Interactive Video-Based Training-On-Demand Over Multimedia Networks

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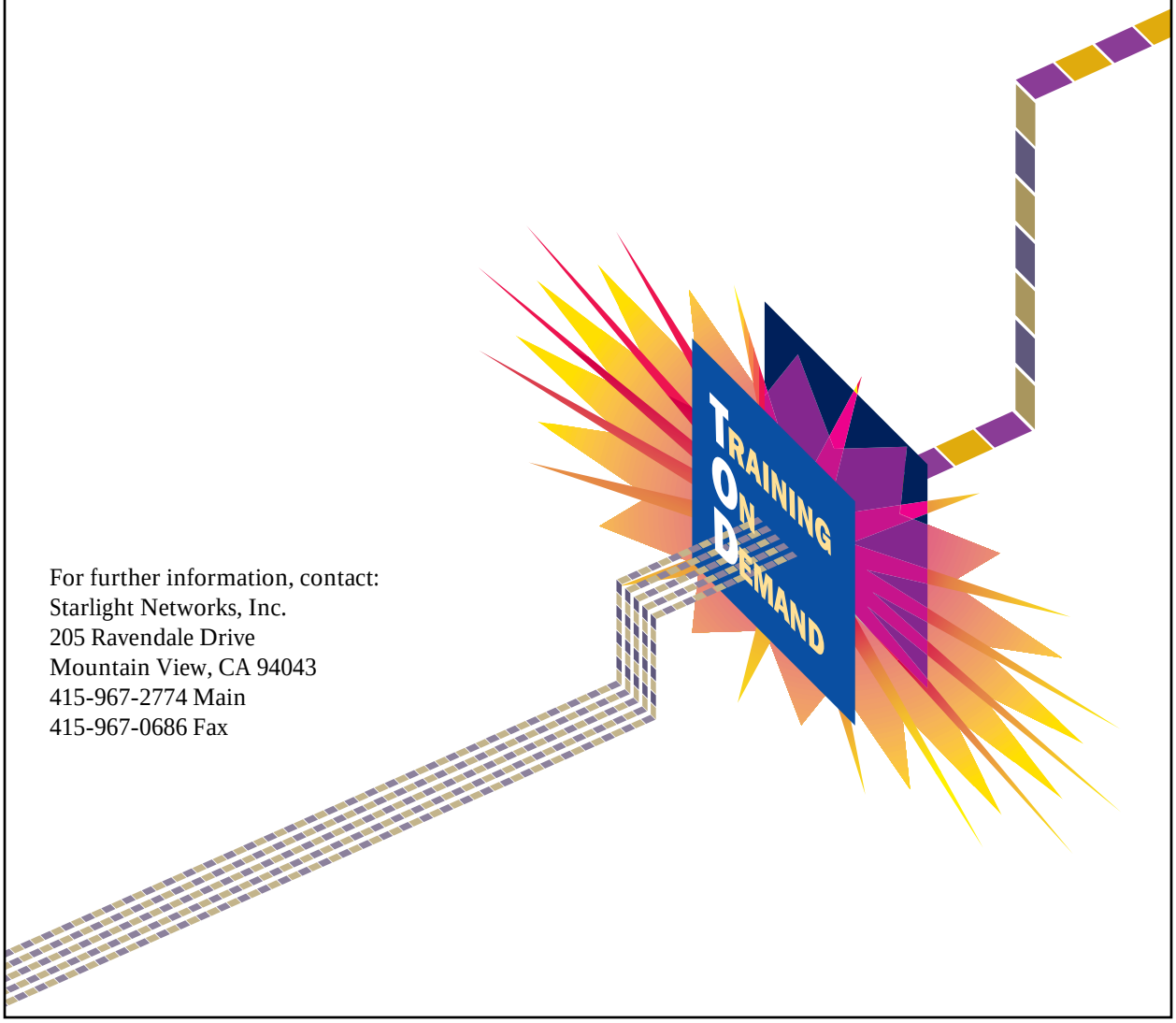

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The training environment and the need for interactive multimedia

According to an annual survey conducted by *Training Magazine*, American businesses spent $50.6 billion in 1994 to train 47.3 million employees over the course of 1.4 billion training hours. Given this statistic, return on investment (ROI) becomes a major concern, and training departments are asked to show quantifiable business results.

Studies show that interactive, computer-based training (CBT) involving multimedia delivers an ROI ranging from 100–400 percent[1], with benefits far exceeding that of other methodologies (including live instruction). Benefits include:

- Reduced cost of delivery.
- Higher retention levels and higher quality of learning.
- Greater consistency of content.
- Greater convenience.
- Immediate feedback for the learner.

The training needs in the corporate environment are enormous, and they continue to grow to keep pace with new technologies that users must learn. The META Group research organization projects the overall market for training in desktop productivity applications using CBT to be almost $300 million in 1995. With the introduction of Windows 95, META Group anticipates total training costs for that product alone to exceed $130 million in 1996, with the CBT market for Windows 95 to be at least $80 million in 1995/96.

Video is the most commonly used medium for training delivery, with an impressive 92 percent of *Training Magazine* respondents using it. Live training is close, with 87 percent using it, and 76 percent using one-on-one instruction.

Interactive multimedia is considered by trainers and experts in the field to be the 'hot' training methodology. Forty-six percent of the organizations surveyed by *Training Magazine* use interactive multimedia, and 20 percent use interactive video. These percentages are increasing, but a gap evidently exists between awareness (of the dramatic advantages of computer-based training documented over recent years) and implementation. Increasingly, corporations are seeking to reduce this gap by combining their current investment in video courseware with the advantages of interactive, computer-based training to deliver video-based training to the desktop.

The need for multimedia networking

Corporations are increasingly recognizing that multimedia is becoming important as a datatype within the information technology (IT) structure and for specialized applications, such as training. To make multimedia viable within the corporate context, and to use it widely, multimedia needs to be shared across the network, just as database and other productivity applications. The TOD — training on demand — multimedia server, based on Starlight Networks' StarWorks®multimedia networking software, handles the high bandwidth and storage requirements to manage the delivery of multimedia data over the network. With TOD, companies can now cost-effectively provide desktop training to hundreds of networked users, enjoying the advantages of both video-on-demand training and multimedia networks.

Interactive multimedia training and return on investment

The current corporate business model requires that departments and their respective programs prove their value to the bottom line. Training departments in particular are commonly the targets of budget cuts, and are routinely in the position of having to cost-justify their programs. No longer is training or any other program allowed to continue on a vaguely perceived value or merely on privilege. (This concern for measuring training's effectiveness is reflected in the *Training Magazine* survey, where one half of the organizations responding evaluate the business results attributable to training.)

Bob Blalock, Director of Learning Technologies Research for AMR Training & Consulting Group, a subsidiary of AMR Corporation (the parent company of American Airlines), authored a paper[2] that discusses the business value of interactive multimedia training in terms of return on investment (ROI).

1. Study conducted by AMR Training & Consulting Group.

2. "Justifying Multimedia: The Payback," Bob Blalock, Ph.D., © 1994.

ROI is a financial calculation that establishes a realistic measure of the 'business value' of a project. ROI is based on a percentage derived from net program benefits (total benefits less costs). The benefit-to-cost ratio is another measure that can be used to determine a program's value, and this is based on the total benefits and costs. Each can be computed as follows:

$$\text{BCR} = \frac{\text{program benefits}}{\text{program costs}}$$

$$\text{ROI (\%)} = \frac{\text{net program benefits x 100}}{\text{program costs}}$$

ROI provides a quantifiable measure of results. Blalock's survey of real-world interactive multimedia solutions discovered typical ROI values in the 100 to 400 percent range. The cost benefits contributing to this include:

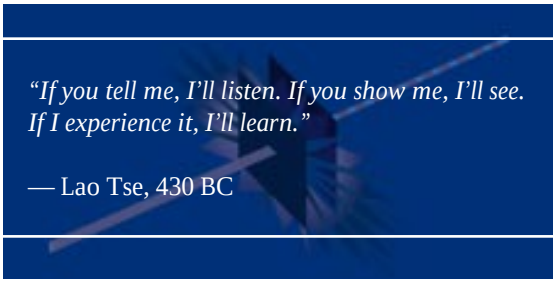
- Significantly reduced training time (and travel time to training sites).
- Dramatic savings in travel, hotel, instructor, postage, printing, and other expenses associated with live instruction.
- Improved comprehension and retention, and improved employee productivity and performance, resulting in significant savings.

Blalock's results are confirmed in a study by Brandon Hall, Ph.D., editor and publisher of *Multimedia Training Newsletter*. Hall conducted a study of the effectiveness and cost-benefits of computer-based multimedia training based on real-world case studies as well as a review of the literature on this topic[3].

Hall concluded that computer-based training reduces the total cost of training, compared to instructor-led training. This is achieved both by program costs that are lower than other methodologies, and higher benefits, resulting in a higher ROI. The total cost of training includes cost of development and cost of delivery. Traditional training has a lower cost of development and a higher cost of delivery. On the other hand, interactive training has a higher cost of development (design and production) and a lower cost of delivery. The lower delivery costs for interactive training result primarily from reduced training time and the elimination of travel, as well as from the ease with which content can be replicated and distributed. ROI for interactive training is higher when the training population is large enough for the savings in delivery to offset the cost of development. With interactive training, the cost per student is reduced as more students are added; with traditional methods, the cost per student remains the same or even increases with more students.

Organizational benefits of interactive multimedia training

Interactive multimedia involves all of the human senses and requires a response, presenting an experiential environment that, as Lao Tse stated 25 centuries ago, optimizes learning. Studies have shown that people learn best through involvement of as many senses as possible: sight, hearing, touch. The more the senses are involved, the more engaged becomes the student, and the more the experience becomes one of exploration and discovery.



This optimal learning environment will, as we'll see, result in productivity improvements that, along with reduced costs, contribute to a high ROI for interactive training as well as other business advantages, including those found in the following paragraphs.

3. Hall's survey includes information derived from a 1990 study by J.D. Fletcher for the U.S. Department of Defense (DoD) on "The Effectiveness and Cost of Interactive Videodisc Instruction in Defense Training and Education." This study is significant in that it demonstrates the government's interest in this area and because its findings are still used by researchers and training department managers to substantiate the effectiveness of training. The DoD studied the use of interactive technology in training as it pertains to effectiveness, cost-effectiveness, time on task, retention, and applicability to training requirements. The study looked at military training programs, as well as those in industry and higher education.

Increased learning/improved retention. Future Systems, Inc., in its March 1992 edition of the *Multimedia and Videodisc Monitor* (now the *Multimedia Monitor*), summarized the data available from several corporate and government training sites and found that interactive video-based instruction had a 25 to 50 percent higher content retention rate over classroom instruction (over a three to six-month time period). The author of this study believes that this factor is the most important benefit derived by interactive instruction, and that it is through content retention that organizations gain their greatest return on investment.

This figure is particularly significant because educational and academic research generally indicates that retention of 10 to 15 percent is normal in traditional (passive) learning situations. In his review of research in the field of CBT, Hall found many studies indicating that interactive CBT results in a higher quality learning experience than other methods and results in increased learning. One study indicated increased learning achievement ranging from 30 to 50 percent[4]. The immediate interaction and feedback of interactive CBT provides constant, highly-effective reinforcement of the material. Retention is critical to performance because long-term learning lays the foundation for continued work improvement.

Reduced training time. The February 1990 issue of *Multimedia and Videodisc Monitor* included a landmark study on the learning benefits of interactive technologies. The study found that interactive technologies reduce learning time requirements by an average of 50 percent. In a separate study, Brandon Hall determined that computer-based training requires less time for training compared to instructor-led training, with the time saved ranging from 20 to 80 percent, with 40 to 60 percent being the most common. Among the conclusions, the study revealed the following:

- TOD delivers information in an easy-to-understand format
- Learners can move at their own pace and skip quickly through material they already know
- Feedback and reinforcement is immediate and effective
- The coursework can be designed and delivered in a tighter, more efficient way.

4. 1990 DoD study by J.D. Fletcher.

One study found that interactive learners gained mastery of the course content 60 percent faster than those in the classroom.[5]

Consistent delivery of course content. The consistent delivery of course content is a constant concern of training professionals. TOD is able to deliver the consistency that is so difficult to achieve with the varying presentation styles and teaching abilities of different live instructors, further complicated by the differing capabilities of learners. TOD does not fatigue at the end of a long day. One study found a 20 to 40 percent less variance among learners' understanding of course content using interactive methods as compared to classroom instruction[6]. Using a networked TOD system, a major Wall Street financial firm is able to standardize its employees on a single training approach. Course content can be delivered in exactly the same way, ensuring that everyone gets the opportunity for the identical learning experience. Consistency helps to assure intended results and higher quality information. Errors are less likely to occur, and it's less likely that learners will need to repeat the material because it's been covered poorly.

Higher performance and quality. Interactive CBT has repeatedly been shown to improve employee performance, reduce errors, and increase the speed of service or task completion. Fractions of a percentage increase or seconds shaved can mean significant savings where millions or hundreds of thousands of transactions are involved.

Increased productivity. Improved learning and retention result in increased productivity, which positively effects the company's bottom line. Not only does the decreased training time give employees more time for productive work, but in addition to teaching new skills, TOD also reduces the time it takes employees to conduct routine transactions, with significant cost savings overall.

Leverage existing assets. Companies can use their existing computer equipment and network infrastructure to implement a TOD system that can be shared by users on the network. Companies that already have a major investment in video curriculae

5. Gregory L. Adams, Interactive Communications, Inc., in Multimedia & Videodisc Monitor, March 1992.
6. Ibid.

can load these courses onto a video server and continue to use them in the new environment.

Easily updated/immediacy. Multimedia courses delivered to the desktop can be easily and quickly updated simply by loading the new version on the video server. The training manager can be assured that everyone accessing the course is using the updated version, and that there are no old versions still in existence. The delays and overhead of planning seminars or printing and distributing volumes of revisions are easily resolved with computer-based programs. Learners can be easily, quickly, and uniformly kept current with instructional or informational changes.

Training when and where it's needed. Classes are often difficult to schedule, they may not be available when they're needed, and students often find it difficult to attend or to take large blocks of time to attend. TOD courses are always available — at the click of a mouse. Delays and inconvenience are not an issue.

Customize to meet specific needs. If you're the U.S. Navy needing to train your engineers on submarine operations and maintenance, you probably won't find an off-the-shelf package for this particular application. Customization will give you exactly what you need.

Measurement. Companies can more easily tabulate empirical data required by regulations or certification requirements, as well as to measure the effectiveness of their training program. Understanding and retention can more easily be determined so that additional training can be provided if necessary. Also, employees responding to tests and questions as part of their training program can receive immediate scoring and feedback, which further contributes to the learning process.

Employees develop a positive attitude toward computers. Perhaps an overlooked, but certainly positive, benefit is that employees using TOD become more proficient at using computers. Users enjoy the interactive environment. They are more involved in the learning experience, which makes it more enjoyable, and this reflects upon their use of the computer and the work environment as a whole.

Instructional benefits of interactive multimedia

How is it that TOD is able to deliver such a high ROI? Such dramatic improvements in learning, retention, and productivity? Why is it that users respond so positively to interactive TOD? This optimal learning environment is derived from the instructional benefits described in the following paragraphs.

Interactive. Learning theorists emphasize the critical role and importance of experience in effective learning. Multimedia is implicitly interactive, and as such provides an experiential environment that maximizes learning, with an opportunity for inquiry, observation, trial and consequence, and guided learning. It involves multiple senses and engages the learner in seeing, hearing, and doing. Seminars and leader-led workshops are minimally interactive; learners are predominantly passive, with little opportunity to actively participate or direct the course of instruction.

Interaction is fun, it's rewarding, it makes the learning experience more enjoyable and satisfying, whether it's a computer you're interacting with, a learning workgroup, or an online instructor. Students participating in NYU's online MIS program interact electronically with course instructors who follow students' progress and respond to questions, as well as with fellow students who share ideas and work on projects together.

Training-on-demand. You learn when you want it, when you need it. With the convenience and immediacy of training to the desktop, you can bring a course up in a window on your screen and get the help you need to get through a difficult part of a new program you're learning. Training can be incorporated with daily work.

Self-paced. Everyone learns at different rates of speed, and with self-paced instruction you can progress at your own speed without interruption. You can review or bypass content as you wish. Seminars and workshops are designed for the broadest common audience, which is too fast for some and holds others back. There is little flexibility for an individual to diverge from the content or pace of instruction in a workshop.

Private. No one needs to know how much you do, or don't, know. There are no 'stupid questions' or 'wrong answers' with interactive CBT.

Convenient. If you're a CSX railroad engineer requiring training on new federal regulations, train operations, and technologies, but you're on the rails up to 12 hours a day, what could be more convenient than to have your courses available to you at a training center at your regular stopover location?

Job-friendly. You can easily fit the coursework into a busy schedule, interrupting the program as needed to take a phone call or attend a meeting.

Easy review/repetition. If you haven't performed a certain operation in a while and can't remember exactly how to do it, you can easily and quickly bring up the training program and find the instruction you need to continue with your work. And, you can get the help you need without interrupting someone else and taking their time. Repetition results in better retention.

Using multimedia for training and other applications — a new way of thinking and communicating

Our world is dominated by dynamic images, and we have come to expect them. The movies and television have shaped our consciousness and our perceptions. And this dynamic environment is sweeping onto our personal computers, as well. Like the transition from still photography to black and white, and then to color motion pictures earlier this century, multimedia is adding color and motion to our computers. It is making technology come alive.

"There is a perceived polarity (however artificial) between technology and the humanities, between science and art, between right brain and left. The burgeoning field of multimedia is likely to be one of those disciplines, like architecture, that bridges the gap."

— Nicholas Negroponte, *Being Digital*, 1995

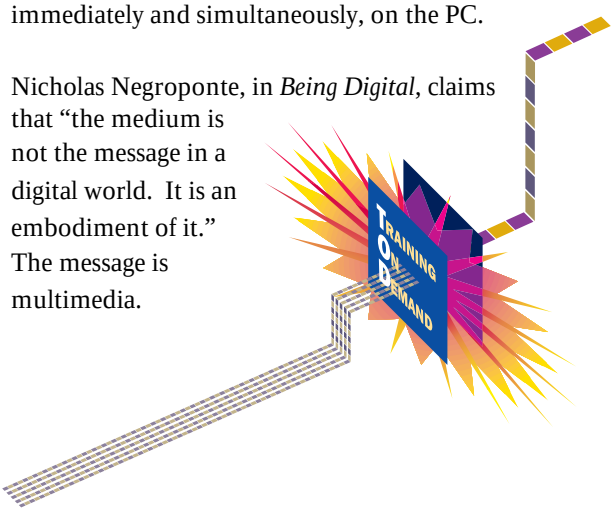
Not only does multimedia data reflect the dynamic, image-prevalent world in which we live, it also promotes interaction, and it demands judgement and values. Multimedia is not passive, it demands decision-making and action on the part of the user. It allows the user to take greater control and therefore responsibility for the learning process. Instead of being passive recipients of instruction, learners become active seekers of knowledge.

Because multimedia is multisensory, it engages both our left- and right-brain functions. Our thought process is naturally visual, and it jumps from subject to subject. Multimedia easily adapts to the way in which we think. It provides a visual environment, and in a training context, users can move around the course content in a nonlinear fashion. Multimedia combines the characteristics of the left brain (logical, linear, and verbal) with those of the right brain (visual, creative and abstract) and in so doing provides an environment that engages the user and promotes accelerated learning.

The world in which we live, work, and play is a dynamic one. The business environment is intensifying as companies position themselves on an increasingly competitive global playing field, cope with the pressures of downsizing, and ask more from fewer employees. New technologies and changes in the work environment necessitate learning new skills. Employee business skills become more critical in this setting, and 'intellectual capital' is a competitive advantage. Training and instruction need to keep pace with the dynamic requirements of business.

With multimedia, the PC becomes a new communications tool. It virtually becomes a window on the world, the path to a new virtual reality. Video e-mail can be used to deliver imaged messages within a work or learning group. Videoconferencing will deliver live presentations to the desktop and make meetings possible without leaving the office. Satellite delivery will make it possible to share video and other graphical messages with contacts throughout the world, immediately and simultaneously, on the PC.

Nicholas Negroponte, in *Being Digital*, claims that "the medium is not the message in a digital world. It is an embodiment of it." The message is multimedia.



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