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EVALUATING STREAMING MEDIA APPLICATIONS FOR HIGHER EDUCATION

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Abstract

Streaming media applications are poised to make a large impact on higher education. Currently a growing number of new audio/video production and delivery applications are being packaged for and presented to higher education. One of the appeals is that the new technologies leverage existing educational practices, in particular, the traditional lecture format. Evaluation of options for implementing this technology into higher education must take into account the following: the ability to adapt existing resources, the amount of training required for educators to integrate the technology, and technical factors. These factors are backgrounded against standardization efforts by the streaming media industry. This paper describes how evaluation factors, as asserted in vendors' claims, are being catalogued within an ongoing watching brief.

Keywords

Streaming media, online delivery, technology evaluation

Introduction

Keeping up with the moving targets of evolving technologies is no easy task, and this is particularly so in the case of applications for creating and delivering streaming multimedia. Streaming technology is becoming increasingly featured in web-based delivery of higher education (Michelich, 2002; Lynch 2002, Furr, 2001) driven both by increasing availability of technologies (McCannel, 2001) and persistent budgetary pressures over the last decade to find scalable alternatives to the mass theatre lecture in undergraduate studies (Roberts, 1993).

The integration of streaming technology into higher education is occurring only after developers of streaming media authoring and delivery applications have overcome some of the initial impediments, such as complex editing and other processing procedures, to the technology, (Furr, 2001). There has also been considerable impact on higher education's network infrastructures, effecting even institutions which do not deploy streaming technologies within their educational delivery strategies, as when institutional networks become overloaded with streaming content accessed by students for leisure as well as learning (Carlson, 2001).

Technology choices made to support flexible delivery often take place without needs assessment and planning for evaluation; technologies are often implemented based on availability, rather than as an outcome of systematic design (Compora, 2003). This paper offers a record and synthesis of information obtained from streaming application vendors, the IT and higher education press, and the educational technology literature, which must be monitored, considered and evaluated if an institution wishes to make intelligent choices in acquiring streaming technologies. It describes and recommends criteria for evaluating streaming media authoring and delivery tools, against the tenuous background of IT industry developments that will determine returns on investment for investment and training choices made in pursuit of enriched flexible learning delivery.

Building an Evaluation Framework

Hansen & Salter (2001) explored the needs of matching technology to higher education at The University of Western Sydney. Their research was informed by Rogers' (1995) *Diffusion of Innovation* theory to consider the broad requirements for implementing educational technology systems-

> From an institutional level, the innovation-decision process has to occur, where a perceived need is recognized and by various decision-making processes results in an institutional adoption. In addition, at the individual level, the innovation has to be accepted and put into use. The specifications and characteristics of the innovation, at least initially, combined with a suitable adoption strategy need to be carefully considered to aid the adoption process and to minimize the "discontinuance" or the rejection after use, of the innovation. (p. 288)

To ensure that the innovation "sticks" evaluators must consider not only technical factors, but also other institutional needs and individuals' sensitivities when evaluating a streaming tool. As described by Hansen & Salter, this included surveying the institution's faculty and staff. The main concerns which emerged were (1) the ability to adapt existing resources (2) the amount of training time needed to learn how to use an application, lastly (3) the technical parameters of the application/s (p. 289). Perhaps another consideration by academics, (certainly seen as a 'hook' by vendors as they promote their applications to educator targets on their websites), is maintaining their comfort level while using the technology unnoticed during their established delivery practice in face to face lectures (or to repurpose recordings of face-to-face lectures for flexible delivery).

Extending Hansen & Salters' categories of concerns to evaluation of streaming technologies is a useful exercise. Information from vendors' specifications and the educational technology literature produces an evaluation checklist (Table 1).

Ability to adapt existing resources	Amount of training time or specialist support needed for faculty and staff	Technical Parameters	
✓ Record/produce from existing classroom/ lecture theatre/document camera/ computer screen, etc. ✓ Record/produce from computer desktop ✓ Facility to interact with presentation materials ✓ Relative effort of recording/production ✓ Delivery plugins needed by students ✓ Cost/licensing options	✓ High ✓ Moderate ✓ Low	✓ Audio + video ✓ Quality of image/audio ✓ File output size ✓ Need for additional server infrastructure ✓ Meets learning object standards for interoperability	✓ Output formats for delivery ✓ Synchronous/ Asynchronous Delivery ✓ Indexing capability ✓ Scalability ✓ Interoperability with institution courseware platforms (e.g.Blackboard, WebCT) ✓ Communications functions

Table 1 Evaluation Checklist

Note that the list of *technical parameters* is, not surprisingly, longer than those listed for *training* and *resource adaptability*. This does not mean that the three categories of parameters are not of equal weight. When applied against available data regarding actual products available in the marketplace, comparison is aided by arranging the information in tables. Ideally, data describing all evaluative factors and their weights could be presented in a single comparative matrix, which is searchable by product. The authors have envisioned such a tool, modelled after the comparative information on course management systems, available online from Edutools (2003). Given the constraints on space for this paper, the information will be presented here, rather, in a series of tables. Any compilation of information about emerging technologies must be considered a work in progress.

Table 2 lists names and URLs of many of the products currently being promoted in the Higher Education marketplace.

Product	URL
Screenwatch	www.screenwatch.com
Camstudio	www.rendersoft.com
Breeze	www.macromedia.com
Aculearn	www.acculearn.com
Impatica	www.impatica.com
Tegrity Weblearner	www.tegrity.com
Camtasia Studio	http://www.realnetworks.com/products/camtasia/index.html
RoboDemo	http://www.ehelp.com/products/robodemo/
Matchware	http://www.matchware.net/en/products/screencorder/default.htm
I-movie	http://www.apple.com/imovie/
Final Cut Pro	http://www.apple.com/finalcutpro/
U Lead Video Studio	http://www.ulead.com/
Adobe Premiere	http://www.adobe.com/
Microsoft Producer	http://www.microsoft.com/office/powerpoint/producer/
Viewlet Builder	http://www.qarbon.com/products/viewletbuilder/features.html
Horizon Live	http://www.horizonlive.com/index.php

Table 2 Products, Vendors and URLs of Streaming Media Applications

Selection of tools for delivering streaming media in higher education is further complicated by the variety of process functions, which are being packaged into the various products. Comparing "apples with apples" is not easy. The available functions address all or various selected stages of production, editing and processing, formatting, and delivery of streaming media content. Table 3 suggests functions and features that should be evaluated when considering a streaming media application product or combination of products.

Process Functions
1. Content capture (can be synchronous or asynchronous with delivery)
2. Content input
3. Content editing
4. Content combining
5. Content application file formatting, compression and packaging
6. Content delivery (may be integrated with synchronous/asynchronous communications)

Table 3 Range of Process Functions Built into Streaming Media Applications

Forces for adopting Streaming Multimedia Technologies

Schott, Chernish, Dooley & Lindner (2003) also noted considerations of technology adoption and diffusion in higher education -

> In practice, teachers and learners have moved to adapt and use the technology of distance learning back in to a traditional classroom, or a traditional classroom as it has evolved to embrace technology. This portends fundamental changes in site-based learning and could presage a future evolution of different hybrid learning spaces and the real possibility of new forms of learning delivery, with great implications regarding course design, content examination, and instructional design

Exactly this seems to be occurring with streaming technologies, as vendors appeal to academics to adopt their streaming production and delivery applications without substantially impacting on their teaching practice, with appeals such as

- "Desktop Recording Software System easily publishes your recorded lectures and presentations for streaming on your web server, on your network or for CD distribution" (Screenwatch),
- "A content creation system that enables the presenter to quickly and easily create "talking-head" video presentations synchronized with PowerPoint slides" (Aculearn), and
- "The leading solution for automatically turning natural teaching into effective multimedia e-learning, for on-demand and live delivery" (Tegrity).

Indeed, on evaluating some of these products, the focus does seem to be on making operation of the technology increasingly simple with declining imposition on the teacher." The dynamics identified by Roger's (Hansen & Salter, 2001) support Wang's (2000) prediction that "once faculties or students are able to benefit from these multimedia technologies, they will use them anxiously."

Uncertainties Concerning Streaming Multimedia Technologies

Although the technology has moved forward at an impressive pace since Diaz (1999) proposed working around bandwidth and file size constraints with Web/CD hybrids and Furr (2001) decided to go with audio only streaming, four years later, there are still some risks associated with large scale investment in technology for streaming audio/video. In Australia, uneven distribution leaves some institutions to serve learners who indeed are still functioning with pre-1999 bandwidth capacity. Some of the applications allow for this by formatting output files for varying bandwidth, down to 28.8 kbps (by eliminating part of the video content).

McCannel (2001) cautioned that streaming media is at a stage in its development similar to the development of videotape formats over 20 years ago.

> The streaming media industry would undeniably be better off if the streaming media companies could agree on interoperable standards, simplifying the end-user experience. Yet none of the big three streaming formats [QuickTime, Real Networks, MS Windows Media] are showing signs of "the Betamax syndrome", and they also aren't showing any signs of convergence.

Learner/users are usually reliant on one of the proprietary plug-ins, and the industry is divided as QuickTime (Apple) declared its codec (coding/decoding for streaming) open source and joined the International Streaming Media Alliance (ISMA) in a movement to standardize. Other ISMA members include Cisco, IBM, Phillips, and Sony. . MPEG-4 is the resulting standard. In the mean time, Real Networks and Microsoft's Windows Media, each continuing to promote their own separate closed and proprietary codec, dominate market share. The range of major media players plug-ins available and their codec availability is listed in Table 5.

Major Players (Multimedia Architectures)	Open Standard Codec?
Real Media	no
Windows Media	no
QuickTime	yes
Flash	yes

Table 4 Media Players and Codec Availability

Recommendations

Undoubtedly, the number of higher educational institutions delivering content via streaming media will continue to grow in the United States, where broadband access is becoming nearly ubiquitous. This will continue to provide models of innovation, which can be evaluated by Australian higher education while this country's infrastructure is evened out, and perhaps more importantly, while the streaming media industry consolidates around a standard. In the mean time, there will undoubtedly be innovative academics at many Australian institutions that will experiment with the technology.

Perhaps small-scale piloting of some of the applications should occur in delivering teaching and learning. For instance, at this institution, it has been recommended that a lower cost product be purchased on a single user license and used to produce streaming small learning objects available to support academics as they learn to use Blackboard courseware. This may give them the opportunity to experience the new media as a learner, while they learn to master the technology in which we are currently invested, and provide an impetus for the adoption and diffusion of streaming media in the near future.

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