Message Design Considerations for Use of Mobile Learning Content in Engineering Education

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Abstract – Video iPods put true mobile technology in the hands of the masses. While this paper explicitly deals with iPods, the content can be adapted for use with any mobile device. These devices can revolutionize engineering education by providing exciting content delivery innovation. Currently, iTouch iPods support a 16 GB handheld audio/video device that will provide up to 10-20 hours of full motion, combined video and audio content. However, use of this technology is new in education, and improper planning and design may lead to poor learning outcomes. Designing audio and/or video learning content for a mobile 3.5 inch diagonal widescreen color display device presents design considerations for the creator of educational content on three fronts – content creation/organization, video production, and environmental usage. This paper provides a first step look at those considerations based on our experiences working with one large automotive manufacturing plant's early adoption of the media.

Keywords: Mobile Technology, e-Learning, iPod, Educational Design

OVERVIEW

When a new medium is introduced it is often first thought of in terms of old medium applications. For example, when film was first introduced, the medium was used to capture theater-like presentations of entertainment content. It took some time before filmmakers began to understand the potential of the new medium, its ability to cut, inter-cut, compress time, and provide 1st person/3rd person perspective interchangeably. Once these principles were established, the potential of the medium began to rapidly develop [Stanton 2].

It is this similar paradigm shift, that producers and writers need to consider when designing educational or training content for display on an iTouch iPod or other mobile video/audio devices. In fact, designing content for mobile video presentations is not the same as designing content for the average television or computer screen. It is its own unique medium and must be designed from the start with that in mind. This paper is designed to identify some of the changes in production and planning of educational material that should be considered in order to create effective training materials in this new medium. These suggestions are made based on the author's experiences in the early stages of design and implementation of video/audio mobile material created for a management training program for a large automotive manufacturing plant. The project is in the early stages of roll out and as a consequence the suggestions in this paper are made based on short interviews and communication with the clients.

Academics have long been considering the problem of adapting learning theory to accommodate new learning environments created by new technology. They have consistently opined that there is limited effective research done, for example, on planning and adapting learning theory to be used in computer learning environments [Stanton 2]. This problem is ongoing as technology evolves and is made available for use in corporate and educational learning environments. Creation of material for mobile technology is dramatically different from anything to come before it and must be considered and researched according to its own unique attributes.

For this project the authors worked specifically with the Macintosh iPod, but the information conveyed here could be adapted to any like mobile device. The iPod has three distinct characteristics that make it a completely new and unique medium. First, the iPod's video capacity is based on H.264 750-Kbps video at 320-by-480 resolution, combined with 128-Kbps audio and displayed on a 3.5 inch screen. This means that while the fidelity of the image is

very high, the small screen size dramatically impacts the visual storytelling capabilities available to the producers. Second, the iPod leverages advanced audio production techniques, by delivering the audio through

"earbuds" more commonly known as headphones. T[1]his allows the producers to deliver audio messages directly to the user with minimal environmental audio disruption. The lack of environmental disruption in turn enhances the importance and effectiveness of the audio content for the learner. Simply put, the learner is not easily distracted by routine external environmental sounds and stimuli. Finally, the iTouch iPod is completely mobile, allowing the user to be untethered from a dedicated, static communication environment. This means that because the user dictates where and when the information will be conveyed, producers must be aware that unlike the audio messages, the video messages are competing with "real world" physical and visual stimuli.

To illustrate these unusual characteristics of the iTouch iPod learning environment, the authors will consider a single case study implementing iPod technology into a corporate education environment for engineers. This case involves the development of training materials and modules for use by an automotive plant to provide soft skills training to management trainees – here the convenience factor of the iPod's mobility is the key reason for iPod solution.

Learning Design Considerations

Every learning design, regardless of medium, must be developed according to certain accepted standards of development practice. According to Sonny E. Kirkley and Jamie R. Kirkley, in "Generation Blended Learning Environments Using Mixed Reality, Video Games and Simulations," all of the following factors should be considered by producers when developing learning environments using new technology: (1) needs and goals for learning; (2) learning objectives; (3) physical and/or virtual space; (4) tasks and interactions; (5) assessment methods; (6) audience and their characteristics; (7) domain area; (8) community of learners and practice; (9) technological capabilities and possibilities [Kirkley 1].

The following list provides a brief overview of each of the Kirkley factors and our assessment of their relationship to the mobile learning environment and to this project's unique attributes and challenges.

1. • need and goals for learning – independent of training media

2. • learning objectives - independent of training media

3. • physical and/or virtual space – mobility a critical concern

4. • tasks and interactions - limited interaction, other than control of the preproduced message.

5. • assessment methods – currently unavailable with iPod technology and this project.

6. • audience and their characteristics – a serious user concern for those unfamiliar with the iPod interface.

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7. • domain area

8. • community of learners and practice – we expect a high level of engagement with users familiar with the technology and possible resistance from users unfamiliar with the medium.

9. • technological capabilities and possibilities – realizing the attributes and their limitations vs. possibilities is critical to successful message delivery with the iPod.

Using the Kirkleys' development process and our analysis of the relationship between those concepts and the iTouch iPod technology and it's use, we can begin to see how the attributes unique to this delivery medium factor in to the design and implementation of the learning goals. Specifically, the iTouch iPod can be utilized in a mobile environment, using closed aural stimuli with visual content that is smaller than any visual content created and used in the past on other formats, like the computer or television screen. As a consequence the authors expect that much of the prior research into use and development techniques for these older mediums will not apply, either in whole or in part, in helping us design and the create content for small screen, mobile learning.

It is with this knowledge in mind that the authors developed content for integration of the iTouch iPod delivery working under certain hypothetical assumptions about the process for developing and displaying the content. For example, as the reader will see from the case study below, the production process for small screen content must be dramatically altered. Text has a diminished role in the process and as do certain kinds of short, quick edits. We expect that certain wide or long shots will not translate well onto a very small screen. We expect to find that audio will have an increased role in the delivery of the message as well. Additionally, we must constantly be aware of the iPod message competing with the distractions of the physical environment. As a consequence, the iPod learning medium will be like no technology for learning that has come before it. It is a direct descendent of TV and computer learning, but it has distinctly different features that will make it a unique learning experience for consumers.

Training – Automotive Plant

The current application case involves is the use of iPod technology to provide soft-skills training for managers at a large automotive manufacturing plant. A formal needs analysis was conducted by the author and five general areas of manager deficiency were identified by the client as those that they wanted to be addressed by the iPod training project: 1) Advocacy for the Company; 2) Engagement and Motivation; 3) Change Management; 4) Conflict Management; and 5) Technical Expertise. Beyond needing to improve manager performance in these areas, there is an additional challenge in providing the information to the managers: that is access to the information, in terms of available "collective" time and tools. Specifically, there is limited audio-visual technology available to the managers so that they can quickly and easily access the learning. The managers' job and time restraints make it virtually impossible to assemble all or even most of the managers at the same time, in one place, for lengthy instructor-led training. Doing so often results in either loss of productivity and/or additional cost for overtime for the company.

The authors' proposed solution is to use a blended training approach, mixing the use of learner-controlled technology (iPod content), print medium training and instructor-led training sessions. The solution proposed is to make iPods, with training content, available for the sixty-plus managers. The iPods will provide initial video training modules for each of the five training categories. The iPod will allow each manager to personally receive the audio video training that would have been developed for a collective training experience. This allows the manager to access the training when he or she is ready and able to spend time with the material. Once completed the manager will be sent to a common training experience with other managers where supplemental written training support and instructor-led simulations will be provided. At this training session the learner's simulation will be videotaped, edited and loaded onto their iPod. This solution decreases the amount of time large groups of managers will need to be present in the same place, at the same time, making the training process more efficient and cost effective for the company.

Of the three distinctive iPod attributes previously mentioned in this paper, only the increased mobility factor is utilized in this learning situation. The client wants the learners to access the material at their discretion to decrease off time from the work environment and to increase quality of interaction with learning materials. The client also is interested in investing in nontraditional learning environments, making the iPod an effective solution for the client's current training needs. Specifically, this client has a tolerance for risk related to introduction of new technology into the education process.

Training--Content Considerations

As with all media design, a solid design methodology and plan is essential. The one used in this case study contains the primary phases of: Analysis, Design, Development, Validation, Implementation, and Evaluation. These phases directly correspond to the Kirkleys' nine factors for development of learning environments using new technology. While the iPod technology will not impact the Analysis phase, it will impact other phases. To leverage the potential of this mobile technology one must be certain that the application fits the need. In each of the above examples the technology solves a communication problem. However, it's important to keep in mind that while doing so, iPod technology introduces two new considerations into our equation – environmental stimuli conflict and adaptation to very small screen video. The need for mobility must justify the challenges of designing videos in a "real world" environment and displayed on a small screen. This should be addressed and documented in the analysis phase. This paper focuses primarily on the issue of adaptation of content to the very small screen video. This project has currently reached the implementation phase. The authors have not yet reached the formal evaluation stage and therefore the data contained in this case study is garnered from informal reviews, interviews and implementation evolution as the roll out of the learning material and environment occurs.

Training--Environmental Considerations

While the flexibility of mobile communication is obvious, one of the greatest concerns the authors have is lack of control over the external environment in which the user will choose to receive the communication. While our learners can choose to view the material in a quiet room at the plant, they may not always choose to do so. In this instance then, we determined one solution to the distraction problem was to be sure that the learner is supported by alternative mediums – live instructors and written material. This blended approach allows for some leakage of information should the learner be visually distracted while viewing the material.

Training-- Production Considerations

Production considerations have a significant impact on whether or not the content of the video message is perceived by the audience as effective and useful. Adhering to standards of production and storytelling are also important because it is much easier for the learner to discard the material if it is being conveyed using a mobile device like an iPod. It is our belief that some of the early failures of use in mobile video material are due to poor production values and/or the "talking head" syndrome. The "talking head" syndrome is what we refer to as a clear preference by educators to create mobile content that are simply compressed versions of themselves talking in a lecture session environment. This is an ineffective training strategy in a dedicated learning environment and our expectation is that in an open environment it will be even less so.

The authors anticipated two production considerations that made the iPod experience different from traditional video production development. First, each user will have a dedicated headset, making the audio production role more significant in the story telling process than it is in a more traditional medium like a kiosk or small TV environment. Because the user will be wearing the head-set, there will be a greater opportunity to speak directly to the user and to leverage the power of sound effects to create a virtual environment. Therefore, the scripts were written to speak to

the individual with one on one visual and audio grammatical constructs. Second, the size of the screen – much smaller than the average television or computer screen - will not allow for the utilization of some production attributes such a text driven content. Also, the small screen presents some unique production considerations of its own. The small screen will not display fine text, defined as anything under 36 points. Consequently, designers should develop content that is video/picture based and not text based. This is a further restriction on the way content can be developed for an iPod learning environment.

So, the iPod's small screen, while retaining a high degree of visual fidelity, is still limited by its size. For that reason the authors created segments with limited use of variant shots. For example, the authors worked using very few wide shots. Most of the segments were shot in medium shots, close ups, and extreme close ups. Finally, knowing that there is an external visual distraction factor which we expected to increase because of the competition between the iPod screen and the real environment for the learner's attention, the authors designed the majority of the video segments to be under 300 seconds in duration.

Summary

It is important to recognize and respect mobile video instruction as a unique means of delivering training and education. We cannot simply dump content created for a different medium into the mobile learning environment and expect positive responses. The authors approached the iPod learning environment as a totally new and independent medium—one which we are just beginning to learn about--when designing the training for the automotive training application. The initial user feedback has been positive. While it will take another year to conduct a thorough analysis of the effectiveness of the training, we have received primarily positive response by the users on the content and in particular the content as it is accessed through this new medium. Assessment of the medium, independent of the other components of the learning environment in this instance, is proving to be complex and the authors are currently working on ways to effectively assess the impact of mobility on the learner's experience. Whether or not the mobility factor effects the learning outcome in a positive way remains to be seen and is the next step in this process for the authors. Anecdotal response from learners in the corporate learning environment and in several other environments in which the authors are beginning to work on deploying mobile learning content, leaves us hopeful that when the content is prepared effectively, learners engage more often and more fully with the material. We hope therefore, they will reach their learning goals more fully and more quickly than they might without access to this mobile environment. From our preliminary experiences, we believe, if creators follow the steps described above in creating video content for iPod delivery, then that content should be more effectively conveyed to your learner. With the right production techniques, delivery of learning material using a mobile device can be a valuable asset in engineering education.

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