Authoring training for web delivery – what works and what doesn't?

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1. CD-ROM has spoiled us

The internet has opened up incredible possibilities for providing easy access to a vast world of information and knowledge. With a few keystrokes, we can locate and be studying material on any subject we wish. We can buy, sell, communicate in seconds. And as a means of efficiently delivering *training*, it has enormous potential.

But every experience in life is *relative* . . . a house is said to be 'luxurious' only because others we have lived in are less so, a sports car's acceleration is thought stunningly quick only when compared to others in the same country and decade.

For all its appeal as a vast online information source, for most users the internet can be a frustratingly *slow* way of learning and the reason is that we have been spoiled by a superior technology: *the CD-ROM*.

Training programs delivered on CD-ROM give the user a rich learning experience without performance or quality compromise. The *benefits* of CD-ROM include:

- Full screen, high quality graphics
- Instant feedback to learner actions
- Instant navigation to any part of the program, no matter how complex
- Instant start-up of animation sequences, audio and video
- High quality audio soundtrack
- Full screen, broadcast quality video with high quality sound
- No need for special browser 'plug-ins'
- Able to study anywhere, without phone connection

But of course there are *drawbacks* to CD-ROM, some of them significant:

- Training material goes out of date once distributed
- Difficult to ensure that all users have the latest version
- Costs of production, printing, packaging, distribution and updating
- If learner's PC is not online during training, then unable to share information with others, record their progress centrally, link to associated material on the web, participate in virtual classrooms, etc.
- Finite limit to the volume of training material, even on a DVD-ROM

2. *Bandwidth:* the answer to everything

The perceived 'Performance' of a training program is a combination of several things in the mind of the learner . . . how long does he have to wait before being able to start

learning, how much delay is there between his actions and an outcome, what is the quality of images, audio, video, animations, and so on.

Three major factors affect this performance:

- The speed of the learner's computer (how fast it can process and present information)
- The speed and capacity of the device where the program is held (eg: a CD-ROM, a web server, etc)
- The data transfer speed of the connection between the two – the 'bandwidth'

A conventional CD-ROM can store about 650 MB (Megabytes) of data, a DVD-ROM perhaps 8-10 times this amount. The *speed* at which data can be read from a CD and transferred to the computer is 6-8MB *per second*. This is why training programs executing straight from CD are fast, responsive and of high quality.

Now consider the bandwidth of a typical *dial-up connection* using a 56K (that's 56,000 bits per second) modem. The effective data rate will be about 6KBytes per second, in other words, *one thousand times slower than a CD-ROM.*

This means nothing unless we consider the kind of data we might be dealing with in a training program and the size of the files involved. For example:

- A full screen graphic interface, 800 x 600 resolution (100KB)
- Miscellaneous images and illustrations (30KB – 50KB each)
- Animated sequences (50KB – 200KB each)
- Voiceover narration (250KB per minute)
- Video clips (6MB – 8MB per minute)

This means that just a *single* page of a narrated training program, assuming the interface graphics have already been downloaded and displayed, might typically require 200KB – 300KB of files, or about 1 minute over a 56Kb modem.

Some of this material may be 'streamed' (more on this later) but the learner will still have to wait for graphics to appear, animations to start playing, feedback to be given. The result of low bandwidth? A slow, frustrating learning experience.

3. Different approaches to authoring and delivery

How can we improve the *quality* of the web-based learning experience? There are several different approaches we can take, each with strengths and weaknesses.

a) Simple HTML content, accessed page by page

The most straightforward solution is to create simple training content as HTML web pages using a tool such as Macromedia Dreamweaver or Microsoft FrontPage. Small illustrations, no animations and little narration keep the experience relatively fast and responsive. All graphics should be in .JPG format (*not* .BMP or .GIF) and compressed as small as possible without attracting adverse comment on their quality. (Try out different compression levels on a target group of learners).

If there is to be narration, use a highly compressed format such as *Real* audio. Ask yourself: "What does audio really add to the learning experience?"

Strengths

+ all content held centrally means easy updating
+ no Browser plug-ins required
+ on-line progress tracking and dynamic links to other web-based material

Weaknesses

- not very 'rich' learning experiences
- program slow to start up and slow response *between* screens
- learner must be on-line throughout training

b) HTML pages with rich 'Flash' content

When you start to add *movement* and *interactions* to the training page the complexity and cost of authoring increase quickly. You can use the 'animated .GIF' format to illustrate dynamic processes or sequences but this is an old fashioned method and produces large bitmap files.

Macromedia *Flash* on the other hand is a *vector-based* animation system combined with a programming language. Flash files are relatively small, can be scaled to any size without loss of quality and they automatically *smooth* ('anti-alias') the edges of graphics and text to produce excellent results. With Flash you can create interactive training exercises and high impact animated illustrations.

Strengths

+ more engaging and more enjoyable content
+ smaller animation files than animated .GIF
+ guaranteed audio synchronisation with images and animation
+ on-line progress tracking and dynamic links to other web-based material
+ all content held centrally means easy updating

Weaknesses

- requires a Browser plug-in for Flash
- Flash files *can* become large if you are not careful
- will need a higher level of skill to create and maintain content
- program slow to start up and slow response *between* screens
- must be on-line throughout training

c) Streamed *Authorware Shockwave* programs

Both the techniques outlined above use HTML or HTML enriched with Flash content. For more complex programs and situations where you want to author *once* for both CD-ROM and web delivery, there are other approaches.

For over ten years, Macromedia *Authorware* has been the leading programming tool for producing high quality, media-rich, interactive content.

The system allows you to package a completed training program either as a single large '.exe' file for CD-ROM delivery OR to pass it through a post-processor which splits this file into many small 'shockwave' segments, each perhaps only 2KB in size. There may be hundreds or thousands of these segments held on the training server, ready for web access.

The learner needs an Authorware Browser 'plug-in' to run the program, which is launched from an HTML page. The segments are sent over the internet to the learner's PC and as they arrive they are processed by the plug-in and executed on screen. The process of segments being sent in this way is called 'streaming' and it means that as one page is being studied, other pages may be arriving, ready to be used later.

Strengths

+ author *once only* for CD or web delivery of the same program
+ web delivery of complex, content-rich training
+ guaranteed audio synchronisation with images and animation
+ on-line progress tracking and dynamic links to other web-based material
+ all content held centrally means easy updating

Weaknesses

- requires a Browser plug-in for Authorware
- will need a higher level of skill to create and maintain content
- content created originally *only* for CD-ROM may be bloated and slow
- program slow to start up and slow response *between* screens (if those segments have not yet been sent
- must be on-line throughout training

d) Downloadable executable modules

The three approaches described above all have one thing in common: the user must remain on-line throughout the entire training session.

Whereas there are some benefits to this (such as the immediate, guaranteed recording of their progress, quiz scores, etc.) where the connection is only a 56K modem, the slow start-up and response, and the inability to train *without* being connected, can be serious limitations.

There is another, rather old fashioned approach which is still worth considering – structuring the training program as several small, topic-related downloadable modules. In other words, use the 56K modem connection as simply a very slow delivery medium for your training units.

The learner chooses a unit (perhaps needing 10 minutes of study) from a menu and *it downloads to their PC before they can run it*. So, although this 10 minute study unit may take 10 minutes to download (suggest the learner makes a cup of coffee), when they *do* start it runs as fast or faster than if it had been delivered on CD-ROM. There is instant movement between pages, audio starts playing as soon as a page is entered, interactive exercises are snappy and satisfying . . . a far more enjoyable experience.

If we think about this for a moment, if that same10 minute training unit had been programmed in HTML and Flash and was executing *as we worked through it* from a web site, the same *volume* of data (images, audio, animations, etc) would end up being received at our PC. What we have done is to ask our learner to be patient for 10 minutes while the training unit downloads. They can then disconnect and use the unit whenever they wish.

As they download more units, they are also stored to their hard disk for later use. They have a local training menu from which they choose units. If the unit has been sent already, it runs. If not, the PC connects up and the requested unit is transmitted from the web server.

Strengths

+ fast, responsive execution – no frustrating waits
+ run training *without* being on-line, without limit
+ no Browser plug-in required
+ author *once only* for CD or web delivery of the same program
+ web delivery of complex, content-rich training
+ guaranteed audio synchronisation with images and animation appearing

Weaknesses

- learner must wait for download to finish before training starts
- learner progress data not easily logged (needs care to retrieve this data via automated FTP or email)
- potential problems controlling training program versions (it is possible to automate the on-line checking of downloaded versions, download newer versions if necessary, even to embed a ‘shelf life’ on downloaded training)
- will need a higher level of skill to create and maintain content
- more difficult to integrate with Learning Management Systems than on-line training modules

4. The chamber of horrors

The most frequent causes of problems and learner frustration are:

- Too much information on the same page- having to wait while many images and animations appear. Split content over more, linked pages.

- Using images that are too large – the best format is .JPG for static illustrations. This gives you control over the amount of compression used when the file is saved. The greater the compression, the smaller the file and the poorer the image quality. .BMP images are uncompressed and unnecessarily large.

- Using the 'animated GIF' format for animations – these are large, take a long time to appear and are not scalable like Flash animations but no plug-in is needed.

- Using animations gratuitously, to brighten up the page rather than to add to the learner's fuller understanding

- Text too small or placed against a busy/cluttered backdrop image

- Audio files not sufficiently compressed - take a long time to start playing and then keep pausing ('Buffering'). If audio is essential to aid learning (is it?) then devote at most 50% of the bandwidth for audio, ie: 28K on a 56K connection. Use a compressed format such as 'Real' and not .WAV files.

- Audio soundtrack not synchronised with screen activity.

- Trying to play 'streamed' video clips on a 56K connection. This is a deeply frustrating and unrewarding experience for the learner. The video may keep pausing to catch up, the audio quality will be terrible and the picture quality will be even worse. Unless the video clip is *genuinely* useful in supporting learning then best not to bother. Eg: clip of frog catching an insect, tornado sweeping across a town, an avalanche in action.

  If you *do* need to include video then the alternative is to provide the clip as a downloadable file such as .MPG, .MOV or .AVI. These will be of reasonable quality but will occupy 6-8MB per minute and may take 30 minutes or more to arrive.

- Training programs which have been written without due regard to the differences between Browsers and cause problems of alignment, content not appearing, etc.

- No help with fetching any required plug-ins

- Relying on Browser navigation buttons (which may or may not be visible) rather than providing the program with its own (far friendlier) navigation controls

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