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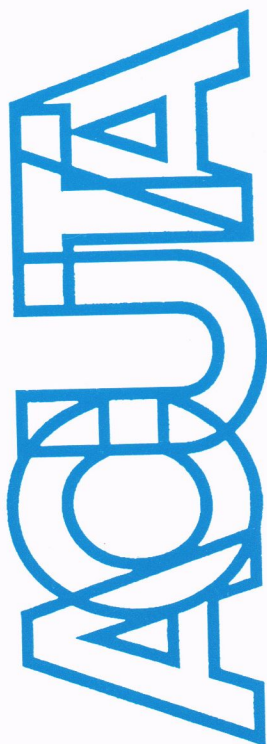
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MONOGRAPH

ASSOCIATION OF COLLEGE & UNIVERSITY TELECOMMUNICATIONS ADMINISTRATORS



ACUTA: A Case for Change

Futures Report of the ACUTA
Strategic Planning Committee
1992

By
Dr. James S. Cross
Longwood College

Coleman H. Burton
University of Missouri

Sydney A. Paredes
U S WEST

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Coleman H. Burton

A member of ACUTA since 1983, Coleman H. Burton is serving as 1992-93 President. Previously, he served as Finance Chair, Treasurer, Vice President and Executive Vice President. Appointed the first Director of University Telecommunications for the University of Missouri System in 1983, he was previously Director of the Computer Network for the university. Early in his career, while employed by General Electric's Advanced Electronics Laboratory, the Cornell University graduate was designated as his department's representative to learn how to program and operate the Laboratory's first computer. He also worked with Syracuse University Research Corporation before joining the University of Missouri. Since 1983, each of the University of Missouri's four campuses - Columbia, Kansas City, Rolla and St. Louis - have installed a new campus telecommunications system. A university-owned digital network interconnects the four campuses and also connects to a similar network operated by the state. Burton has also been an instructor for ACUTA's Understanding Telecommunications workshop. The author of several articles on computing and telecommunications, Burton is the author of a book chapter, and has made numerous presentations at professional meetings. He holds two U.S. patents for error control communications systems. He was recognized by ACUTA in 1986 with its "Past President's Award" and in 1990 by the University of Missouri with its "President's Award."

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I. Preface

This report was commissioned by the 1991-92 ACUTA Strategic Planning Committee to stimulate thinking and broaden the horizons of the Planning Committee and Board of Directors by providing insights about the environment, key issues, controversies, and challenges that will confront 21st century telecommunications administrators. The goal was to help develop a strategic plan that is forward-thinking and flexible enough to meet current and future needs of ACUTA members. The Planning Committee and Board thought the report would interest ACUTA members and recommended that it be published as a monograph. Please read it in the spirit in which it is intended; not as right or wrong, but

simply to encourage broader thinking among leaders in higher education telecommunications.

This report examines changes that impact our nation and our lives, discusses the role of the American college and university in meeting the resulting challenges, and explores implications for 21st century college and university telecommunications administrators. The information, predictions, trends, and opinions here are drawn predominantly from the references listed in the bibliography, discussions with Planning Committee and Board members, and input solicited from others involved in education, telecommunications, and long-range planning.

II. Executive Summary

"It is time for a new generation of leadership to cope with new problems and new opportunities, for there is a new world to be won."

– John F. Kennedy, 1960

Around the world, technology is changing the way people live, work, play, and learn by breaking down the barriers of time and distance, and allowing people access to sophisticated tools and information. Converging technologies, coupled with political and socioeconomic pressure, are effecting a case for change in academia that will transform how we plan, teach, learn, research, make decisions, and deliver products and services. Although the ultimate impact is unknown, it is clear that technology will influence the nature and pace of life in the 90s and beyond. None of us can predict the outcomes or control the process with any degree of certainty, but we can prepare ourselves to contribute to a new world that's being built in higher education. We can only assume that this new world that we all share, work and live in will be a better place.

The following is a synopsis of this report's key findings, covering technology, regulatory, financial, and organization transformation, as well as vendor stratification/alliance, product/service delivery, network management, and planning.

Forecasting specific technological futures is dangerous. It is safe to say that we will continue to see impressive advances in data, voice, text, video, image, and graphic technology. The field will continue to benefit from advances in chip technology for the foreseeable future. By the end of the decade, experts expect to see a 2000 MIPS microprocessor chip containing 50 million transistors per die with speeds in the range of 250 Mhz (Gantz, May, 1990, p. 34).

Integrated data/voice communications and switching will be accelerated by the continued roll out of Fast Packet, Signaling System 7, and ISDN. Network engineering and design complexities will significantly increase. SONET and photonic deployment will make many current end-user devices obsolete, foster the development of high capacity bandwidth applications, change transmission architectures/protocols, and result in new generations of switches. Hypertext, video imaging, HDTV, and graphical interfaces will dramatically increase bandwidth needs and accelerate the development of

multimedia applications in the second half of the decade. As usual, the challenge for the telecommunications professional will be to relate these and other technological advances to the needs of the institution and its constituents. The telecommunications administrator must: plan and engineer for standard platforms; design for flexibility; avoid focusing on any one technology; ensure abundant bandwidth; plan for backup and disaster recovery; build in security; adopt and adhere to standards for interoperability; understand institutional needs; and address multi-vendor system management and maintenance.

On the regulatory front, RBOCs are no longer restricted or prohibited from offering advanced information services. The Cold War thaw will see more and more expansion and alliance with colleges and universities in the former Eastern Bloc countries.

The current financial challenge of "doing more with/for less" will only intensify. The objective for ACUTA members will be to maximize their available resources to support the mission of their institutions. Selling the merits of technology and identifying new sources of funds to support the telecommunications and technology function will be an ongoing challenge.

Organizationally, the network will become the core information resource and will profoundly change the way systems are managed and applications are developed. Network management will become information systems management, subsuming both the MIS and telecommunications functions. Network management will require products, systems, and applications that are integrated across three dimensions: (1) information modes; (2) planning, monitoring, control, and administrative functions; and (3) architecture and protocol layers (Frank, March, 1991, p. 32).

Vendors will see the marketplace become increasingly dominated by global conglomerators with international coverage, strong service and support infrastructures, large installed bases, global market image, and strong financial acumen. The conglomerators will increasingly serve

as distributors for smaller companies who compete on the basis of discreet market niches and technology specialization (Gantz, January, 1990, p. 22). A dynamic vendor marketplace will evolve with continual changes in vendor alliances and product support. Institutions will increasingly evaluate vendors based on international strength and focus.

From the education perspective, we realize that teacher-centered, textbook-oriented education was a great invention in its era. It served us extremely well, while the world's body of knowledge seemed relatively fixed and the pace of change could be measured by the predictable cadence of the daily newspaper. However, learning in the 21st century will be a "trans-human microcosm technology process" (Higgins, December, 1990, p. 8ED). It will no longer be confined to the classroom, but span the student's entire life cycle and permeate every form of social activity. Society's perception of what a college or university is and what constitutes learning and education will also change.

From the network perspective, cheaper chip technology will spawn many new desktop and network devices. The demand for bandwidth will continue to grow as networks become more complex and support a wider array of applications. Telecommunications jobs will become more political, involve more user contact, have a higher degree of visibility, be riskier, and involve a greater degree of interaction with senior management (Gantz, May, 1990, p. 40). The network will become the system and core information resource for many institutions as it crosses organi-

zation lines, time zones, state boundaries, nations, and continents. It will change the work place, enabling us to leverage the mind, the creative process, and our mental capacities in new ways. Networks will be the engines that drive our institutions, economy, and society. They will be the fountains and reservoirs for conducting research in colleges and universities and for developing visions of the future.

America's colleges and universities, which are the envy of the world, must remain so if the United States is to maintain its competitive position in a global economy and society. Institutions must have the technological leadership, facilities, and resources to develop the best minds to undertake applied and theoretical research in the public and private sectors. It is no secret that colleges and universities are undergoing change and reform. Political and economic pressures are necessitating innovative approaches to managing change in a dynamic environment of shrinking resources. More than ever, educators and administrators must consider how to interpret their institutions to the constituents they serve, both internal and external. While telecommunications administrators cannot solve the many problems facing colleges and universities, they can be leaders in helping institutions realize the extent to which networks can enhance planning, teaching, learning, business processes, research, and decision making. The coming advances can make our lives more humane and satisfying, or more impersonal and empty. The telecommunications administrator, with a broad range of skills and expertise, can and must be a key player in the times to come.

III. Societal Trends

"In the beginning all the world was America."

—John Locke

Today we no longer live in a world where individual states or even an important group of states can decide everything in the world. The global society and economy in which we live requires an international approach to problems, not because it is a moral imperative, but because the world is a single and interdependent whole. (Virginia, 1990, p. 2.)

As a result of profound social, economic, and technological transformation, the world's social and economic orders are also changing at an unprecedented pace. America's drop from the highest standard of living in 1965 to seventh place today is no laughing matter, as the U.S. share of the world economy shrinks to approximately 25 percent (U.S. News & World Report, December, 1991, p. 50). The average U.S. worker's paycheck is 12 percent smaller, after inflation, than it was 20 years ago. According to the U.S. Bureau of Labor Statistics, the service sector will increase from approximately 74 percent in 1990 to 88 percent of the U.S. work force by the year 2000 (The Futurist, July-August, 1988, p. 34). In this decade, low-paying jobs will continue to replace well-paying jobs in manufacturing, construction, mining, and agriculture. The number of middle managers will decrease as organizational structures continue to flatten. These issues are but a handful of the most visible. Others include:

- (1) the dominance of Japan in the world's markets;
- (2) the rapid emergence of other Pacific rim nations as major producers of goods;
- (3) the continuing political, economic, and social problems plaguing emerging nations on three continents;
- (4) worldwide reform of totalitarian governments and state-run economies; and
- (5) the consolidation of the European Economic Community into the greatest concentration of economic power in the world.

These global changes come at a time when America faces major changes in its own society that will have significant implications for higher

education. As educational costs continue to rise, heavy pressure will be applied to colleges and universities to control cost and do more with less. Space at premier institutions will be limited, enrollments at two-year institutions will accelerate rapidly, and legislators and the public will place a greater emphasis on outcome assessments.

A rapidly changing job market, along with the changing requirements of new technologies, will necessitate increased business training across the board. To meet this demand, business and industry must invest heavily in employee education and retraining, at an estimated cost of \$80 billion a year. It is also estimated that up to four percent of the labor force will continuously be in job retraining programs during the 90s (The Futurist, July-August, 1988, p. 33). Colleges and universities will be expected to play a greater role in these retraining and education programs by developing business partnerships and offering apprenticeships, internships, pre-employment training, and adult education. Institutions will be expected to develop computer- and network-supported teaching tools and techniques to improve teaching and learning, enabling a greater amount of material to be learned faster. Demand for professional continuing education and certification programs among college-educated workers will persist, and many of these workers will continue to seek quality programs from colleges and universities. Various estimates indicate that the average American will work at several different jobs and careers during his or her lifetime, each possibly requiring new skills, new knowledge, and new attitudes and values. Education and training will be critical in building the capacities in the work force needed to meet the demands of new technology, new production, and competition from the global economy in which the United States operates. We can no longer think of education as something that is pursued by the young and completed upon entering adulthood. Now more than ever, lifelong learning is imperative for individual success, corporate survival, and global competitiveness. The colleges and universities of the 21st century must take their places in this process.

In an age of profound societal transformation,

IV. The Information Age

"It's an amazing invention, but who would ever want to use one?"

– Rutherford B. Hayes, 1882
upon using a telephone for the first time.

many people believe that information technology can provide a competitive advantage. Private industry, foundations, professional consortia, government agencies, and institutions are all supporting "project after project" aimed at exploiting technology's potential.

At the heart of the "Information Age" is what Lewis Perelman of the Hudson Institute calls "Microcosm Technology," the power and capacity of technology (Perelman, December, 1990, p. 14ED):

- to create, store, maintain, transmit, transform, and navigate massive amounts of data and information at high speeds;
- to overcome barriers of time, distance, and language in communication and access to resources and services;
- to gain economies of scale by simulating real-world situations, scenarios, and hypotheses;
- to energize presentations and information by adding new dimensions, depth, clarity, and specificity;
- to spawn unique value-added dimensions in product and service delivery; and
- to extend the capabilities of the human mind by quantifying capacities and units of measures not possible otherwise.

Learning used to be a distinctly human process, undertaken by children in a classroom in preparation for adulthood. With knowledge doubling every year or so, very little in our daily lives remains untouched and unchanged by Information-Age technology. Medicine, retailing, lodging, finance, government, education, entertainment, travel, insurance, manufacturing, and banking have all spawned unique value-added dimensions and dependencies on technology. These value-added dimensions have revolutionized the traditional ways of planning, teaching, learning, research, decision making, and delivery of service.

It is important that faculty, staff, administrators, and students understand that the Information Age involves more than the convenience of a personal computer, facsimile, electronic mail, voice messaging or the "high-tech, gee-whiz gizmos" of MTV. A manifesto that makes for success must consider (Cross, November, 1989, p. 68):

- (1) The enterprise-wide network is the means for connectivity, technology pluralism, interoperability, system integration, and heterogeneous communications.
- (2) System integration and interoperability must transcend at least six different information processing technology categories: voice, data, text, graphics, image, and video.
- (3) Wireless technology will continue to emerge, challenging the best minds to maximize its flexibility while minimizing security risks and exposure.
- (4) At least eight levels of computing differentiation may be required to support an organization's information requirements – supercomputing, mainframe, departmental, desktop, portable, laptop, palmtop, and chip.
- (5) The need for standards and rules for multi-vendor inter-communications will be essential to bridge the old with the new.
- (6) Smart products will continue to proliferate with embedded "chip computing" and microprocessors for improved speed, reliability, performance, and serviceability.
- (7) Artificial intelligence, expert systems and telerobotics will continue to proliferate as value-added dimensions demanded by the user.
- (8) The emergence of a number of national and international networks for conferencing, data base access, sharing research, and distance learning will continue to proliferate.

We have moved from a society and economy in which technology was primarily an extension of the human mind, to one in which technology creates information. In the Information Age, people have a new relationship with the world in which they live. Comprehending the technology that makes this age possible is important. Comprehending the implications of past and future changes is critical.

The mental skills demanded by future jobs will far exceed those conveyed by even the best colleges and universities today. For professionals to be competitive in the 21st century, learning must be continuous and systematic. People must know how to learn; have access to "anything, anywhere, anytime" learning tools; and have the skills required to manage, navigate, and assimilate massive amounts of data, information, and knowledge driven by "microcosm technology."

Colleges and universities must provide access to a wide array of personalized tools, techniques, and services. The challenge is to implement technology in a realistic, sensible, and cost-effective manner, while creating an environment for achieving excellence—an environment which incorporates the highest quality and most innovative technology, while recognizing that people are our most critical resource. We need to

understand the role of technology in education not only in the student-centered, teacher-centered, and classroom-centered ways that we've grown accustomed to in the 20th century, but also from a "big picture" perspective.

We need to view education, Information-Age technologies, and the opportunities they offer in the context of 21st century America. Technology alone is not the answer. The answer lies in the partnership of technology with creative minds, to tackle what needs to be done, instead of doing "old work with new technology."

It is not possible to provide an education for the 21st century without technology. Teaching *about* the technology is the easy task. Assessing and ensuring that technology is applied wisely, effectively, and efficiently is far more difficult. Mastery of technical, professional, and administrative skills is not enough. Colleges and universities must make technology an integral part of the basic fabric and culture of their institutions. Planning, funding, and institutional mission decisions should support and encourage adoption of technology. At the same time, an ongoing assessment is required to determine the strengths and weaknesses of technology and ways it can best be used, with appropriate safeguards against unethical uses.

V. The University of the 21st Century

"The diffusion of knowledge among the people is the instrument by which we maintain our history, identity, economic security, and opportunity for growth and prosperity."

– Thomas Jefferson

While a great deal has been written about the Information Age and future technological trends, few attempts have been made to understand what kind of changes will occur in colleges and universities as a result of significant advances in computing and communications technology. Research only indicates that tomorrow's workers must be able to work with the most sophisticated technologies to perform tasks that in the past were either done manually or not at all.

The college or university of the 21st century must not be place bound; it must be global in every perspective and offer new ways of looking at ourselves, others, and the world. It must span time zones, languages, nations, cultures, and continents. It must be the catalyst for proposing and evaluating new perceptions and ideas about the world in which we live. Technology is rapidly evolving, allowing us to interact with a professional associate in Hong Kong, London, Toronto, Paris, Caracas, Tokyo, Sydney, or Madrid from a majestic mountain perch in the Rockies of Wyoming, as if they were across the table. Technology permits the delivery of a wide array of resources and learning situations, to enable virtually anyone to learn anything, anywhere, anytime. Interactive video and multimedia will animate the world's great museums; reveal the wonders of science and nature; allow students to demonstrate their grasp of the world; energize presentations by bringing new power, depth, vigor, and clarity; and revitalize teachers' professionalism and success.

If the 1980s demanded "just-in-time manufacturing" as a competitive strategy, then the 1990s will demand "just-in-time information and enterprise networks" for success. As the telecommunications industry continues to expand at impressive rates and surpass \$1.0 trillion in worldwide revenues, a wide range of forces are reshaping the marketplace and fueling growth (Gantz, January, 1990, p. 20). Some of the major forces impacting the industry are: chip miniaturization, reduced technology cost, government policy, deregulation, trade agreements, decentralization and flattening of organizational structures, adoption of standards, the Cold War thaw, globalization of business, mergers and acquisitions, and vendor stratification and alliances.

Successful institutions will face not only the challenge of keeping up with rapidly changing technology, but also of making sense of it. That means surpassing mere technical gatekeeping by engineering solutions to problems and opportunities in a way that will fundamentally change how institutions do business, how they relate to their vendors and customers, and how their customers relate to them and access their services. Creative application of Information-Age technology in the college and university of the 21st century means:

- defining the institutions' operating and planning environment;
- identifying key issues within industry;
- analyzing and positioning events, products, and services;
- understanding the relevance of technology to teaching, learning, and research;
- understanding the power, peril, and potential of current and emerging technologies;
- understanding key players and organizational strategies;
- gathering, evaluating, and disseminating intelligence;
- preparing and refining scenarios;
- forecasting and evaluating markets and opportunities;
- identifying risks, exposures, and paybacks;
- performing timely and ongoing analyses of events and trends;
- maintaining up-to-date procurement policies and procedures;
- planning for product obsolescence and retirement; and
- planning and engineering the migration to open systems architecture and standard system platforms.

The need for long-range vision and planning is nowhere so acute as in our colleges and universities. Buildings being planned and built today will be used until 2030 or beyond. Campus planners must envision the electronic opportunities that will be available in the coming decades and the changes in teaching, learning, and space requirements that will make institutions accessible to all. Flexibility will be critical.

Constructing the right physical facilities and infrastructures in the right locations is only part of the challenge. Faculty will also need to develop courses appropriate for electronic delivery. Students will not be well served if existing traditional courses are simply converted for electronic delivery. We know that courses transmitted electronically need not be bound by the traditional academic calendar, the normal workday, the standard "credit for contact" mode, location of the learner and teacher, and the reward systems of the traditional formal classroom.

Faculty, staff, and students must begin to see the world and the disciplines in which they specialize in different ways. Only when they re-think (1) the premises upon which teaching, learning, research, and decision making are based; (2) the environment in which they occur; (3) future personnel needs; (4) employment terms and conditions; and (5) reward systems, will it be possible to transform the curricula and the culture of the institution.

Major technology requirements and issues must also be addressed, such as:

- peer-to-peer communication;
- any-to-any communications;
- system adaptability and growth;
- heterogeneous and multi-vendor connectivity;

- collaborations and partnerships;
- support of national and international standards;
- development of navigation tools;
- copyright clearance;
- voice/data/image/video integration;
- interoperability;
- resource sharing;
- access security and authentication;
- electronic mail/fax/voice/video mail integration;
- reliability, availability and serviceability; and
- cost benefit analysis and justification.

These are not easy tasks, nor will they happen on their own. No one has difficulty comprehending the need to re-train workers in an assembly plant when it is automated; we must understand that faculty and administrators must also learn new skills as their workplaces are changed by Information-Age technology. Developing a sound strategy and plan is not easy, for there are no simple answers to the many issues that must be addressed to influence thinking, reduce risks, and maximize opportunities. In addition, there are no guarantees that the plans can be cost justified to boards of trustees, state legislatures, and voters. Developing sound and well thought-out responses to the many questions that will be raised is critical. We must answer: What is the cost benefit of technology versus people? Can an instructor handle more students if equipped with technology? What is the investment payback period? Will learning significantly improve?

VI. Implications for Telecommunications Administrators

"One thing is certain: The information revolution is changing our lives, and we need to prepare ourselves to cope with its promise and potential."

— U.S. Senator Albert Gore, Jr., Tennessee

Managing telecommunications will continue to be difficult. Those who take the lead will need a wide array of skills and capabilities, demonstrating that they are:

- visionary rather than myopic;
- leaders rather than just managers;
- proactive rather than reactive;
- change agents rather than service agents;
- mainstream rather than departments;
- solution-oriented rather than task-oriented; and
- global rather than departmental in focus and perspective.

In addition to understanding technology, telecommunications leaders must have management, finance, marketing, and policy making skills and experience in the college and university environment. They must understand organizational goals, objectives, priorities, and limitations. They must be leaders who will excel and understand the "I, You, We" elements of success (Cross, August, 1975, p. 49). Academic credentials will become more important for telecommunications professionals seeking higher-level positions. As various colleagues have surmised, they must be "high quality persons" who are comfortable as planners, consultants, strategists, and policy makers in the college and university environment.

Telecommunications professionals should understand that we have moved from a society and economy in which technology was primarily an extension of human muscle to one in which technology is used to create information, overcome barriers of time, speed, volume, and distance, and energize teaching and learning by adding new power, depth, vigor, clarity, and vitality. Learning in the Information Age is a "trans-human microcosm technology process,"

no longer confined to the classroom, spanning a person's entire life, and permeating every form of social activity – work, entertainment, and home life.

The successful 21st century telecommunications administrator will not only depend on technical abilities, but also on the ability to visualize and creatively exploit technology to increase the productivity of an institution's most expensive resource – its people. It is in the "peopleware" area of colleges and universities where the greatest potential for growth and productivity lies. The "Electronic Immigrant," "Telecommuter," "Electronic Jockey," "High-Tech Prof," and "Teleconsultant" will be major players in institution staffing and human resource planning. These new Information-Age workers will cut across department, institution, system, state, and international boundaries, overcoming time and distance barriers via technology, providing a variety of services and expertise at a fraction of the cost by today's standards.

In responding to these challenges and expectations, telecommunications administrators must develop the skills and staff that will allow them to prepare for the following:

- greater involvement and role in organizational strategic planning;
- broader responsibilities for all telecommunications activities and network services – voice, data, text, video, image, and graphics;
- the telecommunications function will gradually become a part of a larger information service function;
- the information service function will evolve to encompass the library, audio visual services, computing, telecommunications, mail services, printing, institutional research, and radio/TV facilities;
- active involvement in product planning and service delivery;

- greater involvement in curriculum issues and planning courses for electronic delivery;
- active role in planning and conducting administrator and faculty technology orientation programs;
- an integral and critical player in physical facilities and campus planning;
- active participant in community outreach and economic development endeavors;
- consultant to faculty in planning and re-engineering courses for electronic and non-structured delivery;

- consultant supporting major campus research projects and research facilities; and
- a greater number of telecommunications administrators will evolve with teaching experience, faculty status, and rank.

These are a few of the many possible changes in the role of the telecommunications administrator as colleges and universities respond to the challenges of the 21st century. As history has shown, an innovative organization changes the times; a creative organization changes with the times; and a static organization falls by the wayside as merely an interesting relic of the past.

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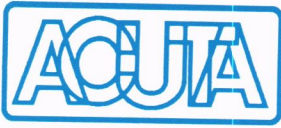
ACUTA MISSION

ACUTA is dedicated to enabling college and university telecommunications professionals to contribute to the achievement of their institution's mission through:

- development of leadership, management and technical capabilities;
- peer networking;
- exploration of key issues; and
- access to quality information.

ACUTA HISTORY

ACUTA was found in December, 1971, by a dedicated group of telecommunications administrators to foster education and the exchange ideas to solve problems and improve service of telecommunications applied to higher education. In 1988, ACUTA incorporated in the state of Kentucky and established permanent offices in Lexington. Its members represent both the large and small, public and private colleges, universities and community colleges in the United States and Canada. Also included in the association are corporated affiliates from the voice, data and video industries who supply telecommunications products and services. In this relationship, ACUTA remains neutral, but informed and cooperative.



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