The Effect of Multimedia Upon Professional and Personal Life and Learning

An Honors Thesis (HONRS 499)

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Muncie, Indiana
April 8, 1994
June, 1994
Purpose of Thesis

This discussion involves the newest technological breakthrough, multimedia, and its effect upon the learning of individuals in their professional and private lives. Along with a technical description of multimedia, its technical advantages and disadvantages are explained. Also, the benefits of its use in public education and business settings are discussed. Finally, the future with multimedia is examined.
There are billions of people throughout the world that I will never come to know. They are scattered from pole to pole, ocean to ocean. They are surrounded by jungles and deserts, cities and farms. They hold beliefs in Christ, Muhammad, and Satan. Some believe in only the physical reality of the universe. Some live conservatively, saving and planning and behaving moderately. Some live exorbitantly, spending and dashing and behaving tempestuously. Some have experienced an invasion by American troops; others have been American troops. Some know of those who have died because of the way they represent their god. Some know of those who have died because of the way their skin reflects colors. Some have experienced typhoons, tidal waves, hurricanes, monsoons, famines, and droughts; some have lived in plush surroundings with ample resources and few disturbances. All of these experiences are real and lasting and valuable. All of these experiences add value to the existence of others. All create the interconnections which create the maze of life.

I can not sit on my neighbor's front porch and discuss these experiences. I can not go to the local coffee house to talk with someone who has known firsthand the joy of liberation or the despair of occupation. In fact, I can not share in many of the experiences of my fellow Hoosiers. I know nothing of the life on a farm, or the feelings of a large city like Indianapolis. Even with a shared country, culture, and environment, there are millions of people who I will never encounter. I am barricaded. I am fated to only know of my own general experiences. I am doomed to know little of others' experiences. I have no eccentric friends or exciting stories to
relate. I am alone. I am isolated.

Or am I? Certainly, it is possible to talk to millions of people through the world's postal and telephone systems. Fax technology enables me to communicate almost instantaneously with anyone around the globe. Also, the future holds many developments which promise to improve communication. Fiber optic cables will provide more avenues through which to communicate. With the new methods of expressing and storing information, it is possible for me to experience life as never before. However, I must know what I want to say and to whom I want to speak.

Through multimedia technology, text and images and sounds can be created to form images inside of my mind and heart that were previously foreign to me. More importantly, the use of this technology can foster within me the creation of new feelings or new avenues of expression which have been foreign to me as well. With multimedia technology, barriers are broken. Walls are broken. The distinction between countrymen and foreigners is made fuzzy. In fact, there is no further need for distinctions. With multimedia technology, every person has the capability to communicate in an effective manner with every other person. The shared experiences of the universe can be a finger's touch away. With multimedia technology, I am no longer isolated. With multimedia technology, I should never again feel isolated.

Multimedia technology still appears in its infancy, yet it has stirred a great deal of interest because of the power just described. The benefits are currently being explored, but its use in the aid of learning has already been explored and deployed in the marketplace and the classroom. Considering the effects it has had there, the
effects it might have on every person's personal life seem immense. This paper will attempt to explain the makings of multimedia technology, its use in schools, its use in business training, and its future effects on personal productivity and growth. Through these explanations, its hopeful use to breakdown barriers between the understanding between cultures and individuals will be seen. Its ability to breakdown barriers will be demonstrated.

What is multimedia? It depends on whom one asks the question. Every expert has a differing opinion on a binding definition of multimedia. Much of this broad disagreement has to do with the infancy of the medium. However, it is safe to say that most experts would agree to a definition of multimedia that mentions the combination of two or media formats, including text, sound, graphics, and video. Using this definition, the market of multimedia-capable software and hardware becomes quite large and easier to identify. The current difficulty in acquiring and using this technology involves the recent inception of the market. A user's standard for multimedia hardware is a moving target, with "state of the art" changing from week to week.¹ No school or business wishes to purchase such expensive tools until assurances of reliability can be made. Resellers of this infant technology are also weary. Developers of multimedia software don't want to spend money to create programs that won't run on all systems, and hardware and software suppliers don't want to invest in designing compatible systems until lots of people are developing

multimedia programs. However, the multimedia industry does appear to be moving toward basic standards to apply between applications and systems. Apple Computer and IBM have formed an alliance called Kaleida, aimed at creating cross-platform multimedia products. This will mean that any multimedia software program could operate on any multimedia computer, regardless of the computer's manufacturer. Hopefully, this will encourage other computer giants to create cross-platform multimedia products as well. Since the industry appears to be more stable, more will desire the educational and training benefits of multimedia.

Without a viable, binding definition of multimedia, perhaps the easiest way to explain a multimedia software package is with an example. One of the most impressive multimedia programs is Microsoft's *Multimedia Beethoven: The Ninth Symphony*. Michael J. Miller states, "With its ability to show you the structure of the symphony, let you jump from part to part, and show you the notes while playing the music, it's the best way of learning about symphonic music in general and Beethoven's Ninth Symphony in particular." This program allows the user to hear the music and see the chord structure simultaneously, creating a multimedia experience. Even for those who are not familiar with music, the intricacy of this symphony can be best explained through this new medium.

Finding multimedia software is considerably easier than finding a multimedia

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2 Wilson, 28.

computer. To help this, the companies involved in the multimedia hardware market have developed the MPC Marketing Council, a board whose task it is to further the use of multimedia in education and business. The Council has defined a multimedia personal computer system as one which includes a PC, a CD-ROM drive, an audio adapter, Microsoft Windows with Multimedia Extensions, and a set of speakers or headphones for audio output. Also, a MPC might have video capture and playback capabilities, and a touch-screen interface. Several factors should be considered when using a multimedia personal computer (MPC). The most critical involves the drive speed of the CD-ROM drive. The faster the drive, the quicker data can be restored and retrieved. The MPC Marketing Council's current specifications for CD-ROM drives require an average sustained data transfer rate of 150 kBps (kilobytes per second). A CD-ROM drive must also have a stereo headphone or output jack for playback of stereo CD audio at a sampling rate of 44.1 kHz and at 16-bit resolution. These specifications insure that most video and audio images can be satisfactorily recalled using almost any application. The specifications of the hard drive, RAM, monitor, and display adapter also significantly affect MPC performance. Basically, one wishes to get the most RAM memory possible, the quickest and biggest hard drive, and the most resolute monitor possible. As for the audio board, one which has


5 Wilson, 28.

6 Loveria, 176.

7 Loveria, 176.
a playback/record resolution of 44.1 kHz/16-bites, an on-board synthesizer, a microphone, and external speakers is preferable.\textsuperscript{8} An MPC which has all of the following, regardless of whether it stands alone or performs within a network, will outperform all other non-MPC computers.

However, whether a MPC stands alone or within a network significantly affects the performance when MPCs are compared to each other. On one hand, a stand-alone system can store large amounts of video and audio on compact disc, which then can be randomly and arbitrarily manipulated by the end user.\textsuperscript{9} If one had several workstations in need of these images or data, however, one would need to duplicate large numbers of compact discs or floppy disks to transfer the data. Such effort wastes time and money. A network-based system also has its advantages and disadvantages. In essence, a network-based system requires only the display, a mouse, and a keyboard on the user's desk, with all other memory stored on a network server.\textsuperscript{10} Since all of the images are stored in one memory location, there are no costly duplications of time and money. A network user simply accesses the information when it is most convenient. Two big disadvantages of multimedia on a network are video storage and retrieval limitations. Margaret Newman Wilson states, "... a non-compressed two-minute video clip takes up the same space as about 15 copies of 'War and Peace' on a computer storage drive. An ordinary 3.5 inch floppy

\textsuperscript{8} Loveria, 178.

\textsuperscript{9} Wilson, 28.

\textsuperscript{10} Wilson, 28.
disk would hold only 80 non-compressed frames, or less than three seconds of full-motion, full-screen video." In fact, just one video image occupies the same space as eight pages of a word-processing document. Also, moving such large video files to similar images shown on regular television programming would be impossible on most of the existing networks today. The movement needed is just too fast. Most office networks of today are not wired for such high-speed transmission. However, Wilson also states that "R&D money is being invested in technology to increase 'throughput' - that is, to send data across network lines faster and faster. Greatly increased transmission speed and capacity are key benefits which new fiber optic lines can deliver." So the technical problems that plague network multimedia use seem to be short-term in nature. Regardless of the choice between stand-alone and network-based multimedia systems, most organizations feel the need to explore the benefits of multimedia. In fact, demand is rising at such a rate that industry experts predict that by the year 2000, every computer will be a multimedia machine.

Important changes in the multimedia market are also taking place outside the realm of the individual user or the organization. Industrial developments are paving the way for the transfer of data to be achieved with greater ease and speed. All

11 Wilson, 29.
12 Wilson, 29.
13 Wilson, 29.
14 Wilson, 29.
Digital communications enable networked multimedia applications. High-capacity fiber optical cable is replacing millions of miles of copper wiring in public and private telephone networks, forming what President Clinton and Vice President Gore refer to as the information superhighway. Also, Integrated Service Digital Networks (ISDN) - which are digital networks taking the place of analog telephone systems worldwide - will handle the high load requirements and intelligent routing of many multimedia applications. Telephone companies are also attempting to improve the interconnectability of its users with other technological developments. Royce Murphy, marketing manager at Hewlett Packard's multimedia operations states, "One very promising development is SMDS - switched multimegabit data services - a redundant, very high-capacity digital transmission methodology that can distribute far more complex information, including still images and moving video. Most telephone companies are working to implement SMDS, which will make multimedia universally available." The federal government, telephone companies, and cable companies are striving to install those technological devices to make the information superhighway as wide and fast as possible. This is a highway where traffic will be applauded, policeman will facilitate speeding, and car pools will be discouraged. The more the merrier. As boundaries between relevant information and its presentation are abolished, everyone profits. Consumers of this technology become enlightened

17 Unsigned, 110.
quicker and better, and companies profit.

Those who have already acquired multimedia software and hardware surely know that multimedia changes the typical learning environment. It changes the ways in which information is presented and the way information becomes knowledge. Physical learning environments evolve from old laboratories into factories of activity and processing. Tasks change, ideas evolve, and boundaries are broken. Some of the most important changes take place between teacher and student. Teachers no longer preach; they guide. Students no longer sit; they strive. The responsibility has shifted from teacher to student.

Multimedia learning is active, not passive. It requires the student to fully participate in deciding the manner in which information is presented, and which information is to be presented in the first place. According to Schank, "Good educational software is active, not passive. Students ought to be doing something, not watching something. Multimedia offers a serious way of improving simulation-based instruction." Multimedia technology allows the student to actively participate in what they see on the screen and the order of this information. Multimedia computer systems give them the power to choose how they will acquire information from a vast array of sources at their disposal - and arrange that information in ways that make sense to the individual learners.


Not only are students actively structuring their learning environments. Teachers are accepting roles leading students through their individual learning paths. Teachers can facilitate this learning through multimedia even without a classroom full of individual terminals. By using multimedia technology in the presentation of a topic, a teacher can generate much more interest than in traditional modes of teaching. Soloway relates an instance where "a teacher uses the videodisks to present information about science to the class: The teacher stands at the front of the class with a remote clicker and moves through segments of the videodisk that correspond to concepts in the curriculum. Students review the material when the television and videodisk player is available."^20 The key to this example is the interactivity of the technology, teacher, and student. Multimedia technology abolishes the idea of teacher-mandated, linear lesson plans whose measure of success is the reiteration of a series of facts and ideas. Since the learner is active, the technology is unlimited, and information is unlimited, the old boundaries of education have been destroyed, both physically and intellectually. There is virtually nothing that cannot be taught using multimedia technology.

In fact, lessons outside the physical realm of the school can be taught using multimedia technology. Field trips are no longer inhibited by location and cost. Something logistically impossible can be created with multimedia. A program called Palenique, for example, is television plus videodisk plus software that takes students

on a digital field trip to a Mayan ruin in Southern Mexico. Using a joystick, students navigate through extensive video sequences of the site, buildings, rooms, and hieroglyphs. Soloway states, "Palenique-style technology connects students to worlds outside of the classroom and allows them to make these connections their own." Some field trips need not be limited by space or time. For example, Titus Leber is working with IBM to create a series of eight CD-ROM computer disks that would retell the 3,000-year history of Europe. A student might want to compare a sixteen century cathedral with a modern church by looking through the most famous examples of both. These comparisons are available through multimedia. Also, a worthwhile field trip may be logistically impossible and exist in one's own backyard. It would be impossible for grades of students to research their communities through interviews, maps, budgets, and histories and then share that information with others. The amount of information would prohibit easy access to others. If it were not for multimedia technology, there would be no practical or inexpensive way to share all of that information. By using high-tech cameras, scanners, tape recorders, and computers to produce multimedia presentations integrating the sights and sounds of the local community, students across the nation can create multimedia files which are

21 Soloway, 24.

22 Soloway, 24.

easily accessed and analyzed by students around the world. At Abita Springs Elementary School in Abita Springs, Louisiana, kindergartners up through fourth graders study the different ethnic groups who have settled the area. Carol Holzberg states,

The Abita students then use computer-technology to help them share their newfound knowledge. They use word processors to transcribe the interviews, write stores about the presentations they've attended, and publish a book which they take home to share with their families. And they create HyperCard culture stacks for each of the ethnic groups that they've studied. . . . The stacks contain far more than just textual information. For example, the African-American stack includes musical recordings while the stack on early Louisiana offers pictures of house types, plus QuickTime movies of arrowheads, spear-throwing, and spear-making tools. The stacks contain far more than just textual information. For example, the African American stack includes musical recordings, while the stack on early Louisiana offers pictures of house types, plus QuickTime movies of arrowheads, spear-throwing, and spear-making tools.

Obviously, multimedia technology allows students to travel throughout the world


25 Holzberg, 35.
gathering and analyzing information at low cost and remarkable results.

Whether dealing with field trips or common classroom learning, multimedia provides excellent learning results. Some of multimedia's best results have come at the hands of the common subjects, namely science. In the traditional science classroom, exploring chemical reactions and other scientific phenomena has required lab experiments that can be time consuming, dangerous or expensive. Now multimedia technology is enabling classes to traverse and visualize the world of science instantly on a computer screen - often in rich, full-motion video. In fact, multimedia helps students visualize things that are often invisible to the eye, or abstract in nature. And with motion video, multimedia can quickly show students real-world application of science. To gaze within the structure of a sub-atomic particle is impossible, yet with multimedia technology, even the least experienced scientist can gaze upon the most delicate scientific processes without regard to cost. Multimedia technology has expanded the walls of education to the limits of the available information and the capabilities of the information handlers. Not only has it expanded the limits, but is has done so with remarkable results. Jan Carroll Weir, science department chairman at Lawrence Central High School in Indianapolis, states, "Prior to implementing the TLTG Physical Science program [multimedia science curriculum] five years ago, we were running a 50-70 percent failure rate. In


the course of one year with TLTG, we reduced that failure rate to no more than 19 percent. Some years we've run as low as 7 percent." Multimeda provides students with a means to learning that transcends the typical school environment. In this new environment, more students grasp the topics. Multimedia includes more students in the success of learning.

Not only has multimedia changed the teaching of typical curriculum, but it has changed the way special needs are handled. By using multimedia technology, teachers can present information in a manner which has the same effect in a student's mind regardless of their physical or emotional limitations. For the students, the opportunity to achieve their maximum potential has excited them beyond anyone's wildest expectations. Both students and teachers are happier using multimedia than any other time in their education. For example, at the Junior High School 47 School for the Deaf in New York City, Susan Abdulezer, graphic arts teacher, has developed a work-study program so popular that students fill out applications, put their names on a waiting list, and sit through an interview just for a chance to enroll. The student-run business, known as Fingerprints Press, produces sign language products, greeting cards, T-shirts, personalized stationery, and buttons for sale at school and in the outside community. Student staff members (ages 16 through 20) use powerful computers for everything from generating original graphic designs and camera-ready artwork to keeping track of inventory, customers, sales,

This project has been fueled by multimedia equipment and software involving word processing, desktop publishing, and scanning. To handle multimedia technology optimally, educators have found it necessary to redesign the physical surroundings of their technology and students. Sometimes this means a whole new building. Burnaby South replaced a 70-year-old school on the outskirts of Vancouver, British Columbia. Burnaby South's central philosophy is to become a village of learners. At Burnaby South, the 'town mall' is a spectacular central atrium, extending from which are various linked sectors of the 'village'. This open architecture serves to break up traditional monolithic thinking in school design. By carefully constructing an open and decentralized environment in advance, Burnaby South is literally laying the foundation for the success of its educational philosophy.

This school hopes to encourage the free flow of ideas among disciplines just as its featured multimedia technology does. If a school district does not have the discipline or finances to construct an entire new structure, it would be wise to change the internal structure of the one it has. Robert Pearlman states, "Changing schools requires changing all elements of school practice and organization simultaneously - school organization, curriculum, assessment, technology, and the learning environments." More personal environments which encourage personal interaction

29 Dr. Carol S. Holzberg, "Special Education Success Stories." Technology & Learning, January 1993: 53.


and self-managing work featuring meaningful project work should be implemented. Also, technology should be current and common, so that a network of parents, teachers, mentors, and students can be held directly accountable for the educational work accomplished by the students. The interior of the school should be modeled after an interactive factory of learning which is what the outside world wants and needs it to be.

Multimedia has been proven to benefit the learning potential of students both young and old, novice and advanced. It would not have a profound impact upon the future of learning if other areas of application were not affected as well. A school environment places emphasis upon the learning of concepts, but the world of business needs applied learning. Concepts are best made profitable when applied through the efforts of all levels of workers in the company, regardless of their responsibility and authority. Principally, the applied learning is done at the top level through the analysis of information in presentations and at the bottom levels through training efforts.

To be most effective, one must present information to his or her audience in a manner which will facilitate its optimal assimilation. Currently, this most effective manner is considered to be one which provides a shorter path in one person's mind to comprehension of that concept in another person's mind. In educational presentations, the principal need is to eliminate barriers to the acquisition of knowledge and its meaningful comparison to previous material. However, businesses

stress efficiency and control, so the sooner the audience gets the exact point of the presentation the better. To achieve this goal, multimedia can accomplish as much as it did in educational purposes. It provides information in the exact manner in which people are most excited about receiving it. Tom Yager states, people "see in color, focus on motion and hear keenly . . . [these traits] are now central to how we take in and process information. Multimedia is, in part, about presenting information through more than one of the senses. Multisensory presentations speed and improve understanding, and they can hold an audience's attention.\(^3\) Humans retain about 20% of what they hear, 40% of what they see and hear, and 75% of what they see, hear, and do. The natural way by which humans learn is a combination of seeing, hearing, touching, smelling, and tasting.\(^4\) Multimedia allows the presenter to achieve a link with his or her audience which achieves almost primal proportions. By giving information in a way which catches the sensory reactions which kept primeval man alive, the presenter bypasses auxiliary levels of information assimilation and catches them at the bottom of the needs hierarchy. Multimedia presentations capture better audience attention which can only lead to a better comprehension in the audience.

To create a presentation with multimedia, a business must keep in mind the technological cost, the type of information included, and the presentation type itself.

\(^3\) Yager, 154.

The least expensive class of multimedia products is directed toward building and presenting collections of still images to groups of people.\(^{35}\) Basically, these presentations involve the multimedia presentation of a typical slide-show. However, a computer allows the instantaneous rearrangement of the replay order, and data already incorporated in spreadsheet or word-processing programs. This facilitates its easy incorporation into a computer-based slide show. If a company wants to get more involved in multimedia presentations, it may incorporate still images generated by a computer or live-action video sequences. The line footage may be incorporated as filmed in sequence or intermittently throughout the presentation. Also, different sounds may be used to facilitate the assembly of different auditory images. Today's business presentation may be enhanced to the level of excitement which engages all of the senses and brings the presenter and his or her audience closer together.

Multimedia's use in training employees is equally important. By using multimedia technology, companies may introduce learning tools and techniques which might be too expensive or impractical to otherwise use. By using multimedia, companies can eliminate the barriers to information retrieval or individual attention which might prohibit optimal learning. Bethlehem Steel in Bethlehem, Pennsylvania, provides an excellent example. Bethlehem Steel has used multimedia in its training since 1985. The initial thrust of the program was to provide its employees, General Motors Cadillac division employees, and third-party suppliers the statistical methods

\(^{35}\) Yager, 155.
necessary to analyze production, inventory, and sales.\textsuperscript{36} These techniques were necessary if Bethlehem Steel was to compete in the highly price-competitive steel industry. To stay competitive, Bethlehem Steel wished to pursue agile manufacturing, where automotive companies and their suppliers collaborate on the manufacture of goods according to market forces.\textsuperscript{37} Bethlehem Steel's training goal involved extensive training for thousands of employees with low cost. It worked. According to Michael Alexander, "Multimedia training has been 'extremely cost effective' . . . Of the 5,000 employees who have taken at least one course, training time has been cut by 20\% to 40\%, and retention rates have risen 20\% to 40\%."\textsuperscript{38} The employees have learned better and quicker, and at a lower cost to the company.

Multimedia training has far more use than the dissemination of textbook-based, personal instruction to thousands of employees. Its greatest uses are for activities in which the normal activity might be rare or too valuable to allow a novice to practice on. For example, the technology is used "to assist in training paramedics, nurses, physicians, and staff. The Department of Emergency Medicine at Halifax Medical Center in Daytona Beach, Florida, uses multimedia technology to train personnel in advanced life support skills in the emergency room. The method eliminates the need to reconcile different shifts, and therefore efficiently utilizes the

\textsuperscript{36} Michael Alexander, "Multimedia focus turns to training." Computerworld, January 13, 1992: 18.

\textsuperscript{37} Alexander, 18.

\textsuperscript{38} Alexander, 18.
limited time available for additional training in a less stressful manner." Multimedia training benefits not only those who might receive a poor service, but those providing the service. For years, the United States Air Force has maintained realistic flight simulators to give its aviators real flight experience without the health risk of a tailspin from 10,000 feet. Also, "in manufacturing environments, multimedia training is used where simulation-based training can help to train factory workers because mistakes would be costly to the organization and hazardous to the trainee's and other employee's health." Multimedia training helps deter other harm as well. For example, Michigan-based Consumer Power Company converted its employee training to incorporate multimedia. "Proper training is of utmost importance because both employees' and customers' lives are at risk if the employee makes a mistake." Since the company switched its training to multimedia, it has incurred less risk, less cost, and higher employee retention. Multimedia training is also used in the financial sector to help train bank tellers in the most polite and beneficial customer assistance. Tellers can interact with multimedia training session that exhibit typical customer behavior. The teller can respond to the behavior and be graded immediately on his or her response. Also, extraordinary circumstances can be shown to the teller as well as the typical banking request. Multimedia is used in many industries to explore recent changes in the climate of the workplace, namely the many meanings and

39 Oz & White, 35.
40 Oz & White, 35.
41 Oz & White, 36.
examples of sexual harassment. Employees can be shown situations where sexual harassment might have occurred. By looking at these examples of video with text-based factual information, the sensibilities of the employees is exposed to the need for sensitivity when working with members of the opposite sex. Multimedia training can be used to extend the traditional boundaries of a textbook, guard against costly harm to the trainee or society, and demonstrate changing societal norms. All are viable environments through multimedia.

After examining the numerous areas which multimedia training can prove effective, the benefits of multimedia training should be discussed. One of the best attributes of multimedia training is that it captures the talents of the best instructor and delivers it one-on-one to the student. Organizations also like the flexibility of the technology. By basing all of the instruction on either hard disk or CD-ROM, the employee may recall any instruction he or she desires whenever it is most convenient. "Also, it provides the ability to monitor individual progress and validates that the students acquired the necessary skill." Multimedia training offers the intimacy of a private tutor, without the cost of a staff of teachers on salary. With these teachers' expertise on memory, students can better learn their lessons, going over it again and again if necessary. This leads to a better training experience. "Firms using multimedia training aids found that newly hired employees were fully prepared to

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42 Oz & White, 35.

43 Oz & White, 35.
handle their assigned duties after a short time than when trained without the aid.\textsuperscript{44} Regardless of industry or task, "multimedia is, generally, more effective and less costly than conventional instruction. It was found that multimedia could be used to effectively teach students in different training environments."\textsuperscript{46}

To state that the implementation of a multimedia-based training system is free of hassle would be untrue. Common problems of an installation include high start-up costs, cumbersome update procedures if the workstations are not networked, limited memory in stand-alone workstations, and the implication that training will now be done during hours when the employee would otherwise be working.\textsuperscript{46} The flexibility that multimedia training achieves can bring about organizational problems because the impetus of training falls upon the worker, not the organization. The control is diffused across the organization, yet the responsibility to perform successfully falls entirely upon the worker and perhaps his or her supervisor. However, these disadvantages are far outweighed by the lessened overall cost, flexibility, and higher retention rates which are achieved with multimedia training. As technology progresses, the implementation cost of multimedia training will decrease. Also, organizations will be better equipped to handle the questions about the timeliness of training once they have had sufficient time to craft policy and procedures. These disadvantages can be handled. The advantages of multimedia training are immense,

\textsuperscript{44} Oz & White, 35.

\textsuperscript{45} Oz & White, 36.

\textsuperscript{46} Oz & White, 38.
too profound to ignore by saying that one's organization neither has the time or money. They don't have enough time and money to avoid it.

The future indeed looks bright. To say that multimedia makes the future bright is an understatement. By using multimedia, barriers between people and information are broken. By making technological changes, barriers between people are broken. In the future, relationships will be drastically different. Who we are and how we interact will be dictated by our relationship to our technology. We will be linked to each other personally and financially, at home and at work, able to simultaneously send and receive high-resolution images, bursts of computer data, and the human voice.\(^\text{47}\) In fact, Dr. John McQuillan states, "There will be so much fiber optic bandwidth in this country and elsewhere in the world that there will be more than enough capacity to support all the voice and terminal-based data communications that could ever be generated by business and home use."\(^\text{48}\) There will be no need for a postcard. A mother can talk to her son, whether he is at the corner store getting a gallon of milk, or stationed on a Pacific Island awaiting his United States Naval assignment. By abolishing these boundaries, people will feel closer to each other as they have never felt before. Not only will relatives feel closer, however. With the telecommunications interconnectivity reaching epic proportions, any person will be able to communicate with any other person, whether it be a long-


lost friend from high school who wanted to see and old friend, to a multimedia
document sent to the President of the United States. Each person's global telephone
number will serve as a telecommunications network gateway, linking him to
thousands of services around the globe.49 Businesses will prosper with the coming
age, reaching consumers quickly and effortlessly in their homes. "Consumers will
manage their affairs and entertain themselves - reading newspaper, shopping,
trading stocks, paying taxes, calling up movies, visiting the library, banking, and
even voting - all from a telecenter at home" says management consultant, John
Naisbitt.50 In fact, Naisbitt states that "the advantage of doing business anywhere,
anytime, through any medium will be possible for the individual entrepreneur and
the small company. They will compete on a stronger footing in the global
marketplace. Since information is indeed power, the individual will be empowered
as never before."51 Businesses and individuals will prosper greatly from the
connections made on the information superhighway. To keep the highway intact,
many improvements in its structure and performance will be made. Naisbitt states,
"The 21st century telecommunications system will have humanlike skills. Through
the applications of artificial intelligence and advanced network software, the system
will keep track of one's evolving preferences and insure that global communications
networks do the same. Networks will be intelligent communications highways that

49 Naisbitt, 13.
50 Naisbitt, 14.
51 Naisbitt, 14.
are personalized, proactive, and intuitive. Since information will be bountiful and its access limitless, the only limitation of one's interaction with this environment is one's own mind.

"Would you tell me, please, which way I ought to walk from here?" For multimedia to have a permanent effect upon the learning practices of individuals, individuals must know what they want to learn. And to know what one wants to learn takes a great deal of knowledge about one's character. In essence, multimedia is just another tool. Like fire, it will do a great deal to further man's struggle to educate himself about his uncertain environment. But man must interpret the optimal use of this tool just as any other. Just because it will facilitate a greater learning in less time does not mean it will tell its user what is important and what is not. As has been demonstrated, multimedia can be of great use in teaching specific tasks as well as general knowledge. Business training, science, chemistry, speech, and music can be taught better using multimedia. But to integrate science and speech in the mind of a student requires the student to make sense of it in regards to his or her beliefs and environment. Multimedia will not craft an individual's character. Instead, it is a wonderful tool in the gathering of information and the creation of knowledge. When used effectively, one can transfer this knowledge into ideas and beliefs. Only then will multimedia be the societal force that it is predicted to become. Until then, it is a glorified film projector, or book. As Thomas Carlyle

52 Naisbitt, 14.

said, "Man is a tool-using animal. . . . Without tools he is nothing, with tools, he is all."54

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