2006-450: STREAMING MEDIA COLLABORATION: BENEFITS AND CHALLENGES OF A HIGHER EDUCATION TECHNOLOGY START-UP

La Verne Abe Harris, Arizona State University

La Verne Abe Harris, PhD, CSIT came to Arizona State University with many years of industry experience in graphic design, information design, illustration, and computer graphics. Prior to coming to ASU, she was the art director of The Phoenix Gazette, the computer graphics production manager at Phoenix Newspapers, Inc., an editorial illustrator for The Arizona Republic, the creative director of a Phoenix advertising company, and the owner and consultant of Harris Studio, a computer graphics consultation and creative business. As the computer graphics production manager for Phoenix Newspapers, Inc., Dr. Harris managed an international, innovative, interactive computer-graphic department in a joint venture with McClatchy Newspapers of Toronto, Canada.

Dr. Harris is an Assistant Professor of Graphic Information Technology at Arizona State University in the Department of Technology Management. She is also a Certified Senior Industrial Technologist. She received her PhD from the University of Arizona in higher education with an emphasis in sociotechnology, and a minor in media arts. She received her Master of Technology in graphic communications technology and her BA in art education/commercial art from Arizona State University. Before she became an assistant professor in the fall of 2004, she was a lecturer in the College of Technology and Applied Sciences, an appointment she held for five years.

As a tenure-track professor, Dr. Harris has been published in several peer-reviewed journals. Dr. Harris is the 2005 recipient of the Electronic Document Systems Foundation (EDSF) grant, and her paper "The Personalization of Data for Print and e-Commerce" is nationally and internationally published for industry professionals and academics in higher education. Her paper, "The Leap from Teacher to Teacher-Scholar: the Quest for Research in Non-Traditional Fields" (Harris & Sadowski, 2005) was awarded the Chair Award for the outstanding paper of the American Society of Engineering Educators Engineering Design Graphics Division.

Richard Newman, Arizona State University

Richard L. Newman joined Arizona State University in August of 2001 and currently serves as Director of Training Operations for the Microelectronics Teaching Factory. In this position Mr. Newman is responsible for the identification, development and delivery of education and training for the semiconductor manufacturing industry. Prior to joining Arizona State University, Richard served 20 years as a faculty member and administrator within the Division of Technology and Applied Sciences at Arizona Western College and the University of Arizona. He most recently held the position of Associate Director at the Maricopa Advanced Technology Education Center (MATEC). MATEC is a national center of excellence funded by the National Science Foundation (NSF) that focuses on workforce development for the semiconductor manufacturing industry. As the Associate Director Richard served as the semiconductor industry liaison and assisted in the development of a national workforce development model in collaboration with SEMETECH, Semiconductor Industry Association (SIA) and member companies. Mr. Newman has been actively involved in curriculum and program development for Technology and Applied Science programs since 1980.

Streaming Media Collaboration:
Benefits and Challenges of a Higher Education Technology Start-Up

La Verne Abe Harris
Richard Newman
Arizona State University

I. Introduction

In response to the need for distance learning options for remotely-located electronic engineering students, the Streaming Media Enterprise (SME) was created at Arizona State University through funding from a National Science Foundation Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP) grant. Part of the purpose of this grant was to set up the foundation of a streaming media enterprise, which would eventually be used to produce streaming media for online coursework. It became evident about midway through the implementation of the grant that more was needed to start-up a technology unit than just the acquisition of machines.

Machines are often deceiving. With a click of a key the multimedia production appears almost effortless because of the expertise of the multimedia professional. Because of this perception, a significant resource of the initial grant proposal was not addressed — the need to fund personnel — human capital with multimedia skill sets. The collaboration between two units: Electronic Systems (ES) and Graphic Information Technology (GIT) produced a temporary solution to the technology start-up unit.

Any technology start-up operation has obstacles to overcome in the equipment acquisition and construction decisions, the media room set-up, the production process decisions, and personnel issues. This paper addresses the benefits and challenges faced in a higher education environment and what has been learned from this experience.

II. Streaming media and the academe

What is streaming media?

A basic overview of the technology is necessary to understand the benefits and challenges of the study. Streaming media is inclusive of both dynamic visual and audio content sent in a continuous stream over the Internet or Intranet. It is one of the fastest growing emerging technologies today. It enables real-time or on-demand access to multimedia content. [1,2] A live streamed event is called a "Webcast."[3] The term "streaming video" refers to compressed captured images. "Streaming media," on the other hand, refers to streaming video with sound.[4] The three dominant streaming media architectures today are QuickTime, RealMedia, and Windows Media.[2] True streaming requires a specialized streaming server.

Why is streaming significant to higher education?
Through the technological innovation of the World Wide Web, distance education has become more popular and attractive than ever to the academe. In order to be successful, today's college students are computer literate and prefer to integrate their studies with work and family to achieve their career goals. Because technology has been socially embedded in their life, they are more receptive to emerging technologies connected to both their personal and academic life.

Many higher education institutions — both public and private — are aggressively pursuing outreach to students without regard to geographical boundaries. These efforts are making available degree and non-degree program offerings using electronic media. The institutions use instructional delivery methods that do not require the student to be physically located at the same site as the instructor. Distance learning has its genesis in the delivery of content through correspondence courses, since the late 19th century.[5,6] Consequently, distance learning is not a new concept to higher education.

Some of the benefits of streaming media incorporated into distance learning include an increase in the amount of time the user spends on the website, as well as increased content retention.[7] Research has indicated that the use of streaming media on a site can double the time spent on the site in comparison to a website without streaming media content.[8]

The findings in the Aberleen Group Report[8] on the cost effectiveness, timeliness, and impact of streaming media on customers, suppliers, employees, and partners can be applied to the higher education arena. A January 2002 Hurwitz Group Report found that approximately 500 percent more of the Web content is retained with streaming media experiences, as compared to static Web sites.[7]

The research firm comScore Media Metrix recently released streaming media viewing habits of American consumers. Fifty-six percent of the domestic Internet population, which amounts to 94 million people, viewed an online streaming media. During April to June 2005, the average person viewed 73 minutes of streaming content per month.[9] Young men, ages 18 to 34, led the way in streaming media consumption as a part of their business communications with 84 minutes per month during the heart of the business day.[9]

How can streaming be incorporated into the curriculum?
Today, almost every higher education institution is engaged in educational program content delivery over the Web at some level. Arizona State University uses Blackboard as the interface design for Web delivery of courses, both as a supplement to face-to-face courses, as well as for courses that are totally online. Traditionally, lecture-based courses are more amenable to Web delivery compared to laboratory courses. Blackboard, along with most of the enabling software is most effective at supporting the lecture format; however, the authors of this paper are interested in exploring ideas and methods to maximize the science, engineering, and technology students' laboratory experience through distance delivery. In general, faculty in science, engineering, and technology-based disciplines are significantly challenged to deliver high quality laboratory experiences at a distance. Hence it is paramount that better techniques are created to

deliver laboratory-oriented courses through Web delivery, where the student's remote laboratory skill development comes close to replicating that of live laboratory experience.

Distance education, collaborative education, and community outreach are natural niches for streaming media. Streaming media has become an appealing venture for academia with the focus primarily on Web-based delivery. The International Digital Media and Arts Association was recently formed with 16 universities and colleges to provide research, digital media curriculum standards, certification, and workshops.[10]

Rich media recording companies offer alternative approaches to streaming media, while vying for the academic market. At the 2005 Educause Convention in Orland, Florida, Sonic Foundry announced closer integration with Blackboard in 2006.[11] Anystream's Apreso demonstrated their screen capture technique of up to 30 frames per second, as opposed to the traditional few frames per second of capture. This full-motion screen capture is a Flash-based codec.

Who are the players in higher education?

Higher education institutions — nationally and internationally — use streaming media as a means of disseminating medical, athletic, science, engineering, educational technology, promotional, and political debate content through the Internet. Only a few have developed a robust virtual laboratory experience online.

Cornell University offers its medical degree overseas in Qatar, located is on the west coast of the Arabian Gulf, through the use of streaming media and Apple workstations.[12] In 2008 Weill Cornell Medical College – Qatar branch will graduate its first streaming video-trained doctors.

Higher education institutions, such as Chicago's Columbia College, England's University of Warwick, The University of California – Los Angeles, Ball State University, the University of Arizona and the University of Denver, have joined the digital media focus in higher education. The University of Minnesota[13] offers online science and engineering courses using streaming media. Stanford Online[14] offers custom tutorials incorporating streaming media for engineering, science and management courses. The Audio Visual Centre in The University College in Dublin, Ireland, is also involved in distance learning and provides educational technology expertise in producing streaming lectures for faculty.[15] Collaborative efforts between the faculty and students of the University of Alabama and the French engineering school ESTACA are evident in their sharing of engineering knowledge via streaming media.[16] Promotional streaming media clips about campus life are produced at Middle Tennessee State University.[17] The University of Arizona Center for Computing and Information Technology[18] uses its streaming media server for the university's community service mission videos. Massachusetts Institute of Technology[19] broadcasts their commencement ceremonies online, and has done so since 1999. Streaming dissertation defenses are presented online at Oregon State University.[20] Northern Michigan University[21] streams budget forums and ThinkPad training videos. Conference debates have also been streamed. As a supplement to a lecture, the Ohio death penalty was discussed in the format of a streaming press conference at the University of Cincinnati College of Law on January 17, 2003.[22] The transfer of television and radio broadcasts to the Web seems like a natural home for athletics. The Indiana Hoosiers[23] and the University of Vermont[24] are streaming game clips, coaches' shows, and broadcasts on the Web.

Recently the Kentucky Technical College system, which includes five community colleges, built a full-blown television studio with a powerful video distribution network using VBrick products to provide two-way interactive classrooms at their campuses.[25] The VBrick system provides access to plug in a camera and microphone system to create a television studio across the interactive television network. Instructors having access to this portable system in their classroom or laboratory can convert any classroom into a TV studio and then distribute the output across the interactive network. This is one example to implement distance delivery in a cost effective manner in any laboratory or lecture environment.

Institutions, such as Massachusetts Institute of Technology (MIT), have a head start in offering online laboratories. It has developed microelectronics WebLab, which can be accessed from students' dorm rooms, remote students located in another country, 24 hours and 7 days a week.[19] Professor Jesus del Alamo from the Department of Electrical Engineering and Computer Science says, "If you can't come to the lab … the lab will come to you!" Among engineering technology programs, Rochester Institute of Technology (RIT) [26] is offering online degrees with requirement of on-campus laboratories, which is closer to the model at Arizona State University at the Polytechnic campus. ASU's Department of Technology Management has been offering a totally online Master of Science Degree in Technology from Environmental Technology Management (ETM) for the past three years. January 2006 a totally online Master of Science Degree in Technology from Graphic Information Technology was introduced.[27] Other Engineering Technology programs are offering individual courses such as Circuits Laboratory and some introductory AC/DC circuits with a reasonable success.

Virtual laboratories

One dilemma in higher education is the expense of building and maintaining realistic applied research and teaching laboratory facilities for institutions offering degree programs in electronic systems technology. Even in states with generous education resources, costs are making it ever harder to maintain these types of programs and lab capability on multiple campuses. Arizona is typical in this regard. The absence of realistic lab training opens a steadily widening gap between the basic science and engineering taught in the academic world and the complex, expensive, and interactive technology used in the industry. To address this challenge, Arizona State University at the Polytechnic campus in collaboration with its industry partners developed a fully functioning microelectronics fabrication facility known as the Microelectronics Teaching Factory (MTF). The MTF is a 15, 000-sq.ft class 100 cleanroom equipped with late generation semiconductor device fabrication tools. The MTF serves as the primary teaching and research laboratory for both undergraduate and graduate students enrolled in the Electronic Systems programs. The MTF offers a new approach to education by providing a learning environment, which includes flexible class schedule, Web-delivered courses, industry mentoring, and industry-like infrastructure aimed at preparing work-ready graduates.

The authors believe the "touch and feel" experience in the laboratory and face-to-face interaction among students and between student and the instructor has to be included as part of the learning environment; however, the component elements and events do not have to occur on a uniform basis for a fixed length of time. In order to provide flexibility to the face-to-face students, remote students and working students, the gatherings can be set after polling the members of the class and time duration can vary anywhere from one to three days. The majority of the lecture and laboratory preparation can be accomplished online. To make this model user-friendly for students, both lecture and laboratory material need to be accessible to students on demand from their desktops both synchronously and asynchronously. Having student access to remote laboratory with video streaming capability and distributing this video to remote sites where students are located makes this task more feasible and minimizes the face to face meetings. This approach by its very nature demands more self-discipline from students to maximize their learning experience. To achieve this mandate, the hybrid delivery model has been selected as the best fit.

A major challenge is the development of effective online laboratory curriculum that enables practice and skills development typically found in a traditional hand-on laboratory environment. The tools in MTF are complex so having this capability in the laboratory provides tool access to the students on demand as many times as they require, followed by conventional touch and feel experience to enhance their total learning experience.

III. Streaming media enterprise, a vital collaborative effort

An Electronic Systems (ES) faculty/staff curriculum development team was formed to develop and benchmark other Web-enhanced curriculum across the nation. It was apparent from the beginning that Web-enhanced materials and class activities were costly and time consuming to develop. The curriculum study became the genesis for a National Science Foundation (NSF) grant proposal and subsequent award of a three-year Advanced Technology Education grant commencing in June 2002. The grant provided funding to design and produce Web-enhanced laboratory curriculum. The grant funds were also used to a equip multimedia studio, which later became known as the Streaming Media Enterprise (SME).

The Streaming Media Enterprise was a collaborative effort between Arizona State University's Electronic Systems (ES) and Graphic Information Technology (GIT) units. The GIT unit provided the human capital. The goal was for the ES faculty to eventually be able to create their own streaming media for their distance learning courses.

Often technologists are devalued in our society, because it looks so easy to push a button and something appears. Overlooking the value of the technologist is one of the biggest errors a start-up operation can make. By summer 2003 a roomful of streaming equipment was stacked in boxes in a room, but there was no one to set-up or operate the equipment. The steps in digital media workflow were foreign to the ES faculty, since that was not their area of expertise *(See APPENDIX C: Steps in Digital Media Workflow)*. The NSF required evidence of use of the video equipment. Richard Newman, director of the Microelectronics Teaching Factory, approached Dr. La Verne Abe Harris August 2003 for help in providing technologists. A timeline was developed *(See APPENDIX A: SME Timeline)*.

Because no funding was requested in the initial grant proposal to support the human capital, Newman and Harris negotiated, and one graduate assistant position was awarded to the project manager, who worked under Harris. The other students were awarded class credit for an independent study, under the direction of Harris, who agreed to supervise the students for two semesters on the pre-production pilot study. It was determined that the first semester (Fall 2003) would be used for inventory, streaming media set-up, and learning how to use the equipment. The second semester (Spring 2004) would be used to produce a streaming media introductory instructional manual on how to use the equipment.

Tentatively, if resources were available, the summer of 2004 would be used to develop a streaming prototype of one of the laboratory activities in the Microelectronic Teaching Factory. The SME was formed.

IV. Streaming media studio acquisition and construction decisions

Operating platform decision

There is strong debate among multimedia production specialists regarding the viability, ease of use and performance of the Apple Macintosh-based operating platforms versus the personal computer (PC)-based operating systems. Final Cut Pro is the leading media arts editing software and is Mac-based and the marketplace for graphics design and production computer equipment is predominately Apple Macintosh-based.

Macintosh computers have earned the attention of Windows users because of the Macintosh networking technology and applications. The Macintosh platform broke new ground in 1991 by delivering the first digital media through QuickTime v. 1.0. Today, 15 to 20 of the researchers in the National Center for Atmospheric Research (NCAR) Supercomputing Group use the Mac platform and iChat AV with iSight each day for weather and climate visualizations.[28]

Steve Jobs announced in 2005 that the iMac G5 ships with an integrated iSight videoconferencing camera and features a new media player — FrontRow, which allows users to access movie trailers from Apples's Web site at full-screen, and streaming in real-time.[9]

The decision to purchase a PC-based operating systems was partially driven by the fact that the users of the studio are engineers, research faculty and staff assigned to the ES department, and are primarily PC users. It was assumed by the grant writers that the faculty would be creating their own streaming video on a familiar platform.

Based on consultation and demonstration by the Dr. Roger Carter, Director of Distance Learning housed on the ASU's Tempe Campus, a PC (Sony brand) Windows-based multimedia workstation, supporting image capture and editing equipment was specified by the ES Department Chair and Director of Training as the operating platform of choice.

Equipment decisions

A list of media arts equipment and software was collected *(See APPENDIX B: SME Lab Workstation Original Wish List).* Based on the studio specifications, a series of quotes were solicited from multimedia equipment vendors located in New Mexico, California and Arizona. Each quote contained a procurement requirement that all equipment required to construct the studio be supplied by a single vendor. Additionally each vendor was required to provide a demonstration of a like-kind studio and a two-day training seminar would be contain in the quote and final bid as condition of the purchase price. The studio was purchased from EAR Technology for approximately $36,000.

Sony DSR-30 DVCAM deck:

The use of the Sony deck was limited within the first few months of this study. The deck served as a useful capture device only when the camera was being used to shoot raw video, and post-production was beginning on another part of the multimedia project, and the projects were shot on Mini-DV tape, rather than via the Laird Cap-Div.

Camera issues:

Issues with the camera, Canon XL1s, were explored to see if the extensive defects related to the original XL1 have transferred over into this model. The first few of the notable issues with the camera were: (1) the viewfinder's sensitivity to light and potential for being destroyed, (2) the potential loss of sync in the audio recording device (not an issues as most audio will be a voiceover), and (3) an unpredictable auto focus that will be bypassed via manual focus.

Additional purchases recommended by the SME Media Team:

• Mini-DV tapes

The mini-DV tape stock recommended was the Sony Mini-DV brand. The tapes were used to archive the footage for future use, as well as to shoot raw video. As well as having a bulk price of somewhere near $4, the digital method of storage ensured that no data was lost. In order to make sure no damage came to the tape before it was archived, a basic rule of thumb was initiated — that the tape not be played back more than 10 times. In reality, the normal use of the footage should only warrant two playback instances: (1) when the tape is dubbed to a VHS with window burn for logging before digitizing, and (2) when the tape is digitized into the editing system.

• Editing software:

For the post-production aspect of this multimedia project, recommendations for software and hardware come from a mutual desire for longevity of equipment and reliable usage as well. When it comes to the root of this multimedia project, creating both DVDs and streaming media, the SME video editor recommended Avid Xpress Pro for editing software, because it is not only inexpensive editing program ($295 with educational discount, $1600 msrp) but has a very distinct and very effective method of producing lossless quality video references for output to our sources. If the Macintosh platform had been chosen, Final Cut Pro would have been the software of choice.

• Editing equipment:

A copy of Discreet Cleaner was ordered to complement the Avid software.

• Monitor and converter box:

An external NTSC rated viewing monitor (any brand of small TV or NTSC specific monitor) was purchased to allow for color balancing of video as well as real-time playback and demonstration. To allow the function of both the NTSC monitor as well as digital and analog input devices, an analog/digital converter box was necessary. The recommended brand and model was the Canopus ADVC100 (msrp $299, educational discount $250).

• Tripod:
The tripod was ordered, but was not received until the end of fall 2004 and could not be used for the pre-production pilot study.

Equipment not used:
• Mackie audio mixer:
The Mackie board was not used because of limited time available to learn the intricate audio process. Initially it was best to shoot the video and audio in the camera itself as the microphones were set up for use by the camera. The information was a time-coded digital file, rather than an analog to digital conversion via the Mackie board. Plus this also assisted in the archiving and storing of our audio files. The audio was stored long term via burned CDs and data DVDs.

Equipment borrowed from GIT Digital Photography Laboratory:
Studio lights and a green screen were borrowed from the GIT Digital Photography Laboratory. These essential components were not ordered for the SME, because the grant funding was depleted.

Media Room Decisions
The next remaining hurdle to overcome was to identify a location for the room for the studio reside; like most universities, space is at a premium and often a challenge. Currently the studio is housed on an interim basis in 200 square foot office space located in the Technology Center Building. A permanent laboratory and studio space are being planned by the ES.

V. Findings

Benefits and Successes
Political factors
The overriding benefit of the SME study was the interdepartmental collaboration that was spawned. Like many departments within a large university system, the opportunity to work interdisciplinary and interdepartmental is often scattershot and ad-hoc and is usually confined to a limited number of faculty focused narrowing on teaching and research.

The key academic personnel in collaboration (Harris and Newman) worked well together and because they had previous industry experience understand the importance of hiring educated, competent, and trained employees.

Economic factors
The physical and financial resources were not available in the GIT unit to purchase and construct a studio of this quality.

Social factors
The ES Department did not have the skilled personnel to deliver multimedia projects. The GIT unit had students who were trained in multimedia, but had a learning curve with new technology. The study provided the opportunity for the ES Department faculty and training staff to interface on a first-hand basis with the GIT faculty and students, enabling them to gain insight into the skill, knowledge and ability required to produce product and drive the enterprise. We believe

this was critical outcome of the study as it became obvious to the ES faculty and staff that the integration and use of the studio and its products into their curriculum was daunting task due to their lack of underlying knowledge and skill in multimedia production.

Additionally, the overall study and startup of the enterprise provided the context for set of real world problems and solutions for the participating students, faculty and staff from both departments *(See APPENDIX E: Script for Pre-production Pilot Study and APPENDIX F: Script for GIT Promotion).*

Organizational factors
The media team reached their goals in the start-up business planning processes of establishing job descriptions, asset tracking for study management, and technological assessment. They also successfully completed the two major multimedia projects. *(See APPENDIX A: Timeline).*

Newman and Harris allowed the technologists to be a part of the decision-making process, which created buy-in to the process and commitment. The first media team had decision-making power in the purchase of additional equipment and the presentation of the instructional video. The second media team had creative latitude in brainstorming for the concept of the promotional video, while Dr. Harris guided them in the digital media process.

Technological factors
Another successful component was the eager acceptance of the technology by the students and faculty. This resulted in the success of the pre-production video, which demonstrated how to use the media arts equipment, and the success of the GIT promotional video.

In addition the startup of the SME enable the GIT students to construct, assemble and test all of the studio equipment and write a series of how-to operating procedures. This became an invaluable benefit to the ES Department as they transition to full usage of the equipment in the future *(See APPENDIX B: Technical Tips)*.

Obstacles and Challenges

Political factors
Political factors can change the way we do business. Interdepartmental issues regarding student and faculty access to the studio, due to institutional and departmental key policies and equipment security issues, plagued the onset of the study.

The GIT professor and the media team had to call security if they needed to access the media room, and the wait was usually 45 minutes to an hour. This situation made it difficult for the media team to work at convenient hours when the PIs were not in their offices. It also made it difficult for the faculty director of the media team to have access to the equipment to shoot and edit at off-hours. Because of the limited access to the media room, the second media team decided to do the video and sound editing and post-production work outside of the SME. Two of the students had equipment and software at their home studios that was comparable to the SME. The rest was borrowed from the GIT laboratories. This was not the preferred method of production, but the technologists got tired of dealing with the ineffective policies.

Economic factors
Economic factors played a role in slowing down the implementation of the streaming media in the SME. The application of the resource dependency theory is prevalent in academic institutions promoting academic capitalism. He who pays the piper calls the tune. The GIT professor and the media team did not have access to the media room and this was a political decision based on an economic factor. Because the equipment was purchased by a grant submitted by ES, only two ES academic professionals had a key.

Social factors: Expectations and commitment
There were unrealistic expectations on behalf of the ES Department faculty and staff relating to the production of streaming media product that was produced by the students. The GIT faculty and students were often pressured by the ES department staff to provide media clips for their courses and training programs. Some faculty did not understand that the students were working in a learning and research environment, and not a production environment. The over-enthusiastic response to the use of streaming media was frustrating to the students, and devalued them.

The 2004 SME team ended up consisting of a project manager (graduate student) and a streaming media technologist (undergraduate student); one graduate student was removed from the team, since he was unable to commit to the time. The summer of 2004 Dr. Harris accepted a tenure-track position and her time for pro bono work was limited. The 2005 team consisted of four students (a project manager, an art director, a senior video editor, a junior video editor). Due to personal issues, the junior video editor was unable to complete the microscope video.

Technological factors: Resistance to new technology
It is not difficult to understand why tenure-track faculty may be resistant to the utilization of instructional technologies in the delivery of their coursework. Some faculty are unsure of how to apply the technology to their teaching. As innovative as the technology is, faculty argue that the use of the technology is not significantly rewarded in promotion and tenure review. There are also ambiguous copyright policies.[29] In many institutions there is a lack of instructional design support or time allocated for faculty development.[30]

Most professors do not have the skills, software, or hardware, to produce original streaming media content for their coursework. Those who do, lack the time to implement them. On a positive note, it has been found that in institutions with strong instructional design support, instructional productivity is found to increase, and new teaching resources become available. [31]

Organizational factors: Change of mission and devaluation of technologists
There were organizational factors that played into the challenges of the SME, which evolved around a change of mission and the devaluation of the technologists. In order to demonstrate the capability of the SME equipment, which would fulfill the requirements of the grant, a more in depth streaming prototype had to be created. With the arrival of a new campus Provost, the directive to faculty was to creatively devise methods of increasing freshmen on the Polytechnic campus. When Harris agreed to lead a new media team in the creation of a streaming media prototype, it was only if the prototype could be a promotional streaming media piece for the GIT, which would fulfill both initiatives.

As previously mentioned, the streaming media technologists were devalued when the grant was initially written, as evidenced by lack of funding allocated to labor and supervision, lack of time allocated to complete the multimedia projects, and lack of engagement in the initial technological decision-making. It was not until the equipment was stacked in boxes with no one to operate it, was the value of the technologists apparent.

Faculty who rely on student labor, instead of professional instructional design support, soon discover that they have devalued the technologist and ended up with a substandard product.[29] Streaming media is complicated. There is no magic wand to make it magically appear. Competent technologists must be available to operate the equipment, as well as to capture and manipulate images, and edit sound and video. This takes time and investment to learn the application of the technology. Like many project-based course assignments, due to the limited time available during a 16-week semester, there is always a challenge to accomplish all of the goals set forth in the study. The equipment training was written as a part of the required quote from the vendors, but the technologists were not the recipients of the training. The prevailing obstacle to the success of the start-up organization, however, was the power play of not having access to the media lab and equipment.

What would be done differently next time?

Administrative buy-in
Much can be learned from the benefits and challenges of a start-up unit in the academe. Administrators should take responsibility for the expectations, power, and conflict in their organizations. Advice for a higher education organization considering a similar technological start-up unit is to institutionalize the SME initiative by involving the chairs and deans up front to minimize the departmental issues and gain institutional buy-in. Technologists cannot stream media without access to the technological tools. Often policies and rules of a bureaucratic organization over-ride common sense.

Training
Allocate professional technical training time for the media team technologists to learn how to use the streaming media equipment. Using the training for faculty makes no sense until the technologists are trained. Then the technologists can translate the production procedure into layman's terminology for user-friendly instructions for the faculty.

Start each academic semester by offering a two-day seminar in the studio to the non-GIT faculty on the benefits, use and development of streaming media. This would ground the non-GIT Faculty on realistic expectations relating to capability of the equipment, production time required and skill needed to produce quality product.

Time
Increase the implementation time required for the student participants. It is suggested that the study be extended to two semesters with the same team to maximize the continuity and student performance. Access to the media room would have eliminated half of the lost time.

Decision-making
By allowing technologists to be a part of the decision-making process early on, they buy-in to the process and become committed to the success. It would have been beneficial to include the GIT faculty in the initial grant-writing process for the buy-in.

Mission of SME
There was some confusion as to the mission of the SME. It should be determined whether any technological start-up should be a research unit, a profit unit, an in-house production unit for e-learning, or a combination. A detailed business plan should be in place regardless of which mission is undertaken, and it should be available for all technologists and faculty.

VI. Conclusion

Streaming media is a technical artifact that is gaining global acceptance in distance learning. The new economy model suggests it is cheaper to invest in technology than it is to invest in people. During resource stress when administrators committed to the streaming technology, but not in the technologists, the technology is not successfully implemented, even when the technologists are committed.[32]

The internal conflicts of power often play havoc in the successful implementation of a technological start-up operation that is based in a bureaucratic organization. If political factors result in limited access to the equipment and room in order to create the streaming media, tasks do not get done. The media team cannot move to an effective and efficient production mode. If no funding is allocated for human capital, and the technological expertise is needed to operate a technology start-up organization, the power shifts to the technologist.

Quality implementation of emerging technologies and services is not important to higher education and society if the business planning, technology assessment, and technologists are not valued. Strategic approaches need to be applied to business and technology problem solving. Much can be learned from the benefits and challenges of collaborative start-up entrepreneurial units in the academe. This SME endeavor has the potential to develop in to a long-term sustainable institutional enterprise that can provide a much-needed service and learning environment to faculty, students and the institution, but all the obstacles need to be addressed without reservation first.

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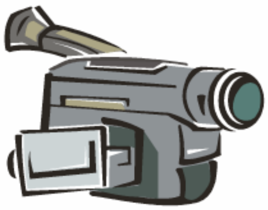
APPENDIX A: SME TIMELINE

SME TIMELINE

Pre-production Pilot Study



Summer 2003: *Equipment ordered*

Fall 2003:
Inventory;
Planning and design;
Workflow procedures established;
More software and hardware ordered

Spring 2004:
Implementation of pilot video on how to use equipment

Promotional Video

Fall 2004: *No personnel resources for SME*

Spring 2005:
Implementation of GIT promotional piece;
Production

Summer 2005: *Flash interactive component added to the GIT promo;*
Post-production

Microscope Video

Spring 2005: *Brief video of how to capture video images through the microscope*

La Verne Abe Harris

APPENDIX B: TECHNICAL TIPS

TECHNICAL TIPS

TIP 1: DIGITAL

Try to go all digital, instead of analog to digital.
This helps to avoid unnecessary noise and encoded artifacts.

TIP 2: CROPPING

Because streaming media usually does not take up more than a quarter of the monitor real estate, it is recommended that faces are cropped tighter.

TIP 3: TESTING

Do your testing before an event, so that you know what alternatives you have in the shooting of the event.

TIP 4: CROSSFADES

Avoid crossfades, because problems result similar to having excess motion. Straight cuts or crossfades in three to five frame dissolves is recommended by Steve Mack, author of the Streaming Media Bible and founder of LUX Media (Daily, 2005). This is preferred to the one-second crossfades commonly used in broadcasting.

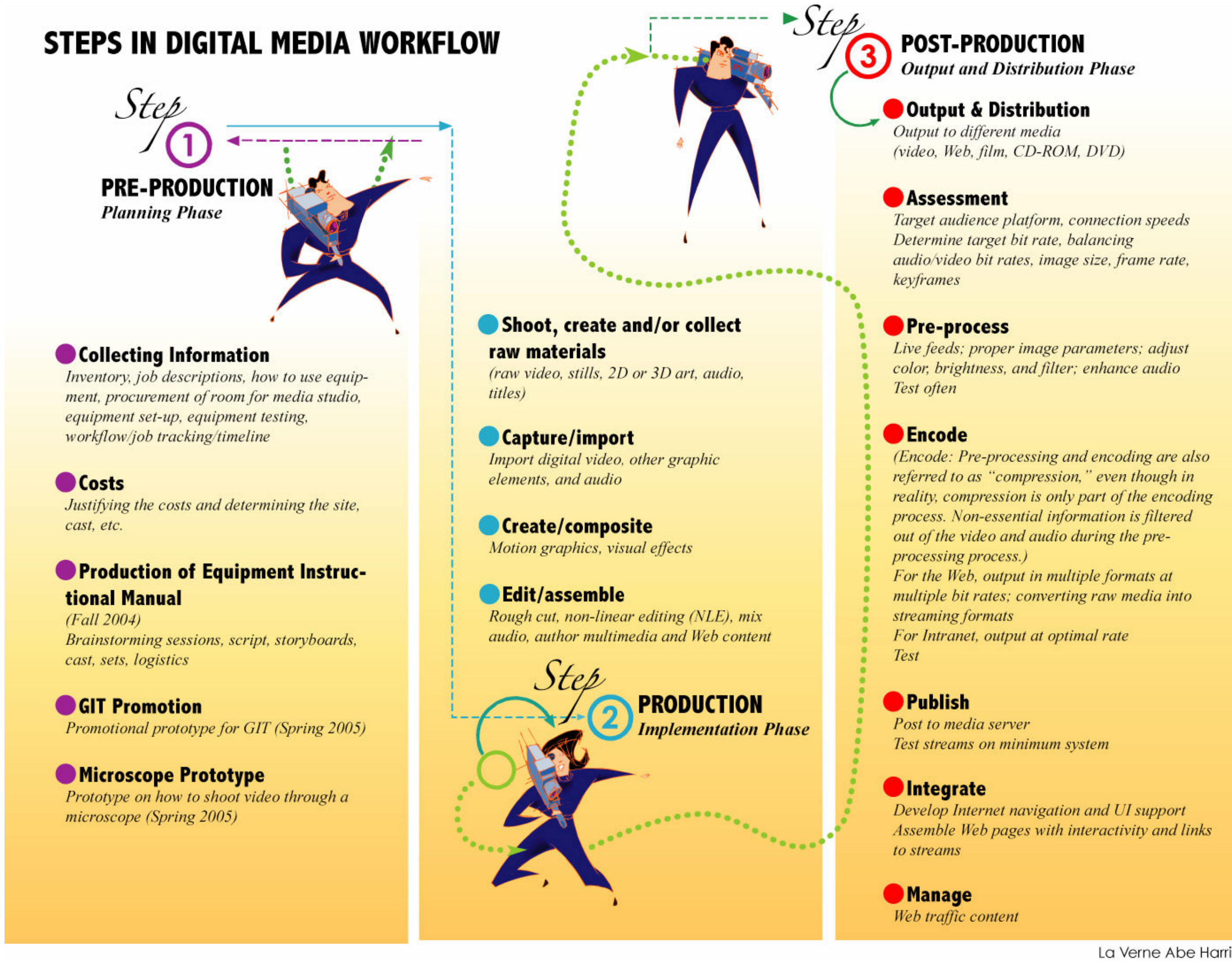
TIP 5: BROADCAST MODEL

Broadcast is the standard model that streaming media should move toward.
Use good cameras, bring in extra lights, and use professional technologists.

TIP 6: RESOLUTION

Streaming video's resolution and image clarity cannot match broadcasting content.
It is recommended that the raw content be shot at the highest resolution, because it can be downsized, but never improved in quality once it is shot.

APPENDIX C: STEPS IN DIGITAL MEDIA WORKFLOW



APPENDIX D: SME LAB WORKSTATION Original Wish List

Sony VAIO or custom build
Minimum specifications:

Pentium 4 3.0 GHz, 800MHz FSB
Windows XP Professional Operating System
80 GHz primary drive, IDE, 7200 rpm
250 Gigabyte hard drive (7200 rpm) will operate as a secondary (video) drive SATA RAID capability preferred.
Combo DVD +/-R/RW DVD Writer
(or cabling and space to allow us to add a Sony or Pioneer 8 X Combo drive, which is what we'd really prefer)
CD R/W drive
Hyperthreading enabled motherboard
1 GB DDR memory
IEEE 1394 (Firewire) interface card with two ports, minimum,
located on front of computer box/case.
Floppy Drive
Optical Mouse
350-watt minimum power supply
Space to add at least two more hard drives
and two more 5 1/4" drives down the road.
Minimum of four IDE channels
(two SATA channels and a SATA RAID channel preferred)
5.1 audio with 90dB internal S/N ratio
DirectX 9 capable dual graphics card with video overlay capability
on both channels (dual DVI preferred).
Front and rear USB.
Yamaha Bi-Amplified Monitor Speakers (40 Watt)
Headphones
Microphone

Monitors

High quality 19" CRT
NTSC monitor (recommended by Roger)
LCD flat panel monitors, 21" is preferred. Two monitors are also helpful because many of today's applications use a lot of screen space.

DV Camcorder/ Video Camera

Specifications:

Canon- XL1S MiniDV video camera with Firewire interface
Digital Camera 6.2M or higher (Fuji FinePix S7000 or compatible)
EW 122P-G2 wireless system
Laird CAPDIV DV to Disk Recorder 4.5 Hour
Canon XL1S Camcorder Carrying Case
DV Recorder. Sony DSR30

http://bssc.sel.sony.com/Professional/webapp/ModelInfo?m=0&sm=0&p=16&sp=113&id=11504

Smith Victor SV920 Tripod
Lowell G0902Z Light Kit/CS
Smith Victor SL7 20 Watt Portable Light
Bretford CA2642 Adjustable Media Cart
Manfrotto BG7 Tripod/CST
Extra batteries and A/C converter for Cannon Camcorder

Software

Windows software:
DVD Creation: *Sony DVD Architect*
Image creation: Adobe Photoshop (bitmap) Adobe Illustrator (vector)
Video Editing and Encoding: *Sony Vegas + DVD, Acid and Sound Forge (recommended by Roger)*
Sorenson Squeeze Compression Suite (highly recommended!!!)
Advanced Motion Graphics: Adobe AfterEffects (optional)

Workflow: *Plan, Capture/Create, Compose, and Deliver*

APPENDIX E: SCRIPT FOR PRE-PRODUCTION PILOT STUDY

Test Shoot: Script

Video:	Audio:
Exterior Shot of Technology Building 50	Welcome to ASU East Steaming Media Enterprise. Inside is the development studio for the new wave of technology in the classroom. Today you will see a short demonstration of the equipment available and the potential we have to create new and useful methods of teaching.
1) Mackie Sound board: 2) Full shot 3) CU volume sliders 4) Low/Mid/Hi adjustments 5) Inputs/Outputs	1) This is a Mackie Sound board for capturing, and mixing live, up to 13 tracks of Analog Audio. 2) The volume of the sources can be adjusted according to volume of the source to create a balanced signal throughout the total mix 3) The levels of the audio can also be adjusted to create a new tone in the sound before the audio reaches the computer. 4) There are numerous methods of importing and exporting the audio depending on the receiving audio device; for our application it will be a DVCAM deck for digitization purposes; but we can output and import through quarter inch stereo cables or XLR cables.
DSR-30 DVCAM Deck 1) Full shot 2) Deck controls 3) Inputs/Outputs (front) 4) Inputs/Outputs (back)	1) Here is our digital tape deck that will allow us to capture footage we have shot as well as audio we create externally through both the Mackie board and the camera itself. 2) The deck has standard controls similar to any DVD player or VCR, including single frame advance playback. 3) The fire wire connection on the front of the deck is how we transfer our digital signal from the deck to the computer and back to the deck. 4) On the back we have a variety of inputs that will allow us to input analog signals like the Sound mixer and convert them to digital signals for computer capture

APPENDIX F: GIT PROMOTION:
SCRIPT NOTES AND SELECTED SCREEN SHOOTS
To: Media Team
From: Dr. Harris
Date: 03/22/05
Subject: **GIT promo script notes**

1. METAPHOR:
TECHNOLOGY CREATES THE FUTURE
Graphic Information Technology is the vision of your future.

2. ASU logo

3. TYPOGRAPHY included with the images:
INFORMATION DESIGN
WEB DESIGN AND DEVELOPMENT
TECHNICAL & SCIENTIFIC VISUALIZATION
MULTIMEDIA
PRINTING TECHNOLOGY
DIGITAL PHOTOGRAPHY
TECHNOLOGY MANAGEMENT

4. IMAGES used for the intro:
Pencil in hand, sketching eye illustration on paper to …
eye digital illustration
The metaphor appears letter by letter. "Technology creates the future."
"Graphic Information Technology is the vision of the future."
"Visualize your future at Arizona State University, the polytechnic-focused campus in Mesa."

GIT//PRINTING TECHNOLOGY
Heidelberg presses to …
GIT eye poster being printed (Dr. Harris) to …
GIT eye poster color proof through spectrophotography equipment (Color Lab)

GIT//INFORMATION DESIGN
Student Union banner designs against sky
(Dr. Harris has these also in digital form) to …
GIT Newspaper design and layout prototype (Dr. Harris) to … (Turn page)
Infographic inside of newspaper (Dr. Harris) to …

GIT//TECHNICAL & SCIENTIFIC VISUALIZATION

Virus poster (Mark) to …

Mechanical object created in Adobe Illustrator (Duff) to …

Truck illustration (Dr. Duff) to …

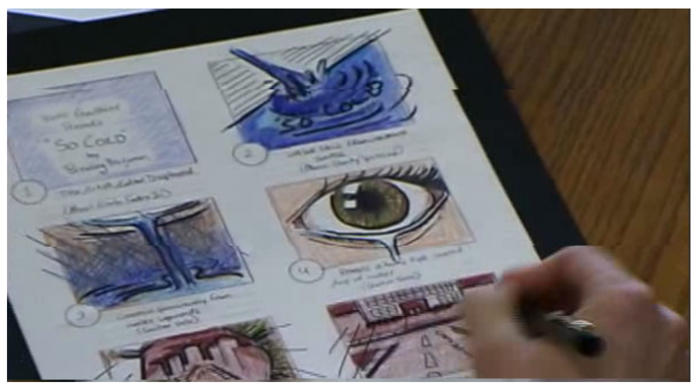
GIT//MULTIMEDIA

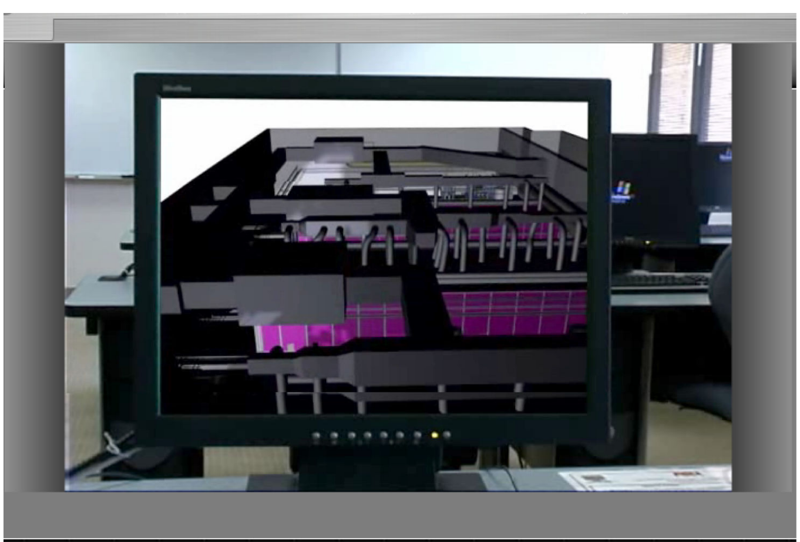
Storyboard sketches of song (Dr. Harris/Travis) to …

Travis' tear Flash animation intro (Travis) to …

Educational interface (Dr. Duff) to …

3D Microelectronic Teaching Factory in different views (Dr. Duff) to …





GIT//WEB DESIGN & DEVELOPMENT

Web programming code (Mark) to …

ASU's new Website [Dot Lestar dot@asu.edu has the sight designed; it should go live soon. We can film it before it is live] to …

GIT//DIGITAL PHOTOGRAPHY

Studio shot poster (Dolin) to …

Image of Technology Center Building (Distribution folder in 114) to …

DIGITAL CONTENT…

We create it • manage it • design it • manipulate it • examine it • research it • market it • educate with it • program it • & present it.

Videography of Technology Center Building to … Flash interface of GIT promo