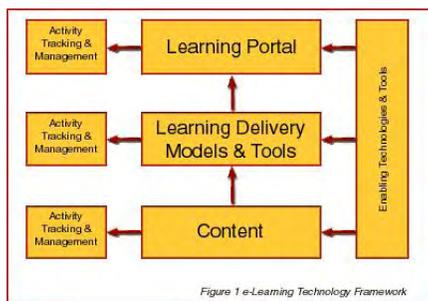


Figure 16. WBT Framework picture obtained from NCC.co.uk website at

<http://www.ncc.co.uk/ncc/myitadviser/archive/issue7/people.cfm>

For an organization to implement a WBT solution, they need to have a plan. Organizations need to figure out if a WBT solution fits into the culture of the company. Steiner gives us the following critical strategies for implementing a successful WBT project (at http://www.macromedia.com/devnet/education/articles/aw_planning.html, 2003):

- Educate the client about the fundamentals of WBT systems.
- Determine the actual training needs or gaps, not the perceived ones.
- Define your process and communicate it, focusing on key review points in the cycle.
- Identify key project personnel then define and communicate their roles.

5. Perform a comprehensive, realistic analysis regarding the technical needs and specifications of the project.
6. Analyze the WBT content thoroughly.
7. Be specific about your actual deliverables.
8. Acquire an intimate knowledge of your development tools.
9. Consider the importance of interface design and website optimization.
10. Test your application early and often, from both a user and technical perspective.

After all this is done the organization needs to follow up with the users to make sure the WBT system is working for them. Brodsky states that management (with the support from selected members of the design team, trainers, and coaches) needs to ensure that training participants are being held accountable for applying their newly learned skills, so the organization can be sure the learning goals they set were achieved (at <http://www.ltimagazine.com/ltimagazine/content/printContentPopup.jsp?id=48117>, 2003).

The Future of Web-Based Training



Figure 17. WBT Future picture obtained from Southwest Research Institute website at

<http://www.swri.edu/3pubs/brochure/D07/WebBase/home.htm>

The future of WBT is moving toward more organizations implementing training solutions. The tools that organizations need to create the WBT solutions are becoming easier to use and offer more help to the instructional designer in the creating of the training. Brodsky says there is a move toward convergence in that organizations are increasingly merging their WBT

with other management tools, so they can unify the view of all financial, customer, and learner considerations (at

<http://www.ltimagazine.com/ltimagazine/content/printContentPopup.jsp?id=56219>, 2003). In

addition, the technology for viewing the training will become faster with higher bandwidth. This

will allow for more simulation modules of training that take to long to load on slower

connections. Wilson, Callaghan, and Honore state that bandwidth increases will allow more

media-rich and interactive content to be delivered (e-Learning, 2000, pg. 33).

Personal Conclusions



Figure 18. WBT picture obtained from CEREDIGM.com website at

http://www.ceredigm.com/gfx/pic_montage.jpg

There are so many areas of WBT, and I found it a very interesting topic, especially since Instructional Developer is my new career. I tried to concentrate my topics on the best practices in the instructional design/development area using the tools that I am familiar with using in my development. As I did my research and wrote the paper, it was clear to me that a WBT system takes a lot of work and planning, and is a project that is of the scale of an Enterprise Architecture of an organization.

Web-Based Training (WBT)

I think WBT is a phenomenal tool for an organization to use for training purposes.

However, if an organization is not careful it can be their worst nightmare. WBT needs to be well

thought out, and integrate with the company goals. The whole purpose of the WBT is to allow learners to access the training anytime, and anywhere. This is a great concept because it lets learners go at their own pace, and when they have time, and be anywhere they want to be for the training. Convenience, time, money, repetition, and better retention are all benefits of WBT, and I think they all make this training process the best possible choice for organization looking to improve their training solution and their bottom line.

Categories of Web-Based Training

I definitely like the blended training method for an organizations training needs. WBT is not always the best way to complete all trainings. Sometimes you just need to have training face-to-face. Another issue is the synchronous and asynchronous styles of WBT. To me this is another way to have blended learning. Sometimes a learner is not able to be at a just-in-time learning session. For these learners taking asynchronous training is the best way. Personally, I like training that has both just-in-time aspects, and learn as you can modules. This allows you to complete different types of learning, and help you to retain the information better. The more senses that you use the better you will remember the material. Therefore, by using simulation, quizzes, text, and graphics a learner can use many different senses, which allow them to have a great user experience.

Best Practices of Web-Based Training

I have had many classes and work projects that incorporate best practices. This is the cornerstone of all projects, or should be in my opinion. Without best practices, projects will be doomed to failure. Best practices for WBT help the instructional designer to create a great user experience for the learner. If an organization wants the learners to get certain objectives out of the WBT courses, then they need to relate to the instructional designer what the goals are so that

the training represents this to the learner. I think one of the greatest “best practices” that organizations can enforce now is the Section 508 standards established by the U.S. Federal Government. This practice allows users with disabilities to have a greater user experience. What a great service instructional designers are doing for people who would not otherwise be able to see or use the WBT system. This one area of best practices for WBT is huge, and there are so many issues to be addressed. However, another area that I think is important is the planning stage of WBT. The instructional designer and the organization have the task of hashing out if the company wants to use WBT, and if so, what it will look like for them. It is so important for this to be determined before any of the rest of the project is started. It is a waste of time to start the design/development phase before you even know what the company needs or wants in the WBT system.

Technologies of Web-Based Training

In this area of my research, I found it fascinating all the technologies an organization has to choose from, and what each of these technologies can do for an organization is tremendous. Each of the solutions offered something different to an organization. It seemed to me that the Learning Content Management System (LCMS) was the ultimate choice for a company to make. It also seemed to me to be a project most like implementing an Enterprise Architecture (EA). LCMS is the ultimate administration, content, and management tool, which defines the goals and direction of the company only in the learning area. As with EA, I am not sure smaller companies would need to go to these lengths and obtain a LCMS. The expense alone would probably prevent a smaller organization from implementing this magnitude of a solution. Therefore, I think most organizations would go for the less expensive options of a Learning Management

System (LMS) or a Learning Portal (LP). With the proper authoring tools along with other middleware, an organization could create their own LMS or LP.

Macromedia MX's Technologies

Macromedia has been developing tools for WBT for quite a while now. They are one of the leading companies in this field, and I personally like the tools they have developed to help designers/developers create training systems. With each new version, Macromedia has improved their tools with time saving features and benefits. As a designer/developer having time saving features and benefits are compelling reasons to use Macromedia's toolsets.

Dreamweaver MX

Dreamweaver is one of my favorite tools to use when creating WBT. It is easy to create basic or dynamic websites with Dreamweaver. I like how it interacts with the other tools, such as, Flash, Fireworks, and others. There are buttons on the toolbars that when pushed open the other programs to allow work that needs to be performed in that application to be done, and then when you are done it brings you right back to Dreamweaver. Macromedia calls this round-trip HTML. What a great feature. For example, if I insert an image into Dreamweaver and it is too big, I can click on the button to open Fireworks and it will take me to Fireworks to edit the image, and then when I am done it will bring me back into Dreamweaver with my image newly formatted. This is such a big timesaver because while working with the file if any HTML code is written it also brings that back into Dreamweaver too. One of the last features I want to mention is how Dreamweaver can help you create dynamic websites. Dreamweaver can work with many different platforms, and technologies. This makes it very versatile tool to use when working with the various development environments like ASP.NET, JSP, ColdFusion, and many

others. I like the fact that Dreamweaver allows this interaction, and that I do not have to keep several tools around to perform the functions that I can with Dreamweaver.

Flash MX

The infamous Flash... you either love Flash or you hate Flash. The thing about Flash that most people do not know is that if you design and develop correctly with the tool you can create fast loading, user friendly websites. I think the people who dislike Flash have bad experiences with slow loading pages. Users do not like to wait for pages to load. This is not Flash's fault, but the designer/developer's fault for building the website incorrectly. With the newest version of Flash... Flash MX, there are many benefits for WBT designers/developers. One benefit is the new component feature. With components, you can reuse code just as you do in Java or C++. Reusable code saves time and money, which is good for the designer/developer, and the organization. I think the thing I like the most about Flash though is its ability to help you create very creative simulation training. I think this is the most appealing way for a learner to learn a subject. The simulation could include audio, video, quizzes, graphics, animation, text, and much more that make it very interactive for the user. However, all of this is no good if the designer/developer does not do their part and create a user experience that is compelling, and accessible for the user. Flash and Dreamweaver can connect to databases and bring in instant access to information. This is why Flash is good for synchronous learning. One of the best benefits for instructional designers/developers is that Flash MX offers templates that help save time in creating WBT content, and interfaces. This alone would make Flash worth using.

ColdFusion MX

Finally yet importantly, ColdFusion is a great tool that offers many options for an instructional designer/developer. The CFML language allows for access to databases, which in

turn gives the instant access of information for synchronous modules. In addition, it gives access to stored information for asynchronous modules too. I think this is a great asset to an instructional designer/developer toolset. The versatility to perform the blended training is a great benefit. ColdFusion, just like Flash offers components that are either built in or you can create you own. These components can be called in the code, and as with Flash, instructional designers/developers are able to save much time, and money for the organization. I think the greatest thing about ColdFusion is that it is compatible with many different platforms, such as, Linux, UNIX, and Windows. I think any tool that makes an instructional designers/developers job easier is worth using.

Final Overview

Is WBT using Macromedia MX's Dreamweaver, Flash, and ColdFusion worth the effort? I think it is because great training solutions need great tools to create them. Organizations to keep up with all the information and changes in technology are going to need creative training solutions. As an instructional designer/developer, I can provide these types of learning environments by using Macromedia's toolsets. In Addition, as a learner I expect the training solutions that I view will be creative, engaging, and entertaining. Can I expect any less than doing this for users as an instructional designer/developer? I think the future of WBT and Macromedia toolsets are intertwined and are one of the leading ways that instructional designers/developers have when creating dynamic WBT systems.

Recommendations



Figure 19. Information picture obtained from Electronic Library Program website at

<http://www.ariadne.ac.uk/issue1/elib/>

1. Make sure to plan your WBT system carefully, and consider the organization culture in the decisions.
2. When designing and developing your content for your WBT system, make it engaging to keep the users attention.
3. Use best practices when creating your WBT system for the best possible user experience.
4. Investigate the many different tools that can help you easily create, and update the WBT systems content and find the ones that best suit the organization.
5. Make sure you have the support of your organization leaders for the WBT system, so it is easy to get the users to see the importance of using the WBT system.
6. Make sure your WBT system is accessible for disabled learners according to the Section 508 standards established by the U.S. Federal Government.
7. Make sure you keep track of the ROI for the WBT system, so that the worth of the training system can be proved to the organization leaders.
8. Use blended learning where applicable, do not force the wrong training on your learners.
9. Security is important, so look into the best options for your organization.
10. Be careful when dealing with vendors and make sure you know what your learning strategy is before deciding on a Learning Management System.
11. Remember to design/develop for the organization's goals and users needs, and not what you want it to look like.

Appendix A

Glossary of Online Learning Terms

Client Needs Analysis

Determine what the client wants to accomplish with WBT or WPSS. What are the explicit outcomes of the project? Will the product provide individual instruction while cutting training costs? Will it replace or supplement existing training? Does the client want to integrate training into a larger information system? What will this project cost? Because of intense client contact, this needs analysis delineates client needs and outcomes that satisfy those needs. It is at this initial stage that the developer and client must decide if WBT / WPSS are the best choice. Responsibility: project manager, instructional designers.

Computer-Based Training (CBT)

Individualized instruction delivered to trainees via computer application.

Distance Learning

A term encompassing all learning that takes place at locations remote from the point of instruction. Distance learning may take the form of an instructor-led course delivered via satellite to multiple remote locations. Distance learning may also be training applications delivered via computer networks to learners at any network node. Web-based training is one distance learning method in that the training application resides on a Web server while learners may use the training from any location that can access the server.

Document Processing

This is the step where subject matter content is formatted into an HTML document—of course, here HTML really means any of the Web technologies for creating pages. Typically, the content elements may be placed in a template page copy using a WYSIWYG editor. HTML converters can be used to automate the document construction process. Since this has become such an easy process, programmers are not necessarily needed for this step. IDs may play a role in this step in that the storyboard and initial HTML document might be similar or the same. Responsibility: instructional designers, programmers.

Electronic Performance Support System (EPSS)

Applications designed to run simultaneously with other applications or embedded within other applications that provide support for the user in accomplishing specific tasks. An EPSS may provide needed information, present job aids, and deliver just-in-time, context-sensitive training on demand. A Web-based performance support system (WPSS) is an EPSS that uses Web technology to deliver support in an enterprise environment.

Evaluation and Updating

Were the outcomes defined in the client needs analysis and tasks/user analysis achieved? Ongoing testing and evaluation will point out unforeseen weakness in the training product. It may become necessary to redesign individual pages or segments of content should the content become outdated, and new information becomes available. Usability issues should have been addressed completely during initial testing of the interface, but added features or content may require interface modification and new testing. The advantages of a Web-based system will become evident during this last phase as updates become easier and faster to implement than with traditional, custom training applications and information systems. Formal evaluation—for example, using the Kirkpatrick model of four levels of evaluation—measures everything from user satisfaction through results affecting the organization. Responsibility: all project positions, as appropriate.

Appendix A (continued)

Instructional Design

The instructional design process is one where a trained, highly experienced designer organizes and presents content in such a way that the end user meets his or her learning goals. The instructional designer (ID) must know the subject matter, with the aid of a subject matter expert (SME), and then know the teaching methods best suited for the medium and the learner. Much effort must be placed on "chunking" the information, culling it down to the essential, and presenting it in discrete informational units. IDs prepare storyboards from which interactive screens may be programmed. With the advent of WYSIWYG Web page editors, IDs can now prepare rough screens, ready for finishing by programmers. Typically, the client and SME will review and approve the storyboards for accuracy and applicability. Responsibility: instructional designers with input from subject matter experts.

Instructional Systems Design (ISD)

A formal process for designing training, be it computer-based or traditional instructor-led training. The ISD process, as applied to CBT and WBT, suggests a comprehensive needs analysis, user analysis, design document (including flowcharts, storyboards, and evaluation procedures), application prototype, finished computer application, usability testing, and effectiveness evaluation.

Interface Design

Interface design is one of the most critical phases of the development process. The user interface must provide all the features needed for the user to navigate the application as intuitively and transparently as possible. User-centered design dictates that the interface provides features that allow the learner to control the learning process. The client may request features that should be discussed thoroughly at this phase. This will help minimize "feature creep" which can destroy an interface design and derail a project in later phases.

The user analysis should define the range of user computer experience so that the interface designer may choose design elements most appropriate for the target users. Interface designers best understand the complex non-linear way learners will use the product. Interface designers work with instructional designers and client representatives to define metaphors and the interface to support those metaphors and, if necessary, mesh with established client design standards. The result of the interface design process is a dynamic prototype interface ready for testing. Responsibility: user interface designers, instructional designers.

Learning Content Management Systems (LCMS)

An LCMS provides an organization a full range of training management options; and since most LCMS's are web-based and integrate into an organization's intranet, the implementation is easy and the browser interface friendly. The specific features and capabilities of one vendor's LCMS over another will vary in future years, perhaps merging with learning portal and knowledge management applications, but variety will still be the norm. The constant that will be the trend is the interoperability of LCMS to learning object content, thanks to online learning standards.

Learning Object Repositories

Today we have learning content residing in virtual repositories, the corporate library of custom courseware and the extensive catalogs of courseware offered by commercial training vendors. The advent of learning objects and online learning standards will ultimately transform these learning *content* repositories into learning *object* repositories. Learning objects, on the other hand, require meta-data describing that object, data that enables the process of discovery. The computer agent built into next generation LCMS's will be able to scan the entire Web for learning objects meeting your criteria and make them available almost instantly. The current trend toward commoditizing courseware content will shift toward learning objects as content in this form becomes more prevalent.

Appendix A (continued)

Learning Portals

The learning portal is the gateway to for the learner. As organizations evaluate the return on investment, measured in productivity gain and good will, clearer definitions and best practices result. Yet, learning portals do rely upon other web technologies and standards. In a world of distributed computing and an environment of corporate responsibility for learner learning opportunity, this trend would predict that the learning portal would assume much of the role of the traditional training.

Media Creation

Based on the storyboards, media specialists create the variety of content that will make up the product: text, still graphics, movies, animations, music, narrations, databases, Shockwave content. Media must conform to the standards specified in the design document and be fully compatible with the interface. Responsibility: instructional designers, graphic designers, videographers, sound designers, programmers.

Multimedia

Multimedia describes any application that uses multiple media (graphics, text, animations, audio, and video). However, multimedia is primarily thought of as any application that uses high-bandwidth media (audio and video) and is most often delivered on CD-ROM. Multimedia does not describe the purpose of the application, such as game, presentation, or CBT. Nor does multimedia describe the delivery media, such as CD-ROM, only the nature of media used in the application. CBT and WBT may also be considered multimedia applications if they incorporate multiple media to meet instructional objectives.

Server-Side Scripting

Server-side applications may be needed for creating dynamic documents, performance tracking, learner record keeping, and security measures. Documents that include dynamic information (network status, product inventories, legislation status, etc.) offer rich, timely information to the learner. Additionally, the WBT/WBPSS may need to log usage and track learner performance. A programmer can write scripts or backend applications that perform these and other tasks. Responsibility: programmers.

Site Maintenance

Project documents and supporting files can become scattered and unmanageable. It is important that a project site manager take control early in the project to establish procedures for everyone to follow in supplying and maintaining project files. There are many site management tools available to help the responsible person keep control of files. Responsibility: programmers, system administrator.

Standards Definition and Design Document

For the benefit of all processes that follow, it is wise to prepare a design document. The technical team provides input into the technical standards, which include required software, bandwidth limitations, software settings, file naming conventions, and technical details required by the interface. The project site manager sets standards for site maintenance and internal security. The Webmaster should specify procedures and standards, which must be followed for server compatibility, external security, and user access control. Instructional designers provide an overview of the prior analyses, learning/performance objectives, and instructional design to meet those objectives. Responsibility: instructional designers, systems analysts.

Appendix A (continued)

Tasks/User Analysis

What exactly does the user/learner need to know to perform on the job? Should the training improve skills, knowledge, and/or attitudes? What components of an informational system should be accessible to the user to improve job performance? What are the range of existing computer skills and educational levels of the target users? The tasks/user analysis probes each of these questions thoroughly to understand exactly how to structure WBT/WBPSS to meet the user's needs. Responsibility: project manager, subject matter experts, instructional designers.

Technical Analysis

Often, the first questions asked concern the clients and users computing resources. Unfortunately, sometimes this is the focus for project development. The purpose of the technical analysis is to establish the baseline technical capabilities. Most appropriate is to define, with the client's assistance, a baseline projected to the time of implementation and including capabilities added expressly for this project. For example, the client may be installing fiber optic networks and wants to use multimedia to take advantage of the increased network speeds. From the technical analysis, the "toolbox" of technologies can be defined. The instructional designer will then design the course or performance support system to take advantage of technological capabilities in an instructionally sound way. Responsibility: project manager, systems analysts.

Template Design

The technical team prepares a template based on the tested interface design. This template includes blank pages with pre-positioned and coded navigational controls and repeating screen elements. The template may also include a library of models of interactive screen designs. Afterwards, the components of the template may be duplicated and expanded by other developers. Responsibility: systems analysts, programmers.

Universal Playback

WBT that plays *unaltered* on any common computer system. Universal playback is a reality since Web browsers, the playback engines, exist for DOS/Windows, Apple Macintosh, and UNIX operating systems. Although HTML, JAVA, and VRML, the languages of Web browsers, are undergoing rapid changes, these languages are not platform-specific.

Usability Testing

Test the interface on real end users or those with similar skill and knowledge levels. Through careful observation, scientific analysis, and subjective evaluation the effectiveness of the interface can be determined. Most likely, this is an iterative process requiring testing, refinement, and more testing. The tested interface prototype becomes the basis for template and technical standards design. Responsibility: usability engineers, human factors experts, or cognitive psychologists.

User-Centered Design

Application design that considers the needs of the end user as paramount. In CBT/WBT design, user-centered means designing for maximum instructional effectiveness and usability while allowing the end user control over the learning process.

Web Browser

A software application that displays hypermedia-rich documents delivered from network server(s). Many different browsers are available for text-based and graphics-based operating systems and hardware.

Appendix A (continued)

Web-Based Performance Support System (WPSS)

A Web-based system that provides on-demand access to information, job aids, and context-sensitive training. A WPSS supports users in accomplishing specific tasks. WPSS is an extension of EPSS intended to deliver support in an enterprise environment.

Web-Based Training (WBT)

Individualized instruction delivered over public or private computer networks and displayed by a Web browser. WBT is not downloaded CBT, but rather on-demand training stored in a server and accessed across a network. Web-based training can be updated very rapidly, and access to the training controlled by the training provider.

Web Server Administration

Once the project files are placed on the server, someone has to configure the server for content types used, monitor courseware/performance system usage, maintain user accounts or access privileges, maintain supporting databases, and monitor and update external hyperlinks. Responsibility: system administrator, Webmaster.

Appendix A (WBTIC Online at http://www.webbasedtraining.com/primer_glossary.aspx, 2002, and B. Dianne Calhoun, 2003)

Appendix B

Newsgroups, and Mailing Lists

<u>eLearning Forum Blog</u> Blog on e-learning	blog
<u>onlinefacilitation · Online Facilitation</u> If you are a facilitator of live e-learning, join this discussion.	browser
<u>QuickTopic - eLearning Forum</u> Online discussion forum for e-learning issues.	browser
<u>synctrain · Synchronous Internet Training</u> The "Synchronous Internet Training" list ('synctrain') is a discussion listed created to serve trainers, educators, and other people interested in Live Online Learning.	browser
<u>trdev · Training & Development Discussion Group</u> trdev is a place where training and development issues are discussed in a professional, non-commercial, collegial forum.	browser
<u>WBT/Online Learning Listserv (WBTOLL-L)</u> Online discussion group that offers daily exchanges related to the development of Web-Based training and e-learning programs.	listserv

Appendix B (WBTIC Online at http://www.webbasedtraining.com/resources_maillist.aspx, 2002)

Tables

Table 1. Retention rates and the typical learning experience

Time From First Learning	Percentage of Material Remembered	Percentage of Material Forgotten
After 1 day	54%	46%
After 7 days	35%	35%
After 14 days	21%	79%
After 21 days	18%	82%
After 28 days	19%	81%
After 63 days	17%	83%

This table was obtained from the white paper called “Maximizing Human Capital in the Knowledge Economy”, and was created by Spitzer in 1939 (2001, pg. 5).

Table 2. E-Learning Portals

E-LEARNING PORTALS	
PROS	CONS
<ul style="list-style-type: none"> • Consolidated access to a large variety of aggregated content • Independence from one content vendor • Immediate access to learning due to minimized deployment time • No large up-front technology and software acquisition costs • No cumbersome implementation behind firewalls • Flexible, convenient, and fast access to learning from multiple locations • Low or no maintenance costs • No congestion or overload of network infrastructure • Reduced in-house IT demands • Overall cost lower than for customized e-learning solutions 	<ul style="list-style-type: none"> • Course quality may vary with the multitude of vendors • Nonstrategic solution • Limited options for customization • Often lack evaluation tools, learning management, and other value-added services • Security issues of storing sensitive learner data outside the organization • High-speed Internet access needed to support media-rich courseware • Little specialized content in vertical areas • May offer limited technical and instructor support and bear certain execution risks • No direct control over hosted content and data • Broad market acceptance still uncertain
<p><i>Source: WR Hambrecht + Company</i></p>	

This table was obtained from the website <http://www.learningcircuits.org/sep2000/weggen.html>

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