U.S. DEPARTMENT OF COMMERCE
National Telecommunications & Information Administration

Evaluation of the
Telecommunications and Information Infrastructure Assistance Program

Case Study Report

Tri-State Network Demonstration Project
94068

Starkville, Mississippi

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Site Visitors: Paul Tuss & Debra Prescott

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PREFACE

On behalf of the National Telecommunications and Information (NTIA), I am pleased to share the following report that is one of a series of case studies conducted on grants awarded by the Telecommunications and Information Infrastructure Assistance Program (TIIAP) in 1994 and 1995. The case studies are part of the program's evaluation effort designed to gain knowledge about the effects and lessons of TIIAP-funded projects. NTIA contracted Westat, a research and consulting firm, to perform an independent evaluation of the program's first two years of grants. The evaluation consisted of a mail survey of 206 grant recipient organizations and in-depth case studies of selected projects. In February, 1999, the Commerce Department released Westat's evaluation report.

The projects selected for the case studies cover a broad range of program types and sizes, planning grants as well as demonstration grants, and they show varying degrees of implementation, sustainability, and replication. Westat selected the projects to represent a cross-section of all projects funded in the program's first two years. Specific selection criteria included geographic region, target population, project application area, project category, and size of award. To conduct each case study, Westat reviewed all project files, including progress reports and the final report, and conducted site visits. The site visits consisted of project demonstrations and interviews with project staff, representatives of partner organizations, and project end users.

NTIA thanks the case study participants for their time and their willingness to share not only their successes but their difficulties, too. Most of all, we applaud their pioneering efforts to bring the benefits of advanced telecommunications and information technologies to communities in need. We are excited about the case studies and lessons they contain. It is through the dissemination of these lessons that we extend the benefits of TIIAP-funded projects nationwide.

We hope you find this case study report valuable and encourage you to read other TIIAP case studies. You may obtain additional case studies and other TIIAP publications, including the final Westat evaluation report, through the NTIA web site (www.ntia.doc.gov) or by calling the TIIAP office at (202) 482-2048. We also are interested in your feedback. If you have comments on this case study or suggestions on how TIIAP can better provide information on the results and lessons of its grants, please contact Francine E. Jefferson, Ph.D. at (202) 482-2048 or by email at fjefferson@ntia.doc.gov.

Larry Irving
Assistant Secretary for Communications and Information

TIIAP CASE STUDY

Tri-State Network Demonstration Project

EXECUTIVE SUMMARY

The TIIAP grant was designed to significantly expand an interactive framework and technological infrastructure developed by the Tri-State Education Initiative (TSEI), an educational initiative established by the National Aeronautics and Space Administration (NASA) to support the simultaneous advancement of the educational, economic, and social/cultural goals of the people of the region. The network served a total of 30 school districts (5,600 teachers, 102,000 students) in the 9,800 square mile tri-state area. Conceived as an economic and community development project, the primary objective of the $600,000 TIIAP demonstration project was to implement a community-based advanced telecommunications infrastructure that would support economic development efforts focusing upon Tishomingo County and impacting the surrounding region. This objective was addressed through the provision of the following services:

- Development of an expanded telecommunications infrastructure including infrastructure improvements in Alabama, Mississippi, and Tennessee and expanded infrastructure improvements in Tishomingo County, Mississippi. The physical network included an advanced telecommunications system that provided two-way interactive video communications, two-way interactive data communications, Internet connectivity, voice-based information services, and a gateway to all existing Mississippi networks. The expanded infrastructure was used to develop and implement an integrated community incubator program through the Tri-State Resource Center (TSRC) located at NASA's Yellow Creek site in northeast Mississippi. The small business incubator provided Internet, fax/phone, conference, and other business support services.

- Development of WEB, an interactive, wide-area network to facilitate communications among four economic development areas: leadership, applied lifelong learning and training, physical resources, and socioeconomic opportunity.

The original proposal was developed and submitted by the Tri-State Education Initiative Consortium (TSEIC), a 501-C-3 not-for-profit organization of 30 school districts organized to work cooperatively to enhance and broaden the capabilities of their respective education systems. After the grant was awarded, TSEIC had second thoughts about their capabilities to oversee a project with such a strong economic development focus. With approval from TIIAP, the project was reassigned to the State of Mississippi Department of Economic and Community Development (MDECD). Mississippi State University (MSU) was contracted to manage project operations with Johnson Controls World Services, Inc., as the onsite subcontractor.

The complexity of the Tri-State Demonstration Project presented many challenges to those involved. The large number of components and players involved in the project created issues of coordination and organization. Another related frustration involved dealing with new and rapidly changing technologies

while meeting tight project deadlines. During the implementation stage, crossing LATA[1] lines across states was reported to be the biggest and most unexpected difficulty the project team had to deal with.

Project staff believe they've made a real difference in the lives of students, teachers, and families in Tishomingo County, and to a lesser extent in Pretiss and Alcorn Counties. The most important indicator of the success and the impact of the total project is the tremendous level of community support that was garnered in an initially reluctant population. Although there were only limited data available at the time of the site visit to demonstrate the project's impact to date, the project's ultimate impact will undoubtedly be widespread, encompassing education, industry, and community development. The educational aspects of the project in particular should establish lasting impacts on the county's teachers and students. And the economic development supports and resources developed through the project have already begun to stimulate local industries to take advantage of worldwide commercial opportunities available via the World Wide Web and encourage non-local businesses and industries to consider locating in the area. An important factor in the project's success was the extensive collaboration among several departments on the MSU campus.

OVERVIEW

Purpose and General Approach

Goals of the Project. The TIIAP grant was designed to significantly expand an interactive framework and technological infrastructure developed by the Tri-State Education Initiative (TSEI), an educational initiative established by the National Aeronautics and Space Administration (NASA) to support the simultaneous advancement of the educational, economic, and social/cultural goals of the people of the region. The network served 30 school districts (5,600 teachers, 102,000 students) in the 9,800 square mile tri-state Area. Conceived as an economic and community development project, the Tri-State Network Demonstration Project was inherently broad-based and its ultimate goals long term. The $600,000 TIIAP grant was awarded to help alleviate rural isolation and a lack of telecommunications resources and infrastructure in the northeast corner of Mississippi. The primary objective of the project was to implement a community-based advanced telecommunications infrastructure that would support economic development efforts focusing upon Tishomingo County and impacting the surrounding region. This objective was addressed through the provision of the following services:

- Development of an expanded telecommunications infrastructure including infrastructure improvements in Alabama, Mississippi, and Tennessee and expanded infrastructure improvements in Tishomingo County, Mississippi. The physical network included an advanced telecommunications system that provided two-way interactive video communications, two-way interactive data communications, Internet connectivity, voice-based information services, and a gateway to all existing Mississippi networks. The expanded infrastructure was used to develop and implement an integrated community incubator program through the Tri-State Resource Center (TSRC) located at NASA's Yellow Creek site in northeast Mississippi. The small business incubator provided the following core services:

[1] In order to carve up the telecommunications business so that interexchange carriers (IXCs) could be competitive, the federal government created artificial boundaries beyond which the monopoly local phone companies could not go. Those boundaries are called LATAs and the concept was very simple: only local exchange carriers (LECs) can carry telephone traffic within a LATA or intraLATA calls, but only IXCs can carry telephone traffic between LATAs or interLATA calls.

  - Internet,
  - Fax/phone,
  - Conference services,
  - Resources,
  - Knowledge-based skills, and
  - Reasonable rent.

- Development of WEB, an interactive, wide-area network to facilitate communications among four economic development areas:
  - Leadership,
  - Applied lifelong learning and training,
  - Physical resources, and
  - Socioeconomic opportunity.

Specific goals for each of the four economic development areas supported by WEB were as follows:

- **Leadership—**The Leadership Framework will facilitate communications between existing leadership entities such as the Board of Supervisors, the school board, local corporate leadership, and local non-profit representatives. The forum will incorporate management tools including integrative "group ware" (such as MOSAIC) software and hardware for TQM workshops, and interactive voice-data-video systems that will accommodate everything from leadership training seminars to real-time town hall meetings.
  - **Applied Lifelong Learning and Training—**This framework with make learning more job based by relating content through a framework designed for the culture of the area served.
  - **Physical Resources—**The physical resources framework will operate a geographical information systems (GIS) data-based inventory of the tri-state area's people, places, and other community programs and services. Included on the GIS data-based inventory will be a demographic database on the people of the tri-state region that will also document places including schools, colleges, universities, hospitals, libraries, research facilities, manufacturing plants, recreational sites, historic sites, parks, business-industrial sites, and other elements of the physical community with digital photography of all buildings catalogued and described. Finally, the GIS will also serve as a centralized database for other things in the region that when properly organized will increase the efficiency and quality of life of the residents. Included will be items such as routes and schedules for public transportation, recycling and reuse programs, resource

sharing, public facility listings, and other community programs and services. The GIS resources, coordinated and made accessible to all citizens through the WEB, will include strategically located, user friendly voice/data/video nodes in publicly accessible locations to facilitate communications and interaction by all end users.

- **Socioeconomic Opportunities—**This framework will organize, catalog, and coordinate programs, and budgets that promote economic opportunities, health and human services, cultural affairs, and education. This will be developed in collaboration with local, state, and federal organizations to provide ways for integrating services in the working environment.

WEB's interactive network was used as a collaborative communications interface with the region's customers/stakeholders (students, parents, educators, and community representatives). The WEB's physical and operational components were centered at Tishomingo High School in Iuka, Mississippi. The WEB configuration was a "star" type network with the network hub located at Tishomingo High School. Two network "expansion nodes" were located outside Mississippi to provide access to the citizens of Tennessee and Alabama. Expansion node #1 was located at the High School Campus of Columbia State Community College at Lawrenceburg, Tennessee, and expansion node #2 was located at the Bolbert County Schools Complex in Muscle Shoals, Alabama. Four additional remote network nodes were located within Mississippi to serve the citizens of Tishomingo County and to provide access to state, national, and international resources and other networks available through gateways located in Mississippi. These nodes included an electronic classroom at Belmont High School, small video conferencing system at the Iuka Hospital, the Iuka Library, and the Tishomingo Economic Development Foundation. Mississippi State University's (MSU) switching center provided the network with a gateway to the world.

Proposed End Users and Other Beneficiaries. The project's geographic parameter seemed to change throughout the course of the project. In the beginning, the potential universe of end users included everyone in the Tri-State Network region, which included communities within a 98,700 square mile region incorporating parts of Alabama, Mississippi, and Tennessee. Each of the 30 Superintendents from this region are represented on the Tri-State Education Initiative Consortium (TSEIC), which serves 232 schools, 5,600 teachers, 102,000 students, thousands of area industries and businesses, and a population of 550,000 residents.

Despite these intentions, the initial implementation efforts concentrated on Tishomingo County, Mississippi. Later, the focus expanded to encompass Alcorn and Prentiss Counties, also in Mississippi. Ultimately, project administrators and team members were advised to further enlarge the scope to once again include areas in Alabama and Tennessee. Despite the changing geographical dimensions of the project, the target demographics remained all-inclusive—everyone "from kids to grandmas."

Description of Grant Recipient and Project Partners

Grant Recipient. The original proposal was developed and submitted by the Tri-State Education Initiative Consortium (TSEIC), a 501-C-3 not-for-profit organization of 30 school districts organized to work cooperatively to enhance and broaden the capabilities of their respective education systems. Representation on the consortium is provided by each of the 30 superintendents. The TSEIC is directed by a full time Executive Director in association with NASA's Tri-State Education Initiative (TSEI). The full-time staff of both operations totals seven full-time employees, including a full-time systems specialist. During its 3-year

existence, the Tri State Initiative has also incorporated the efforts of over 150 professional facilitators and trainers and a volunteer work force that has donated more than 25,000 hours of their own personal time to its projects. In operation since late 1990 and based at the Tishomingo County Educational Complex near Iuka, the TSEI is a highly successful, nationally renowned program. The Education Initiative was designed to develop, enhance, and reform educational systems in Alabama, Mississippi, and Tennessee.

After the grant was awarded, TSEIC decided against involvement and responsibility for the project and returned the award to the U.S. Department of Commerce because they had reservations about their capabilities for managing a complex project with such a large economic development component. Officials in the State of Mississippi Department of Economic and Community Development (MDECD) convinced Commerce to fund the project through them instead. MSU was contracted to take over project operations with Johnson Controls World Services, Inc., as the onsite subcontractor. MDECD had little involvement in the project's operations beyond garnering the support of the Yellow Creek site that housed the network hub. MDECD was interested in sponsoring the grant for the economic development gains it would bring to the region, but recognized that Mississippi State was in a better position to manage the project. The project was reassigned (with approval from TIIAP) from TSEIC to MDECD.

Project Partners. Mississippi State University managed the project and provided in-kind resources and staff time. University departments playing key roles in the project are listed below:

- Computer Applications and Services administered the project
- TV Center developed promotional videos
- History Department conducted research into the historical development of the region.
- Small Town Center, School of Architecture was responsible for
  - GPS (global positioning system) mapping
  - GIS database
  - 3D imaging for videos
  - Aerial mapping
  - Site inventory
  - Three-day community design event to explore how the site might grow.
- School of Education evaluated educational component of project
- Physics Department responsible for
  - Technology training for K-12 teachers through workshops and print materials
  - Planning and organizing Interned-based learning events (e.g., Smithsonian virtual tour)

- Social Science Research Center-evaluated community impacts

Johnson Controls World Services, received a subcontract from MSU to manage onsite operations of the network hub.[2]

NASA, through the TSEI and TSEIC provided

- Significant funding[3]
- Facilities to house the network hub and server
- K-12 curriculum development materials
- Technical assistance
- The original technology infrastructure on which the project was expanded

Tishomingo County School District assisted in planning the network and assumed responsibility for the network after it became operational.

The Smithsonian Institution came on board after the project started to offer distance educational programming for K-12 students.

The Oceanographic Command of the U.S. Navy provided access to fiberoptic telecommunications lines to Washington, DC, enabling the Tri-State Network to provide virtual field trips to the Smithsonian Institution.

Project Staff

- Project Director—Head of Computer Applications and Services, Mississippi State University
- Network Manager—Director and producer of TV studio, Mississippi State University
- Training Coordinator—Local school teacher
- Outreach and Community Support Liaison—Staff member, Computer Applications and Services, Mississippi State University

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[2] Johnson Controls operates the Yellow Springs facility that was originally intended to serve as the network hub. When NASA delayed turning the site over to the state of Mississippi, the hub and offices were set up instead at the Tishomingo County Educational Complex near Iuka. Johnson Controls, had to build the hubs telecommunications transmission system from scratch rather than use the existing infrastructure at the Yellow Springs site.

[3] To reduce the impact to the Mississippi area of discontinuing work on construction of a solid rocket motor nozzle fabrication and refurbishment facility at Yellow Creek, MS, NASA agreed to turn ownership of the facility over to the state of Mississippi and provided a grant of about $10 million to complete the site infrastructure and facilitate the transition to new users. The grant was intended to assist the state in providing security, general site maintenance and other services while locating tenants and finalizing plans for the site. NASA's financial contribution to the TIIAP project were an outgrowth of negotiations that took place during this transition period.

- Operations Manager—Staff member, Computer Applications and Services, Mississippi State University

Other than a few graduate students who were involved in training, materials development, web development, and programming, all project staff were employed full time at MSU and worked with the Tri-State Network initiative on a part-time basis.

Project Costs

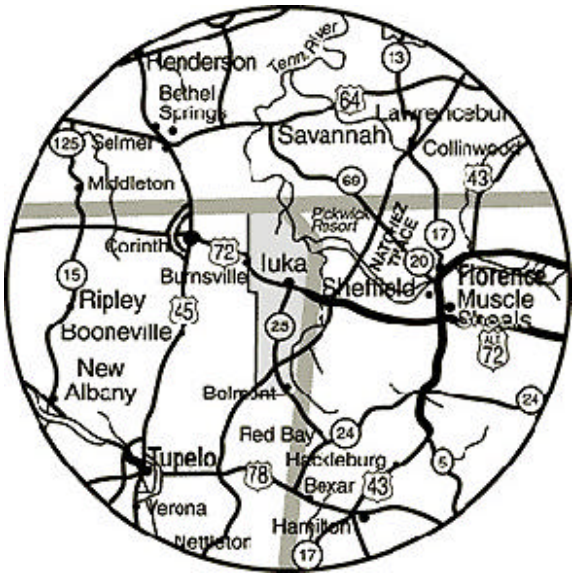
The total project budget was $5,560,000. Sources of funding were the U.S. Department of Commerce (DOC), the State of Mississippi Department of Economic and Community Development (MDECD), and the U.S. National Air and Space Administration (NASA) as detailed in the table below.

Components	DOC	MDECD	NASA
1. Network Infrastructure	$600,000	$42,000	
2. Network Applications			
A. Physical master plan		$226,000	
B. Network access software		$100,000	
C. GIS integration		$60,000	$100,000
D. Cultural/education links		$79,000	
3. Training and Resource Support		$368,000	$1,960,000
4. Resource Development & Support Services		$750,000	$1,100,000
5. Project Evaluation and Documentation		$129,000	
TOTAL	$600,000	$1,754,000	$3,160,000

PROJECT CONTEXT

Community Description

The area of impact (see the following map) lies within a 9,800 square mile region that includes parts of Alabama, Mississippi, and Tennessee. Defining the project region as Alcorn, Prentiss, and Tishomingo Counties in Mississippi, the total population is 72,683. Of the three counties, Alcorn has the largest total population (31,722), followed by Prentiss (23,278) and Tishomingo (17,683). Tishomingo County, however, is the major focus of the project. Located in the northeast corner of the state, it more closely resembles a county in the heart of the Appalachian Region than a typical Mississippi county. It is a rural county, with timber and other agricultural pursuits occupying a large sector of the economy. Tishomingo County ranks 46th out of the 82 counties in Mississippi with a per capita income of $10,446.



The federal government spent billions of dollars on failed ventures over the years at the Yellow Creek site in the northeast corner of Tishomingo County.

- In 1975, the Tennessee Valley Authority announced plans to build two nuclear power units at the Yellow Creek site but canceled the project in 1982 after spending about $1 billion.

- In 1988, NASA announced it would use the site to build a new generation of solid rockets for the nation's fleet of space shuttles. That project died when Congress killed the program after spending more than $2 billion on it.

- Thiokol Corp. moved in briefly after NASA's departure with plans to produce rocket motor nozzles at Yellow Creek but abandoned the project when NASA was forced to cut its budget in 1995.

As a result of these failed ventures, the economy of the region has experienced tremendous up and down cycles in which the economy temporarily booms as thousands of people move to the area and new hospitals, schools, cultural facilities and highways are built, and then the economy suddenly crashes. Consequently, residents in the area are very hostile toward the federal government and suspicious of any new initiatives.

Status of Telecommunications/Information Infrastructure Environment Prior to the TIIAP Project

In 1991, the National Aeronautics and Space Administration (NASA) inaugurated the TSEI, an educational initiative with a systemic approach to educational and community restructuring that included the development of an interactive framework and technological infrastructure to support the simultaneous advancement of the educational, economic, and social/cultural goals of the people of the Tri-State region. The TSEI operated an Interactive Learning Network in Tishomingo County that served a total of 30 school districts (5,600 teachers, 102,000 students) in the 9,800 square mile tri-state area. The network included PCs and printers in each of its 30 school district offices, a 1-800 modem access to the file server, electronic

mail, and bulletin board system, connectivity between the Tri-State Learning Center and NASA's Marshall Space Flight Center in Huntsville, Alabama, and access to the world via Internet. The TIIAP grant was designed to significantly expand this infrastructure through the inclusion of an interactive framework and technological infrastructure to support the simultaneous advancement of the educational, economic, and social/cultural goals of the people of the tri-state region.

PROJECT IMPLEMENTATION

Activities/Milestones That Occurred Prior to the TIIAP Grant Period

TSEI approached Mississippi State University to draw upon the school's expertise and collaborate on an education network. A group of faculty on the MSU campus pulled together to look at the feasibility of the proposed project and agreed to help TSEI develop a TIIAP proposal. The original TIIAP application, which included a video produced by the university's TV Center, was submitted in May 1994 through the TSEIC, with proposed starting and ending dates of October 1, 1994, and September 30, 1995, respectively.

Activities/Milestones That Occurred During the TIIAP Grant Period

Word that the project would receive funding was passed down in October 1994. After a lengthy debate about roles and responsibilities, the project was reassigned from the TSEIC to MDECD. The project's organizational issues were resolved and approved, and actual funding was in place in June 1995. With delays in the acceptance of the proposal and the dissemination of funds, physical work on the project did not actually begin until late August 1995.

In September 1995, multiple activities were conducted simultaneously by the various groups and departments involved. The project team met together on a monthly basis to coordinate their efforts. One of the project team's first activities was to establish a database to document and monitor project activities. Key activities are described below.

The School of Architecture worked for nearly a year to complete a site survey of the Iuka site that included comprehensive video taping of the entire site. The work of the GIS inventory portion of the project continued throughout the project period and involved mapping social and economic data by census block groups, mapping of locations of significant sites, and revision of maps of transportation routes.

In November 1995, the first of several teacher workshops was held at Mississippi State University. The hands-on demonstrations provided initial instruction with basic e-mail and accessing the World Wide Web through Netscape. Participating teachers were responsible for providing instructional technology training for other teachers in their schools and in surrounding school systems.

Installation of the network infrastructure equipment was completed by December 1995. The four remote nodes were located within the boundaries of Tishomingo County to provide access to the WEB for all citizens of the county and the region either through a direct network connection, a dial-in terminal server, or by a simple voice telephone. A gateway node was installed at MSU to interconnect the WEB to the resources available at and through the university. Equipment was also installed at the network expansion sites in Lawrenceberg, Tennessee, and Muscle Shoals, Alabama.

Upon completion of the network infrastructure, several customer support and economic development activities were initiated. These activities including mailing letters and visiting Tishomingo County businesses and community leaders regarding the project goals and the promotion of economic development in the tri-state area using video conferencing and other network resources. A strategy for the establishment of the Tri-State Resource Center (TSRC) was also developed and began to be implemented. The objective of the TSRC is to promote economic development, education, cultural, and socioeconomic growth through activities such as networking, telecommunications, television, video teleconferencing, etc.

Early in 1996, several key tasks were completed. After a long process of generating and editing extensive video footage, interviews, computer models, and animations of the network sites, two promotional videos were produced and distributed. A Community Design Workshop was conducted in March on the development of the region around the Yellow Creek site. And specialized computer-related software packages were developed to enable the project team to translate USGS mapping data into usable standard formats. Project staff also completed graphics, text, and links for the Tishomingo County home page (http://www.erc.msstate.edu/projects/tristate), as well as grammar and network connections for the Unix network interface. A photographic aerial site survey was performed in March.

Project activities began to be scaled back at the end of 1996 to begin a transition phase in which the network could begin moving into a self-supporting mode. Because the demand for more dial-in capabilities to area citizens had increased significantly, dial-in Internet access was expanded.

After receiving several extensions—first through the end of May 1996 and then through the end of August 1996—the project officially ended January 31 1997.

Steps Taken to Sustain Project Activities beyond the TIIAP Grant Period

The intent of the project was to get the network up and running, get the schools that it would serve involved, and then turn network operations over to school district personnel. Project staff intended to set up a non-profit organization to enable school officials to run the network, but the state Attorney General ruled to disallow the project to compete as an Internet service provider (ISP) forced the project to turn over the accounts to ISPs. MDECD retained control of the network until an agreement could be worked out with the Tishimingo School District to take the network over at a later date using ISPs to provide service.

Plans were also developed to move the Tri-State Resource Center into a self-sustaining mode of operation so that its community incubator program would remain in operation after the grant period ended.

Activities/Milestones that Occurred Following the TIIAP Grant Period

Network operations were smoothly transitioned to the Tishomingo County school system.

Issues and Problems

The complexity of the Tri-State Demonstration Project presented many challenges to those involved. At the start of the project, a critical hurdle to be overcome concerned the hostile atmosphere existing in the region toward "outsiders." This hostility was due to the economic devastation that the Tri-State Region had experienced over the last 10 years. As explained previously, the local economy had been devastated by a series of abandoned federal initiatives; the community was very reluctant to support the TIIAP initiative. However, once the communities came to understand that this project was being carried out by a local state university rather than a federal agency, the atmosphere changed. Project staff worked hard to reward the community's trust by providing opportunities for citizens to improve their economic and educational opportunities. Enticing businesses to venture into electronic commerce was more of an obstacle than was anticipated. The project staff attribute this fact to a lack of understanding of telecommunications, the Internet, the technology, the business potential, and obstacles that they would face in cyberspace. Project staff visited Tishomingo County 2-3 days a week during early phases of the project to attend Rotary Club board meetings, conduct press releases, and otherwise meet and dialogue with community members and business leaders.

The actual physical location of the onsite management of the project was a factor in several respects as well. The TIIAP proposal was written with the expectation that the Yellow Creek facility would be available as the hub site for the Tri-State Resource Center operated by Johnson Controls. However, NASA did not turn the site over to the state of Mississippi until January 1996. In order to expedite the establishment of the TSRC, NASA offered temporary space for the hub at the Tishomingo County Educational Complex near Iuka. The hub and officers were set up there, with the hope and design that they would be moved to Building 1000 at the Yellow Creek site as soon as it became available. Unfortunately, this did not happen, and the offices of the hub site remained at the Educational Complex. This in itself meant that Johnson Controls did not have the transmission lines and telecommunications infrastructure readily available, as defined by the project had it been established at the Yellow Creek Site. Essentially, this involved building a system "from scratch," which delayed the full operation of the TSRC for an estimated 3 to 6 months on a component of the project that could have potentially been operational within 3 weeks at Building 1000.

The large number of components and players involved in the project created issues of coordination and organization. As mentioned previously, the original major player in the demonstration project was the TSEIC, in the role of project administration. The overall project administration was later turned over to individuals who, 1 year earlier, had been involved in writing just one component of the proposal. Changing key players midstream was a significant issue in both the organization and execution of the project goals.

A related challenge facing project staff involved coordinating the demand on resources, especially television resources at MSU. The multifaceted and dynamic natures of the project created unexpectedly formidable time and personnel demands for the university. For example, the university's only nonlinear editing computer system was being used exclusively by the Tri-State Demonstration Project for roughly 4 months while the videos were being created. Consequently, several other university projects that needed the equipment had to be scheduled around the Tri-State video projects.

Furthermore, the broad scope and multifaceted organization of the project made it difficult for area residents to know whom to contact with which questions or concerns. This was alleviated to some extent by the addition of a 1-800 number so that people could direct their queries to the proper source.

Another related frustration involved dealing with new technologies while meeting tight project deadlines. The project goals established for the original 18-month timeframe were ambitious to begin with and, undoubtedly, the complexities and limitations of the project were magnified when compressed into what would have been essentially a period of 7 months (based on the initial project end-date of March 31, 1996). In retrospect, project staff estimate that perhaps 24 months would be more reasonable to implement a project of this size and nature.

To compound these difficulties, the technology employed in the project changed rapidly from the time of the conception of the project to its actual implementation, leading to several changes in the project's approach and conduct. For example, fiber optic technology was much more cost effective in 1996 than in 1995. The experience of generating high-quality, creative products and events under pressure, using leading-edge software and hardware was nevertheless considered beneficial by the project team because it increased their knowledge about technical systems and the time requirements necessary to produce quality results.

During the implementation stage, crossing LATA[4] lines across states was reported to be the biggest and most unexpected headache project staff had to deal with. It took considerable effort to determine the rules and regulations governing LATA lines, and there were substantial costs associated with setting up the network across LATA lines. Despite these difficulties, and despite the fact that the network nodes in Tennessee and Alabama ultimately received only minor use, the project director felt that the out-of-state nodes were worth installing because they provided an opportunity to learn about the issues involved in interstate telecommunications.

Project staff also had a difficult time accessing several federal databases containing information about the project site that was needed for the architectural survey. Despite a prior commitment from NASA to share aerial photography, satellite imagery, and other needed data, it turned out to be extremely difficult and in some cases impossible to obtain access. Part of the problem was due to a lack of coordination between divisions within the agency and part of the problem had to due with security and proprietary issues.

NASA was not the only organization unwilling to share data. As part of the project, a GIS user interface was developed to allow network users to easily access local GIS data from a web browser such as Netscape. However, MDECD directed the project staff to limit the GIS data available to the general public and economic developers from around the country. Therefore, the demonstration that existed on the website at the time of the site visit was said to represent only a small portion of what is possible. MDECD's rationale for reserving exclusive access to majority of data was that the state would then be in a better position to sell Mississippi during presentations for prospective businesses.

[4] In order to carve up the telecommunications business so that interexchange carriers could be competitive, the federal government created artificial boundaries beyond which the monopoly local phone companies could not go. Those boundaries are called LATAs and the concept was very simple: only LECs can carry telephone traffic within a LATA or intra-LATA calls, but only IXCs can carry telephone traffic between LATAs or inter-LATA calls.

Comparison Between Project as Originally Proposed and What Actually Happened

There were many differences between the project as originally proposed and what actually happened, most of which have already been discussed. The two most significant differences were as follows:

- The network hub was originally intended to be located on the site of NASA's Yellow Creek Production Facility; however, the site was not turned over to the State of Mississippi by NASA until late in the project. This delay made it necessary to locate the network hub in the alternate Tishomingo High School location.

- The TSEIC was originally slated to manage the project, but upon deciding that they weren't capable of managing a project with such a large economic development component, the project was reassigned to MDECD.

PROJECT ACCOMPLISHMENTS AND IMPACT

Project staff believe they've made a real difference in the lives of students, teachers, and families in Tishomingo County, and to a lesser extent in Pretiss and Alcorn Counties. Perhaps the most important indicator of the success and the impact of the total project is the tremendous level of community support that was garnered in an initially reluctant population. Community members became involved in all aspects of the project. The educational aspects of the project in particular should establish lasting impacts on the county's teachers and students. And the economic development supports and resources developed through the project have encouraged local industry to take advantage of worldwide commercial opportunities available via the World Wide Web and persuaded businesses and industries to locate in the area. Overall, the project's impact will be widespread, encompassing education, industry and community development. An important factor in the project's success was the multi-discipline collaboration that occurred between campus groups that typically do not work with each other.

Technology-Related Accomplishments

The technology components of the project were implemented as planned. The project had four major technology components:

- **Network Infrastructure:** The network backbone was composed of leased T-1 lines and ISDN connections. The backbone provides two-way interactive video communications, two-way interactive data communications, Internet connectivity, voice-based information services, and a gateway to all existing Mississippi networks. Internet access was provided by a leased T-1 line from MCI and propagated through the network to selected locations via direct connections and three 28.8 modem pools.

- **Network Applications:** A number of network-based activities were developed to enhance usability of the system and support business/industrial recruitment.

  – **A physical master plan.** This site plan for the entire Yellow Creek area was presented in a 20-minute animated video, with a "fly-though" of the area. The plan includes a compilation of existing studies, maps and other demographic data and allows

customized "visualization" of the site for potential business and industry, recreational enhancement, and other land and resource uses.

- **Creation of the Network Access Software.** This provides the communications linkages to the World Wide Web via Home Pages and makes the physical network operational.

- **GIS Integration.** The Geographic Information Systems developed by Mississippi Resource Center and NASA developed were enhanced and made available to the Tri-State Network. It is accessible by all users on the WEB.

- **Cultural/Educational Linkages.** A prototype for a comprehensive cultural/education network for schools and the community was initiated with a linkage to the Smithsonian Museum of Natural History in Washington, D.C.

- **Training and Resource Support.** General end user, educational, and industry/business-specific training on the use of the Network was provided to the citizens of the tri-state region. The training was based upon the outcome of a needs analysis of the training requirements.

- **Resource Development and Support Services.** Operation of the Tri-State Resource Center onsite project management, facility support and maintenance, development of a business incubator, development of the Tri-State Resource center, and direct support to MDECD for job recruitment was provided.

Telecommunications equipment, including interactive video monitors, were installed at the network hub at Tishomingo High School, the four network nodes in Tishomingo County, and the two expansion nodes outside Mississippi. Each of the 11 schools in Tishomingo County were provided with Internet access and interactive video capabilities. In addition to the school accounts, approximately 100 business and 300 residential accounts were established in the project's service area at no cost to the subscriber. Direct connections to the core router at the network hub provide high-speed connectivity to desktop computers at those sites where remote routers and LANs are located. The remaining users were provided 28.8 dial-up modem access through a combination of local access lines as well as toll-free 800 lines. Internet traffic was segregated and balanced over the total system for specific groups of users. Business incubator sites were given access to a specified modem pool to serve their needs, while other community users were given access to other modem pools. In addition to Internet access and interactive video capabilities, the network provides each end user with an e-mail server, a DNS server, voice response, web servers to make the network more user-friendly and effective, and restricted access to the Geographic Information System (GIS) Inventory of the project[5].

The GIS data assembled by the MSU School of Architecture included

- **Revision of maps of transportation routes in Tishomingo County**.[6] Through on-sight and aerial photos, which were taken during 1991-92, the new highways and railroads were added

[5] Only a small portion of the GIS data are accessible to the general public. MDECD retains exclusive access to the majority of the GIS data.

[6] While carrying out the GIS activities, project staff were surprised to discover that no existing maps, either paper or electronic, were up to date insofar as showing the most recently built highways and lane expansions on existing highways. (*continue on next page*)

to existing maps. These revised maps were then re-digitized to provide current electronic map files for the county.

- **Mapping of basic county areas.** Based upon data from U.S. Census Tiger files and in files obtained from Strategic Mapping, Inc., 20 area maps were made for Tishomingo, Prentiss, and Alcorn counties.

- **Mapping of social and economic data by census block groups.** Data were extracted from Census Bureau CD-ROMs, and 40 maps showing the distribution of a number of social and economic variables were created in Atlas GIS format for two of the counties. Mapping of locations of significant sites and geographic features within the counties was also undertaken.

While the original proposal called for the production of about 30 maps for Tishomingo County, additional data allowed for the production of additional maps in Alcorn and Prentiss Counties. Additionally, the location coordinates on more sites than originally anticipated were available, thus allowing for the depiction of the region in greater detail. Database files that will allow the future completion of maps for Alcorn County and Pretiss Counties have also been produced.

The GIS inventory also involved assembly of a variety of two- and three-dimensional data on the physical infrastructure at the Yellow Creek Plant site. These activities included

- Site photographs,[7]

- Aerial photography performed by Lockheed Martin,

- Site survey data derived from the aerial photography,[8]

- CAD (computer-assisted design) data on the buildings and improvements planned by NASA, and

- Three-dimensional computer models of the site and buildings.

- In addition, Digital Elevation Model and Digital Line Graph data from the U.S. Geological Survey on the site and surrounding area were assembled and coordinated.

(*continued from previous page*)

Thus, accomplishing the project goals necessitated the development of up-to-date road maps of the area (particularly to include the latest highways and railways) and converting these to electronic formats. The correct inclusion of major roads and highways was particularly important for the site inventory maps because they serve as reference points for the location of most other sites.

[7] In order to help determine and record which buildings planned by NASA had actually been built and to what level of completion, a photographic survey was performed. Buildings, pads, and partial structures were photographed with a digital camera from multiple exterior viewpoints. Not all sides of every building were visually accessible due to terrain, vegetation, or other site conditions.

[8] Aerial photography images exist as approximately 9" square transparencies and corresponding contact prints. The aerial photography images were used to generate site survey data that indicates contours at 2-foot intervals, building footprints, paved roads, sidewalks and paths, unpaved roads and paths, pads, deck, rail lines, utility poles, vegetative cover, ponds and other man-made and natural features visible through the aerial photography.

Approximately 5,300 CAD files were assembled as part of the GIS inventory. The site is represented as a polygonal mesh model, which uses a 100-foot grid generally, and a 50-foot grid in areas requiring greater detail. The model includes paved and unpaved roads and parking areas, sidewalks, concrete pads, decks, dams, and ponds. Models of portions of the site can be generated at higher levels of detail from the existing data. Building models based on the CAD design files and the site photography were constructed for all major buildings. These models represent exterior conditions only. The site model, in combination with building models, can be used to generate custom fly-by or walk-through animations of existing site conditions and can serve as the base for the generation of animations of master-plan or site-development scenarios. Models of individual buildings and surrounding site conditions, including interior spaces, can also be generated.

A complete GIS database for the entire area proved to be an impossible task during the life span of the project. However, as a result of the work that was done on this portion of the project, a significant advancement was made in establishing a current GIS database for the region that can be built upon in the future by other researchers.

A GIS user interface was developed to provide easy access to the complex data sets available through the network. This feature of the network allows economic developers across the nation to gain access from anywhere on the Internet to information that may be critical for making relocation decisions or business recommendations about the tri-state area.

A World Wide Web site was created to provide an on-line version of the Tri-State Project and an overview of the region and to provide a mechanism for those parties interested in accessing information about the project and the region from the Internet. This site includes information pertaining to small businesses, area industries, recreational facilities, and area history. Small businesses in the tri-state region were offered the opportunity to design or have designed web pages for them to represent their business or organization on the website. Many small businesses exercised this option and were pleased to have the capability for Internet users to gain access to information about their businesses and the products and services that they offered. The website created for the project is located at the URL *http://www.tristatenet.org*.

Impact of the Project on Direct End Users

The TIIAP project fulfilled a great need among the residents of Tishomingo County for access to the telecommunications infrastructure and training in its use. Residents are acutely aware that the use of technology and telecommunications are an important factor in their abilities to compete in the technological world of the 21st century. Project staff reported that people often had to be turned away from town meetings about the project due to a lack of standing room. The outpouring of volunteers to assist with various project activities was reported to be phenomenal. Community members not only provided technical assistance but also went so far as to offer their extra bedrooms for use by the project staff when they were in town. (And project training staff had more requests for training sessions than could be accommodated.) When the demand for training outstripped the availability of computer systems in the community of Belmont (population 1,200), for example, over $30,000 in local contributions were raised in a 2-week period to purchase 25 state-of-the-art computers for the community's electronic classroom.
Other indicators of the impact of the project on end users can be judged in relation to the baseline technology literacy study conducted as part of the project. The study, which is described further in section F, found that at the beginning of the project there was a very limited level of knowledge or use of

technology and telecommunications within the region. However, during the latter stages of the project one of the new small businesses (a computer sales company) spawned from the impact of the project sold over 100 computer systems within one small rural community. As the project matured and the citizens of the area developed a better understanding of the technology and its potential, the demand on the telecommunications system grew at a rate far greater than imagined.

The new learning technologies made available through the TIIAP project were reported to have made an especially strong impact on end users in the Tishomingo County schools. Training sessions were held with selected teachers from each school in the county to enable them to become the lead teachers for the educational component of the project. These teachers were provided with computers, printers, modems, and television monitors for use in their classroom. Assistance was provided from the school system and the project to have each teacher's classroom wired for phone lines. With the installation of dedicated phone lines, teachers had dial-in access and could communicate using e-mail, and they could use the World Wide Web. Netscape was installed on each of their systems, and the teachers were trained and encouraged to integrate resources found on the World Wide Web into their curriculums. Along with the network technology installations, a number of related improvements were made in the classrooms such as providing additional electrical access and making structural repairs as necessary.

Although there has been no attempt made to determine and document how and how often the Tri-State Network is used by teachers and students in the Tishomingo County schools, project staff and school administrators believe that the training activities and the provision of equipment and access has significantly changed classroom instruction throughout the county. Several examples of how the Tri-State Network has been used by the schools were provided, the most notable being a pilot project with the Smithsonian Institution's National Museum of Natural History called the Natural Partners Initiative. This collaborative program was designed to enliven the way science is taught to elementary and middle school students. Through the initiative, the electronic communication and information technology provided by the TIIAP project made possible the interaction between school children in Mississippi and museum scientists and curators at the National Museum of Natural History. These interactive sessions allowed students to "visit" the museum, engage in real-time dialogue with museum experts, scientists, and curators, and have collaborative learning experiences while remaining in their own classrooms. Interactive experiences were made possible through other Internet broadcasts from the National Museum of Natural History such as "Live from Antarctica," sessions with Peace Corps representatives, an "electronic field trip to the live Marine Ecosystem exhibit, and a "Live from the Stratosphere" session with atmospheric researchers. These events typically reach about 5,000 students and teachers.

The network's interactive video systems have also been used to assess and improve student teaching. Using the interactive video equipment, faculty and administrators can unobtrusively observe student teachers in the classroom from a remote location. The technology also allows for more frequent communication between the student teachers and their colleagues. The interactive technology also allows the schools of education to place student teachers in more geographically isolated areas away from the university.
Not only has this project had regional impact, but also it has had, and continues to have, national impact by reaching hundreds of teachers and students across the nation through the telecommunications infrastructure provided by TIIAP.

In addition to impacting end users from the educational community, the Tri-State Project became a vehicle for area businesses to take part in the competitive arena. At the time of the site visit, 16 businesses had

participated in the network by using electronic commerce via home pages advertising for their businesses. Home pages for participating business are located at the URL http://www.tristatenet.org/small/html/index.html.

There has been no attempt to document or evaluate project impacts on end users at the expansion sites in Alabama and Tennessee.

Impact of the Project on Other Beneficiaries and/or the Overall Community

Through the TSRC and under the direction of the MDECD, economic development was a major thrust of the project. The TSRC provided assistance to businesses and industries within the region in a variety of ways. These included providing technical support and expertise in 1) simple and complex networking, 2) a wide range of telecommunications technologies, 3) integrated facility management, 4) the Internet and World Wide Web access, 5) web/home page development, and 6) strategic planning. In addition, major efforts were expended in providing consulting services and technology training. These activities included 1) ISO 9000, 2) quality, 3) Stephen Covey's "Seven Habits of Highly Effective People," 4) business management, and 5) small business administration and development.

The TSRC's primary efforts centered on supporting and enhancing existing regional economic development infrastructures. A unique "electronic incubation" concept was developed by the TSRC team that created a virtual business incubator to foster the development of new small businesses within the region. The central focus of the electronic incubator was to jump-start individuals within the region to venture into businesses that took advantage of the telecommunications network. A minority consortium incubator concept was also developed and implemented by the TSRC during the final stages of the networking project. Additional efforts were directed toward developing the climate to attract high tech, diversified industries and businesses that could take advantage of the advanced telecommunications systems implemented under the networking project. In particular, the videos created for the project will be used by state and local officials to promote economic development in the region.

Numerous existing businesses and industries within the region took advantage of the resources provided by the TSRC throughout the duration of the project. Quartet Industries, Parker Hannifin, DeVaughn Wood Products, Denotee Martin Contractors, Lackey Electric, Intec Corporation, Merlin Internet Services, and Wolverine Tube represent a sample listing of businesses that were provided assistance or gained startup support through the TSRC. The TSRC staff placed home pages for several businesses on the Tri-State Network and provided valuable support for these companies to take advantage of the opportunities available in the $2 billion international electronic commerce market. Because the small rural manufacturing industries that most commonly exist in the tri-county region have traditionally focused their commercial activities within the limited confines of the area, they had a great deal to gain by marketing their products and services and conducting commercial transactions worldwide using the telecommunications systems made available through this project. Unfortunately, there is no available documentation of the amount of new business generated via the World Wide Web.

It is important to note that several new technology-related small businesses were spawned in the region as a result of the impact of this project. Computer sales climbed dramatically after the network was installed. Over 300 personal computers were sold to county residents in a 3 month time frame. Three new ISPs and one new computer retailer started up. In addition, major efforts were expended by the TSRC in assisting

the startup of an electronic services and repair company with the potential of employing as many as 25 people with the region.

The MSU School of Architecture carried out a number of tasks to support master planning and economic and community development efforts involving the re-use of the Yellow Creek site. These included conducting a community design workshop on the development of the region around the Yellow Creek site, and the compilation, organization, and creation of new digital data on the physical infrastructure of the site. Each of these activities has the potential to positively affect the community as a whole, depending on the nature and extent of development that ultimately occurs at the site.

Participants in the community design workshop were drawn from the tri-state area and included architecture and landscape students and faculty from MSU and from Auburn University in Alabama, faculty from the University of Arkansas, nationally recognized consultants in energy and environmental systems design, members of the communities surrounding Yellow Creek, as well as representatives of MDECD and the MSU School of Architecture. Participants worked in teams to attempt to discover and articulate the underlying assets and concerns regarding development and growth in the area, and developed alternative schemes for development intended to accentuate strategies that illuminated those assets and concerns. These schemes and the underlying research were then presented to the community in an open forum designed to solicit discussion, comment, and criticism. Community response was warm and enthusiastic, although turnout was low.

Impact of the Project on Grant Recipient and Project Partners

A beneficial part of the project was the establishment of ties by MSU to the Smithsonian, NASA, and the U.S. Department of Education. The continuation of these ties and the development of future projects with these agencies has been an added benefit from the project. The positive working relationship between these federal organizations and MSU helped to break down existing barriers typically encountered when states deal with federal entities. The cooperative nature of this project allowed the state government to maintain creative control of the project while using federal partners as advisors and mentors.

In addition to the relationships with federal entities, the TIIAP initiative also strengthened ties between MSU and the Tishomingo County Special Municipal Separate School District. Tri-state project staff from MSU were involved in the development of the district's 1996-97 Educational Technology Plan. Tri-State staff members helped the school district understand the capabilities of existing technology, incorporate Tri-State Network Project plans into the school system's technology plan, and recognize the need for additional electronic access including the requirements for additional phone lines. The district technology plan is currently being implemented and has been greatly enhanced by the telecommunications infrastructure put into place by the project.

The technological advances stimulated by the TIIAP project also motivated the school system in Tishomingo County to pursue additional grants to maintain the momentum that was started: State funding was received to further improve the technological capabilities of area schools. At the time of the site visit there were over 700 PCs in the Tishomingo school system. All of the county's K-6 teachers and about 75 percent of the teachers at the secondary grade levels had at least one computer in their classroom. And all 257 classrooms in the county were wired for Internet access. To ensure that the equipment will be used, the school board has required all teachers to have technology training by the end of 1998.

Several schools in the county received state funds to develop special computer-based laboratories designed to expose students to careers in science and engineering. The teachers of the 3-year sequence of courses for 7th, 8th, and 9th grade students underwent 4 weeks of training to teach the courses. In each of the three courses, student pairs rotate every 2 weeks through a sequence of self-directed instructional modules covering topics such robotics, laser, CADD, computer applications, production processing, manufacturing management, environment and technology, engineering structures, biotechnology, electronics, aerospace, satellite/weather and meteorology.

The project's relationship with the Smithsonian Institution National Museum of Natural History has led to several additional collaborative endeavors. As part of the educational component of the project, eight middle school teachers were selected to participate in the Smithsonian's Natural Partner's Initiative. The teachers were brought to the museum to acquaint them with the various resources of the National Museum of Natural History and provide the background for curriculum development for four modules that would utilize the Smithsonian's resources and could be accessed by the teachers within the region and across the nation. The modules are being developed with the support of a grant made possible by the Bell South Foundation and represent spinoffs from the Tri-State Network Demonstration Project. The modules include Insect Zoo, Seeds of Change, the Arctic Research Project, and Search for the Giant Squid.

In related collaborative venture, an MSU professor from the School of Architecture spent 5 weeks at the Museum of Natural History with a group of his students in the summer of 1997 conducting a 3-D mapping inventory of artifacts and exhibits in the museum's archives. The university funded the effort to make the museum's collection available electronically to anyone with Internet access. This endeavor has expanded further with the Smithsonian using software created for the 3-D mapping project to create new museum exhibits.

The TIIAP initiative had several unexpected effects on the grantee organization, MSU. Prior to the TIIAP initiative, MSU was only involved in a limited amount of educational and training activities outside the university using distance learning technologies. Now, the university is involved in several such projects. For example, the TIIAP initiative was instrumental in MSU's receipt of a contract from the U.S. Marine Corps to provide educational opportunities to personnel across the globe using interactive video technologies. The interactive distance learning approach is ideal for the Marine Corps and other military organizations in which personnel frequently transfer to different locations. The MSU distance learning program will provide a B.S. degree in business to Marine Corps personnel. The business program is expected to serve approximately 1,000 students each year and may be expanded to other branches of the military.

In addition to the enhancement of the university's distance learning capabilities, the TIIAP grant directly led to the establishment of the University's new Center for Education and Training. The vice president of the university suggested that a center be formed to provide a mechanism for interdisciplinary ventures because he was so impressed with the way the various university groups worked together on the TIIAP initiative across departmental and college lines. The TIIAP project also put MSU's School of Architecture on the map by securing their reputation with state agencies and within the architecture community.

Project Goals Not Met

Technically, the project accomplished its primary objective to implement a community-based advanced telecommunications infrastructure that would support economic development efforts focusing upon Tishomingo County and impacting the surrounding tri-state region. Nevertheless, project staff would have liked to have had greater involvement within the medical component of the project. Unfortunately, the project didn't have enough buy-in from that segment of the community and the network node at the county hospital is not realizing its full potential. Similarly, the expanded nodes in Lawrenceberg, Tennessee, and Muscle Shoals, Alabama, have shown a much lower involvement in network activities than was anticipated at the time of the proposal.

Impact of TIIAP Support on the Initiative

Without TIIAP funding, the project wouldn't have been able to leverage an additional $5 million and therefore wouldn't have had nearly the magnitude of impact. Tishomingo and its neighboring counties would never have been able to purchase the level of equipment provided and stimulated by the grant. And without high-speed and affordable Internet access and an awareness of the value of access to the information infrastructure, the county school system and most local businesses would not have made the effort to pursue Internet connectivity on their own. Particularly impressive is the incredibly fast rate at which the technological transformation took place in the region. Without the TIIAP grant, such a transformation would have taken many years to achieve.

EVALUATION AND DISSEMINATION

Evaluation

In the project proposal, evaluation is conceived as a formative monitoring process to ensure that the project was operating within the parameters set forth in the implementation plan. However, a detailed evaluation plan was not conceived until an evaluator from the MSU Department of Education joined the project team 8 months after the proposal was prepared. The monitoring/evaluation plan that was ultimately developed for the project adopted a systemic approach to "determine fundamental changes in the social and economic fabric of the project site that can be associated with the actual implementation of the program." The systematic approach delineated three levels of analysis:

- Individual/family
- Institutions
    a. Education
    b. Business/industry
    c. Government
- Community

Systemic indicators and measurements were to be obtained from three types of data sources:

- Nominal/focus group meetings
- Secondary data
- Primary data

Nominal/focus group meetings were to be held on a quarterly basis to obtain indepth and qualitative information about the strengths, weaknesses, and needed areas of change of the project from the perspective of consumers. Nominal/focus groups were to be selected from student, parent, educator, business/industry, government, and community leader groups

Secondary data used in the evaluation were to include a broad-based assessment of existing indicators using census data, educational statistics data, business and industry data, and government data to benchmark the extant conditions of the project site. In subsequent periods, as new indicators became available, an analysis of change was to be conducted.

Primary data used in the evaluation were to involve telephone interviews with a representative sample of more than 1,500 consumers to determine knowledge of, access to, and preference about information technology. These interviews were intended to establish a baseline level of technological literacy among the consumer population. In addition, a "Nielson-type rating" form was to be developed and administered to users of the Tri-State network throughout the period of the project to determine the use of different aspects of the technology and assess the dynamics of the type, frequency, and proficiency of use.

As the project unfolded, the project evaluator modified many of the planned evaluation activities to accommodate changes in the various components of the project. Unforeseen delays in the implementation of some facets of the project due to the delayed turnover of the Yellow Creek site and problems negotiating a state purchasing contract, both of which were outside of the project team's control, necessitated postponement of interviews and regional data collection. To expedite the data collection process, it was decided that personal interviews with parents, educators, business and industry leaders, government leaders, and other interested area citizens would be conducted in lieu of focus group meetings. Furthermore, project delays also led project staff to completely drop the Nielson-type rating survey.

Additional evaluation activities were added to the evaluation plan as well. Two types of evaluation activities were conducted during the initial training session for teachers in November 1995:

- Participants were surveyed to establish baseline data about their levels of technological competency; and
- An assessment of the training session was conducted.

Baseline data on the teachers were collected using several instruments. The first was a two-page evaluator-created, short-response instrument, which required participants to describe the prototypical classroom from their educational past and then describe the classroom of the future as well as the training required for the teacher in each classroom. Results indicated that the teachers anticipated few differences between the

classrooms of the future and the past. They acknowledged that technological innovations were likely to become available in the future, but they did not expect this to change teachers' instructional practices.

Participants also completed Mississippi Teachers and Technology: A General Survey of Attitudes Toward, Knowledge of, and Access to Computers and Computer-Related Technology, an eight-page, force-choice questionnaire developed by the Social Science Research Center at MSU. The questionnaire was adapted from a telephone survey conducted in Tishomingo County in October 1995. It provided basic information on the technology background of participants and served as a basis to shape future training sessions. Again, results indicated that participants were aware of the general potential of technology, but had limited training and skills in its use.

The third instrument completed by teacher participants was the Technology in My Life Survey, supplied by the Social Science Research Center. This three-page, rating-scale-type instrument was intended to assist program staff in planning technology learning experiences for teachers. Results indicated that while a few participants had limited experiences with technology, the majority of participants would require intensive, hands-on training with a great deal of direct personal support.

As a follow-up to the training session, participants completed a short evaluator-developed technology-based (e-mail) instrument. Participants responded to information learned during the training session and what assistance, equipment, and training would be required to infuse technology into the daily instructional process of their classrooms. Results indicated participants were quite pleased with the session, but they needed additional time for further experiences in using the technology and gaining access to available information. Requirements for infusion of technology into the instructional process ran the extremes of the technology spectrum. Responses ranged from needing a computer for classroom use to needing a modem and dedicated phone line access to Netscape installation. Site visits by the project evaluator to each participating teacher's classroom were conducted in February 1996.

The most ambitious element of the systemic evaluation was the telephone survey of consumers in Alcorn, Prentiss, and Tishomingo Counties in the State of Mississippi. The survey was designed and developed in the Social Science Research Center at MSU to obtain baseline information regarding people's attitudes toward, knowledge of, and access to computers and computer-related technology, as well as other forms of technology. Data were collected via telephone interviews with a random sample of more than 1,500 adults living in households with telephones. The data were collected in the last two weeks of October 1995 (Tishomingo County) and the first two weeks of July 1996 (Alcorn and Prentiss Counties) by the Survey Research Unit in the Social Science Research Center. Households were selected using random-digit-dialing procedures; within a household, an adult (over 17 years old) was randomly selected and interviewed using the Hagen-Sollier technique. Each completed interview lasted approximately 10 minutes. The final data set contains information for 1,536 respondents (there were 195 refusals).
A comprehensive evaluation report was prepared by the Social Science Research Center about the results of the baseline technology survey. Because the report is essentially a statement about the first year of a long-term community economic development project, limited information is presented about the project's effects and impacts. This type of impact information was to be obtained after the project matured via a followup telephone survey. Unfortunately, this followup survey has yet to be implemented. There are, however, a number of implications about program improvement that have been gleaned from the baseline technology survey. The evaluators made several recommendations for the project communities and the project staff to consider as the project moved forward in subsequent years.

- The project should assist the communities in developing intermediate and long-range community goals associated with the desired community and economic consequences of this new communication technology. It is the evaluators' belief that the community is rapidly acquiring a more informed understanding of the emerging communication technology and will soon be in a better position to define community development goals. To some degree, the project staff will need to reformulate project goals to better reflect community desires and ambitions.

- There are three substantial resources within the community that can be more effectively coordinated with the conduct of the project. The evaluation detected a substantial amount of volunteerism among residents of the tri-state project area. This is an untapped resource that holds potential promise for not only expanding the program, but also entrenching the technology in the social fabric of the community. Also, substantial resources such as the Tri-State Education Initiative (NASA's role), along with the Tri-State Educational Initiative Consortium (the role of regional educational leaders) need to be brought into the project as major collaborators and players in any future phases of the project.

- Paradoxically, communications between project components and the project management and the community players should be given the highest priority in all future project activities. The evaluators were impressed by the complexity of the project, with the competing priorities of the community groups and project components, and with the dynamic nature of the technology. When these three facets are considered collectively, it is clear that great care needs to be taken with communication and coordination.

Dissemination

Several dissemination activities took place in connection with the Tri-State Demonstration Project. The most notable were the three videos produced as part of the project. In collaboration with the MSU School of Architecture, the university's Television Center produced two 12-minute videos and one broadcast-length video program to aid MDECD in developing industry and public awareness of the nature and benefits of the project. The first short video, aimed at CEOs and other executives of major industrial or manufacturing facilities, described the Yellow Creek production facility, its infrastructure, intended development, and regional demographics. The second short video, aimed at the general public, documented the networking initiatives, their benefits to business, industry and education, and the public/private partnerships driving the project. Both videos included contemporary electronic visualizations of the region including the Yellow Creek site and interviews with local business and education leaders. These videos have been distributed by MDECD to economic developers and education systems throughout the region. The broadcast-length video program was developed around the theme "Visionary Partnerships" and incorporated elements from each of the shorter videos to create a documentary about the project rather than a marketing tool. The program has been aired on public television stations in Mississippi, Alabama, and Tennessee.

In addition to the videos, articles about the Tri-State Network were written up in the *Clarion Ledger* (a local paper) and *T.H.E. (Technological Horizons in Education) Journal*.

The project director for the Tri-State Demonstration Project was also invited to give the keynote address in Canada at the Telecom 97 November Canadian Telecom Conference. Other conferences at which project-related activities were presented include

- ETEC 1997, the annual conference of the Environmental Technology & Education Center;
- NECC 1997, the National Education Computing Conference; and
- Mississippi State Computing Association Conference 1997, a statewide technology conference.

Potential for the Project to Serve as a Model

The possibility of replicating various components of the TIIAP project in other communities would clearly benefit people throughout the nation. Thus far, it has been the GIS user interface that has generated the most interest outside the project's service area. The GIS user interface was developed to provide easy access to the network's complex data sets by the average person within the region. Due to its success and unique software approach, it has attracted significant attention from the Department of Defense and other organizations. The fundamental architecture of this software engine has far more potential than just that of accessing a GIS database. It appears that it has implications for the basis of an intelligent tutoring system that could be especially useful at all levels of education, especially in military technical schools. The interface was developed in such a way that it can be modified to remotely control almost any MS Windows application over the Internet efficiently and effectively. Distance learning could be greatly enhanced by taking advantage of such a software tool.

LESSONS LEARNED

The following lessons were articulated by project staff to guide national telecommunications policy:

- **Simplify interstate network regulations**—A major Federal effort needs to be made to reduce the ridiculous costs and burden of crossing LATA lines within the same network.
- **Support rural telecommunications initiatives**—Rural Americans need telecommunications and can profit from it the most, but, unfortunately, they are the ones who can afford it the least.

Lessons were also provided for organizations attempting to implement a similar telecommunications network:

- **Know the community**—When developing a telecommunications network, it is important to carefully analyze the area being served (e.g., how do ISDN rates vary across states? what network architecture is most appropriate for the setting?). Furthermore, the fit between the network and the community must continually be reassessed.
- **Get the community involved**—People, not the technology, are the most important asset in accomplishing major networking projects. Put another way, technology is seldom the problem

or the answer, it is almost always the human behind the technology that can facilitate or stall project outcomes. Community involvement can be maximized by focusing on applications of the technology rather than technology literacy and by focusing on community development rather than economic development.

- **Use industry standards**—Selecting industry standards for equipment purchases will maximize compatibility with the rest of the world. Project staff also found it worthwhile to switch to standard algorithms from proprietary algorithms in order to ensure compatibility.

- **Be flexible**— Numerous variables are beyond the control of the project team and may cause changes in a network infrastructure and the project's implementation. Anticipate, for example, that technology selected at the time of the proposal may need to change or even be replaced with more effective technology by the time the proposal is funded and equipment is ordered.

- **Be realistic**—Projects of the nature, complexity, and magnitude of the Tri-State Network Demonstration Project should never be attempted within a time span of less than 2 years. Better yet would be to negotiate some type of sliding schedule to better accommodate equipment purchases and changes in technology.

- **Establish strong partnerships**—Partnerships, if designed properly, can produce tremendous benefits for all parties involved and make it possible to achieve objectives never before imagined. However, lines of communications between project entities and associated organizations should be streamlined. Delays in processing orders, etc., can have a significant negative impact on the project timeline.

- **Don't neglect training**—Most people do not understand telecommunications technologies and the potential that they hold for their future. Thus, training is a key component in any telecommunications project.

The most important lesson learned by the tri-state network project team is that technology continues to be a moving target and change is never-ending.

FUTURE PLANS

A detailed plan for a followup phase to the project had been developed concurrently with the plans for the initial TIIAP-funded phase. The followup phase involved an expansion of the network and network applications through the further development of the communications infrastructure. The plan involved implementing over 150 electronic classrooms throughout the state, specifically:

- 100 in K-12 school settings;

- 20 in community colleges;

- 20 in universities; and

- 34 in hospitals.

The long-term goals of the followup phase were to improve economic and community development, education, communication, and integration of vital community and global resources. Project planners were hoping to receive a second TIIAP grant to implement the followup activities. Unfortunately, thus far, the tri-state network team has thus far had little success obtaining funding from alternate sources. Several efforts to advance the project were underway at the time of the site visit. These include:

- MSU responded to an RFP at the state level to consolidate an ATM network backbone.
- The MSU Television Center plans to continue working with the Department of Education, NASA, and the White House on educational projects that will have a direct positive impact on the tri-state area.
- The MSU School of Architecture plans to
  - Complete the full series of GIS maps for the three-county area,
  - Develop a plan for revising and correcting GIS maps as changes occur, and
  - Continue work with MDECD to visualize potential industrial facilities and to supply GIS/GPS data to engineers for community planning/development.
- Tishomingo school district plans to
  - Prepare an application under the e-rate for additional T1 lines and restructured its equipment to maximize access via the state backbone, and
  - Continue working with the Smithsonian Institution on related projects included distance-learning projects similar to those offered through the Natural Partners Program.

The highest current priority of the project, however, is to transition the network into a self-supporting system while continuing to meet the needs of the citizens of the region.