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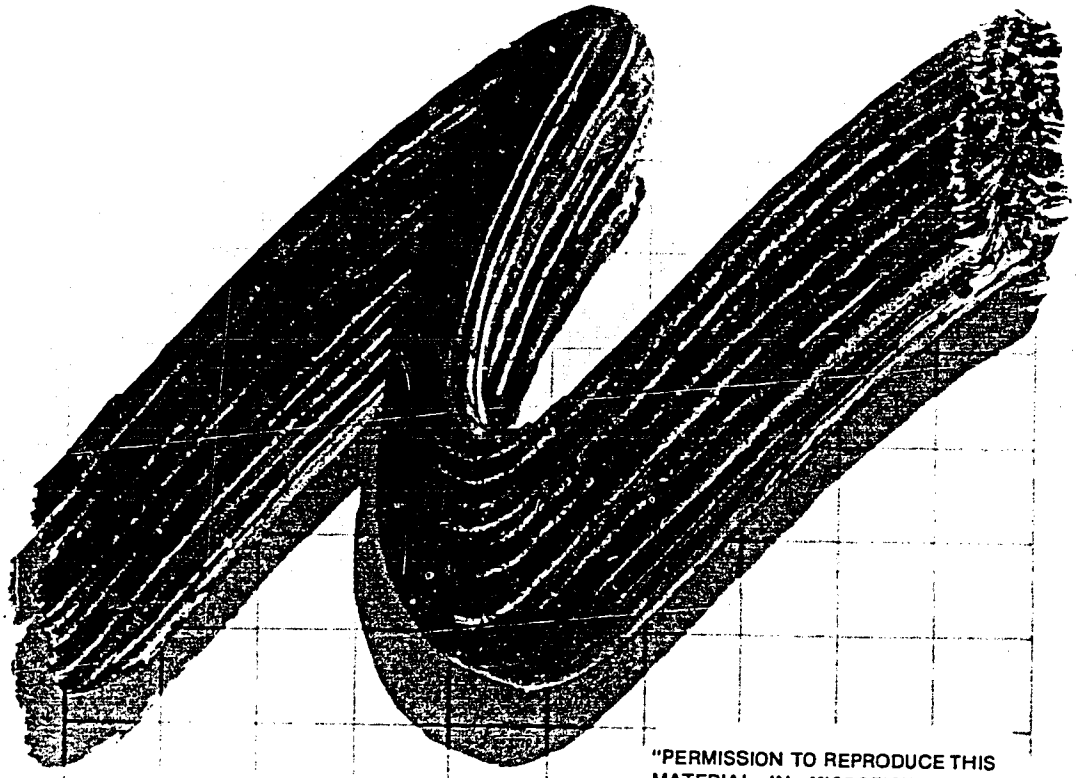
ABSTRACT

Ways that colleges are involved in economic development and how these roles develop at different colleges are discussed, along with the rationale and benefits for college involvement in economic development. Attention is directed to key programmatic, policy, organizational, and strategic issues that need to be addressed with increased college participation. In addition to a literature review, information sources included: a mail survey of almost 300 public colleges and universities; telephone interviews with researchers, public officials, association representatives, and college and university leaders; and site visits to seven public universities. For seven economic objectives, college roles in economic development are identified, as are the colleges which serve as examples, possible economic benefits for each objective/role, possible institutional benefits, and some potential concerns. College roles in economic development are described for specific institutions of the following types: regional, urban, historically black, technological, and flagship campuses at state university systems. Also considered are 10 prerequisites for success for college involvement in economic development. A 7-page bibliography, and addresses and phone numbers of national resource organizations and colleges cited in the text are included. (SW)

SRI International

The Higher Education–Economic Development Connection:

Emerging Roles for Public Colleges and Universities in a Changing Economy



American Association of State Colleges and Universities

The Higher Education–Economic Development Connection

Emerging Roles for Public Colleges and Universities in a Changing Economy

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Preface

This book discusses the increasingly important role America's public, four-year colleges and universities are playing in the economic development of the nation's cities, states, and regions.

The report was developed by the Public Policy Center of SRI International (formerly Stanford Research Institute) under contract to the American Association of State Colleges and Universities (AASCU). It was funded under a cooperative agreement with the Economic Development Administration (EDA), U.S. Department of Commerce, and is based on research conducted during the fall of 1985 including a literature review and site visits to seven institutions.

Tom Chmura of SRI is the report's principal author. Steve Waldhorn, director of SRI's Public Policy Center, supervised its development. Jim Gollub, Doug Henton, Robert Kelley, Ted Lyman, John Melville, and Hal Scogin also contributed. Shirley Hentzell edited the draft, Edith Duncan did the typing, and Suzanne Andrick handled production at SRI, and Joanne Erickson of AASCU edited and coordinated publication of the book.

Helen Roberts of AASCU has directed the overall project on higher education and economic development. Beverly Milkman, Margaret Wireman, and Scott Rutherford have been the key supporters of this effort at EDA. Harold Williams represented the National Association of Management and Technical Assistance Centers (NAMTAC) in the project.

Executive Summary

America's four-year, public colleges and universities face a key juncture in their history. Increasingly in today's economy they encounter pressure to play a more active role in the economic development of the nation's cities, states, and regions. Their knowledge-based resources now constitute an essential element in the new economic infrastructure the nation needs to compete in a highly competitive, technologically advanced, and rapidly changing global economy.

Higher education institutions can meet the new demands imposed by government and industry in ways that enhance their traditional missions. Developing new roles that contribute to economic development can enable these institutions to develop new alliances with industry and government, expand their resource base, enhance their ability to attract and educate students, develop stimulating and useful research opportunities, and fulfill public-service obligations.

Higher education institutions need not see the demands to play a more active role in economic development as a threat. Colleges and universities that are proactive and strategic in developing new roles consistent with the purposes of higher education can strengthen their position in and relevance to society.

Public colleges and universities have a wide array of resources and can play a variety of roles that can contribute to economic development. Key roles include economic research and analysis, capacity building for economic development, development of human resources, technical assistance to business, transfer of technology to industry, basic and applied research on new products and production processes, and stimulation of entrepreneurship and new business development.

Different roles suit different kinds of colleges and universities. Institutions need not be as well endowed as the University of Texas or as technically advanced as MIT to participate in rewarding ways. A regional college or university, for example, can offer valuable service in supporting community development, and the flagship university of a state can develop a center of excellence that fosters the renewal of primary state industries.

Many factors influence an institution's involvement in economic development and the specific roles it develops. Some factors are internal to the institution, others external. The most important factor of all appears to be dynamic, entrepreneurial leadership. Other key factors include institutional capacity, strong relations with the public and private sectors, a supportive campus culture, the availability of special resources, supportive administrative policies, and special organizational arrangements. Conversely, the lack of funds and of faculty interest can be key barriers.

It is crucial that public colleges and universities build capacities and programs appropriate to their own missions and capabilities, rather than waiting until external forces (funding cuts, demands by the legislature, decisions of prospective students to go elsewhere) impose roles that may be inappropriate and undesirable. Building the kind of culture and infrastructure that will make institutional knowledge resources useful to economic development efforts is a major challenge facing public colleges and universities today.

Many institutions successfully meet this challenge in ways that enhance their image, resource base, and program quality. Consider the following examples:

- Building on a long history of linkages with industry, Georgia Institute of Technology has increased its emphasis on high-technology industry and expanded its research capabilities, transforming itself from a reputable engineering school to one of the top research institutions in the country.
- The University of Alabama at Tuscaloosa played a critical role in preventing a GM plant from closing by using faculty members and students to help identify cost-saving productivity improvements. This effort provided a unique "laboratory" for the campus community and led to several other collaborations with industry.
- George Mason University (VA) reinvigorated itself by developing an important niche in regional service. Strengthening programs in high technology, public policy, and fine arts helped it serve the region better and increase financial and popular support.
- Michigan State University created a new biotechnology institute to help existing industry in the state and stimulate new biotechnological enterprises. The institute has provided the university with a major center of excellence and significant new research opportunities.
- Eastern Oregon State College, a school threatened with closure in the early 1970s, has developed a stronger mission and program to serve the educational and economic needs of a rural Oregon region. Through these efforts, it has gained higher credibility, secured new resources, and increased its overall enrollment.

Taking full advantage of opportunities made possible by involvement in economic development requires that colleges and universities become more strategic, entrepreneurial, and externally oriented. As Clark Kerr has noted, "Great universities will be those which have adjusted rapidly and effectively to important new possibilities."

Certainly, there are potential dangers for colleges and universities seeking to become more active in economic development. Unrealistic expectations arise. Without careful planning, conflicts of interest may develop. Teaching roles could weaken. University priorities could become distorted. And academic freedoms could be threatened.

With experience, however, higher education institutions can learn to develop policies, procedures, and relationships that protect their basic interests. Thus, the biggest danger for institutions in the future may be that of missed opportunities—a failure to secure new benefits, to strengthen themselves institutionally, and to enhance their capacity to serve society.

The current public interest in colleges and university involvement in economic development is no passing fad, but rather represents a fundamental shift in society's view of higher education. Unless public colleges and universities develop appropriate and effective roles in economic development, many will find that state, community, and industry leaders will either begin to impose restrictions or turn to other institutions for their knowledge-related needs.

Introduction

Our nation's universities and schools have a vital role to play in revitalizing America's competitiveness. . . Without strong educational institutions, the United States will not be able to capitalize on our key potential strengths in technology and human resources.

The President's Commission on Industrial Competitiveness

Economic development projects involving colleges, universities, industry and government are springing up across the country. New economic realities—such as global competition, changing markets, and fast-moving technology—are casting a new light on colleges and universities. They are now needed in new ways and are being asked to perform new roles.

Almost all (98 percent) of public institutions responding to a survey conducted in 1985 by the AASCU Task Force on Economic Development indicated that they perceived new demands to play a more active role in economic development. Governors and legislators, often enamored with visions of Silicon Valley, want colleges and universities in their states to spawn new industries and create new jobs. Industries, both mature and new, are looking to higher education institutions for the new commercial ideas and technical talent that can give them a competitive edge. Various community groups want new education and retraining programs at local colleges. Economic development organizations seek better economic information and advice on development strategies from university experts. The institutions themselves, many faced with tight budgets and declining enrollments, see economic development as a means to increase funding, create new programs, and enhance prestige in the state.

Many campuses are responding to these pressures. Of the 300 public institutions responding to the survey, 97 percent had plans to increase their efforts in economic development. New relationships are being forged with government and industry. New degree programs are being instituted to meet industry's needs. Centers of excellence are being established in areas considered critical to a state's economy. Joint research programs are being initiated. Schools of engineering and science are expanding. Technology transfer programs and small business incubators are proliferating. New economic research institutes are emerging. And much more is going on, all in the name of economic development.

At times, these developments seem faddish. Not all have been well planned. Some have been naively copied from those at other institutions. Few have yet been carefully evaluated. In many cases, promises may exceed capabilities; in others, desired results may take many more years than expected.

Purpose of This Report

America's public colleges and universities find themselves today in a challenging new environment. This report examines how they are responding and reviews the increasingly important roles they are playing in economic development.

This report is intended to provide an introduction and general overview for college and university leaders. It will

- highlight the rationale and benefits for college and university involvement in

economic development

- provide general information on the current state of the art of college and university involvement in economic development, examining the full range of roles that institutions can play and how those roles develop at different institutions
- identify key programmatic, policy, organizational, and strategic issues that need to be addressed as institutions participate more actively in this field.

The report was prepared for a national conference sponsored by the American Association of State Colleges and Universities (AASCU) and the National Association of Management and Technical Assistance Centers (NAMTAC), held in Atlanta in April 1986, and for general distribution to colleges and universities and other interested parties after the conference.

Perspective

The report presents a broad view of both the process of economic development and the range of roles colleges and universities can play in that process. It demonstrates that involvement in economic development can—if appropriately designed—help colleges and universities carry out their missions.

Economic development means different things to different people. To some it means helping a failing industry become more competitive. To others it may be recruiting a firm to expand local employment and strengthen the tax base. It can mean developing the capacity of a neighborhood group to generate new enterprises. Increasingly, it connotes high-technology development, or promoting small businesses and entrepreneurial start-ups, or commercializing new technologies. *Broadly, economic development is a process of innovation that increases the capacity of individuals and organizations to produce goods and services and thereby create wealth.* This, in turn, can lead to jobs, income, and a tax base for communities, states, and regions.

The ideal college and university involvement in economic development is the strategic use of knowledge-based resources to assist in the development of a local, regional, or state economy. Such institutions have resources that can enhance the capacity to produce goods and services and thereby create wealth, jobs, income, and taxes. Appropriate roles can be based on teaching, research, or public service—however an institution can best contribute.

The key, however, is for colleges and universities to use their resources strategically to aid the economic development of their service area—their community, region, or state. Thus, a university-affiliated technical assistance center located off campus, using independent consultants, and having no ties to faculty members, laboratories, or campus facilities is not a strong example of university involvement in economic development, whatever the merits of its technical assistance program. Similarly, when university research produces a new technology that is commercialized by industry abroad, such activity hardly contributes to local, regional, or state economic development, as worthwhile as the research may be.

Finally, the new recognition of the college or university as an economic asset offers a unique opportunity for institutions to strengthen themselves and enhance their ability to contribute to their communities and regions. Involvement in economic

development need not be simply a reaction to outside pressures. It can be "enlightened self-interest." If done well, it can help colleges and universities enhance program quality, maintain or increase enrollment, and secure needed new resources. If colleges and universities do not respond appropriately, then other institutions, such as corporate universities or private research institutes, will be asked to take on the knowledge-based roles required in the new economy.

Thus, the overriding challenge is for a wide variety of colleges and universities to find appropriate roles in economic development that both support their institutional interests and are effective in addressing new economic needs.

To help meet this challenge, the report focuses on several key questions:

- What pressures are acting on public colleges and universities? What are the new imperatives for their involvement in economic development?
- What are the costs and benefits of involvement in economic development? How can such activity support an institution's teaching, research, and service missions?
- What is the range of roles colleges and universities can develop in response to these new imperatives?
- How do different kinds of institutions develop their roles in economic development?
- What factors determine how effective colleges and universities will be in economic development, and how can those factors be shaped?
- How can higher education institutions develop effective strategies to guide their involvement in economic development?
- What are the future prospects for their involvement in economic development?

Methodology

The report was prepared by the staff of the Public Policy Center of SRI International during late 1985 and early 1986. After extensive review by an AASCU advisory committee of academic, industry, and governmental representatives, it was finalized in March 1986 and released for the conference in April 1986.

Four primary sources of information were used in developing the report:

- a review of the literature in economic development and higher education (see bibliography)
- a mail survey, conducted by AASCU's Task Force on Economic Development, of over 450 public higher education institutions (Almost 300 colleges and universities responded.)
- telephone interviews with other researchers, public officials, association representatives, and college and university leaders around the country
- site visits to seven different public universities: Cleveland State University, George Mason University, Georgia Institute of Technology, Jackson State University, Pennsylvania State University, San Jose State University, and University of Texas at San Antonio.

As previously indicated, this report is not intended to be exhaustive. It is an overview pulling together a wide variety of useful information and examples, particularly from institutions that have not received much coverage in the literature. Even though little evaluative information exists on how well different institutional programs have

worked, the report identifies several critical issues and suggests a strategic process by which institutions can address those issues. To expand and address these issues, AASCU has commissioned a separate series of papers on such topics as strategic planning, intellectual property rights, and faculty reward structures for consulting and public-service work. These papers will be published by AASCU in a companion volume to this report, entitled *Issues in Higher Education and Economic Development.*

It is hoped that this report will provide those concerned about higher education with practical information, useful frameworks, stimulating examples, and thought-provoking questions to encourage the development of new and more effective institutional roles in economic development.

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Every state higher education institution has many "publics," and economic development is only one of its potential purposes. But today, a wide variety of forces affecting colleges and universities call for a stronger role in economic development and adding new dimensions to institutional responsibilities.

Externally, governmental, political, fiscal, demographic—and economic—pressures all affect colleges and universities. Internally, colleges and universities face challenges to improve their research, education, and public-service missions, as well as to maintain their positions in the states.

External Forces

Throughout history, most of the major changes within universities have arisen from external forces—such as the Morrill Act of 1862, which created the land-grant institutions and emphasized their service role; federally sponsored university research beginning in World War II, which strengthened their research role; and the postwar baby boom, which, together with federal student aid, greatly expanded college enrollments.

Today, colleges and universities are beset by other external forces. National study commissions question their quality and effectiveness. Enrollments in many areas decline because of demographic shifts. Institutions face fiscal pressures because of resource constraints and may face even more with the Gramm-Rudman-Hollings legislation.

The external trends and pressures acting on colleges and universities and encouraging their involvement in economic development include the following:

- Industry needs
  Skilled work force/recruitment pool; increased productivity; strong research base; new commercial products; available technical assistance; available consulting expertise; access to cutting-edge technology; access to competent faculty members; access to top-quality facilities
- State government needs
  Jobs for residents; competitive industry; generation of new firms; attraction of new firms; increased tax base; data/analytical support
- Local community needs
  Data and policy analysis; good town and gown relations; jobs for residents; local economic development; neighborhood development
- Societal pressures
  Declining birth rate; criticism of higher education; waning public support; limited public dollars; new federal budget cuts.

New Economic Challenges

The traditional industrial economy that served this country so well for decades is being replaced by a new, knowledge-based economy, just as surely as the industrial economy replaced the agrarian economy at the turn of the century. The era of low interest rates, limited foreign competition, slow-moving technology, stable markets, and mass production processes that allowed some key industries to operate in a

sheltered environment has disappeared, to be replaced by one of high costs, extensive international competition, rapidly changing markets, and rapid technological change.

Most growth and job creation in this new economy occurs in sectors such as advanced manufacturing, information, services, and high technology, and in new, small, and medium-sized firms. But this is not the only change taking place. In the new economy, the competitiveness of all industries—manufacturing, service, trade—increasingly depends on new styles of management, effective use of technology, and a skilled, adaptable work force. Traditional industries often keep their competitive edge today by shifting to smaller operations, specializing in certain products, using new technologies, implementing new production methods, and making more effective use of human resources.

Marc Tucker, executive director of the Carnegie Forum on Education and The Economy, has written that as the economic shifts intensify, "The United States will find itself in a position in which it must always be on the leading edge, creating new markets, inventing new materials and energy sources, designing new products, coming up with new manufacturing processes, creating new services—constantly inventing, designing, creating."[1]

These economic shifts have critical implications for colleges and universities. A faster-changing technology demands stronger, more specialized, more responsive research from universities. Implementing the technology developed in college laboratories requires improved efforts in technology transfer and commercialization. Current technological developments require less from the traditional disciplines and more from interdisciplinary efforts.

The globalization of the economy creates a need for improved knowledge of the cultures, markets, and languages of competing nations—in turn creating new roles for schools of diplomacy, international studies, and languages. A more competitive business climate requires that firms have more access to technical and managerial expertise. The increased importance of human resources necessitates strengthening of the education system at all levels and increasing its responsiveness to lifelong learning needs. Individuals will require the ability to learn new skills quickly and to adapt to several career changes. Finally, the growing importance of new and small business in the economy calls for a more supportive environment for entrepreneurs.

Table 1 reviews this economic transition and suggests some of the implications for colleges and universities.

New Economic Infrastructure Needed

In this new environment, efforts to promote industrial competitiveness and economic development necessarily take on new forms. The traditional practice of attracting manufacturing plants by promoting the advantages of low-cost labor, cheap land, and public subsidies (through tax breaks or industrial development financing) no longer works as well as it once did. Simple boosterism and tax cutting are neither as effective nor as rewarding as approaches that stress new enterprise development, the transformation of mature industries, and the development of appropriate high-technology industries. Rather than attempting to "steal" industries from other regions,

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revitalization efforts today attempt to promote a "home-grown" economy by providing an environment that supports local entrepreneurs, assists existing industry, and encourages high-growth sectors.

Supporting such efforts requires a new economic infrastructure or support system. An area's comparative advantage can be built by ensuring the availability of such key resources as

- accessible technology
- a skilled and flexible work force
- entrepreneurial management
- availability of risk capital.

These factors—more than just location, physical resources, or low wages—can provide a competitive advantage for economic development in today's economy.

The Potential for Strategic New Alliances to Promote Economic Competitiveness

Clearly, the higher education institution is a major contributor to the development of technology, human resources, and management—three of the four components of the new economic infrastructure. Accordingly, industry, state government, and communities increasingly press public colleges and universities to become more involved in economic development. Colleges and universities have the capacity to help industry, states, communities, and others meet contemporary economic development needs and the potential to forge strategic new alliances on all sides.

Industries—not just high tech, but traditional manufacturing, trade, and service industries that must compete in global markets—seek well-trained managers, a more highly skilled work force, and opportunities for renewing and expanding worker skills. They also seek a strong research base from which they can develop new products and services for the market place, and access to highly qualified expertise and cutting-edge laboratories. They need the universities, in particular, to have the faculty and facilities that will keep their research at the cutting edge. Industry needs are not purely technical; companies need people who can think critically, communicate well, and operate effectively in a global economy. When industries examine their overall needs in today's economy, they begin to recognize the importance of colleges and universities to their economic competitiveness.

State and local governments are increasingly interested in economic development, encouraging more jobs for their residents, helping existing industry become more competitive, and encouraging new business development, either by supporting new start-ups, expanding existing industry, or attracting new firms. In this context, they see colleges and universities in economic terms.

Other groups have economic development interests as well. Economic development organizations need to better understand the state or community's economic condition, how it is changing, and how to go about improving it. Labor unions seek retraining opportunities for their members. Community-based organizations want to increase their capacity to participate in economic development. All of these organizations can benefit from new links to colleges and universities.

Table 1

Implications for Colleges and Universities of the Changing U.S. Economy

Traditional Economy	New Economy	Implications for Universities
Slow-moving technology	Rapid technical change	Increased research, Technology transfer
Distinct technical fields	Merging technical fields	Interdisciplinary programs or centers
Little foreign competition	Strong foreign competition	Knowledge of new competition
Focus on domestic markets	Focus on global markets	Knowledge of new cultures, languages
Mass-produced products for mass markets	Complex products for sophisticated consumers	Technical aid for business
Growth in volume of products sold	Growth in value added to products sold	New products and more flexible processes
Human resources as a factor of production	Human resources as a competitive edge	Stronger educational system
Slow-changing skill requirements	Rapidly changing skill requirements	Lifelong learning, extension programs
Employment growth in Fortune 500	Employment growth in new/small firms	Support for entrepreneurship
Economic growth through smokestack chasing	Growth through new business development	Commercialization of new technologies

Colleges and universities can assist each of these sectors in meeting their needs and can, if they choose, develop new relationships—new strategic alliances—with such groups in ways that benefit both parties and the overall economy. It is not that colleges and universities have never played the roles being discussed or interacted with these groups. What is new is the need for all sides to work more closely together if they are to achieve their individual objectives. The human capital and technology needed by industries, states, and communities to compete in today's economy heavily depends on the programs and resources of colleges and universities. Effective alliances among industry, government, and higher education institutions can give the nation a unique competitive advantage in the global economy.

The Internal Forces

In addition to these external factors, internal conditions are also encouraging colleges and universities to increase their involvement in economic development.

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Particularly in light of recent criticisms about the quality of education provided by American colleges and universities and the declining enrollment caused by demographic shifts, the leaders of these institutions are seeking ways to enhance educational programs, keep them current, and make them attractive to a broader array of students (which increasingly means students outside the traditional 18-24 age group).

Similarly, federal cutbacks in many research programs and the desire of many institutions to expand their research capacities prompt many universities to seek new ways to attract research support, maintain quality staff and facilities, and develop new areas of excellence (which today means soliciting industry and state government support).

Also, at the community and state level, colleges and universities need to carry out their public-service mission in ways that promote positive external relations and improve the institutional image (which, more and more, means involvement in economic development).

Financially, many colleges and universities now face serious problems that could worsen as the effects of federal deficit-cutting measures take hold. Thus, institutions must seek new ways to enhance their revenue base. Economic development can be a means to new income.

Finally, many public colleges and universities have broad political needs to enhance their public image, develop allies and supporters, and generate new resources and new support for their missions. Again, public institutions are finding that, increasingly, this can best be done within the framework of economic development.

Internal forces and needs that encourage universities to become more involved in economic development include the following:

- Research needs
  resources for staff, equipment; attract/keep top-level researchers; maintain staff morale/income; new topics for research; special areas of excellence; capacity to do cutting-edge work; long-term funding; professional stimulation
- Education needs
  attract students; exciting new programs; cutting-edge curricula; attract/keep faculty members; real problems for study; support graduate students; jobs for graduates; relevant education
- Public-service needs
  image as contributor to community/state; overcome town/gown tensions; positive community relations; positive industry relations
- Political needs
  positive image; political allies; support for resources; support for missions; good system relations.

New Opportunity for Colleges and Universities

Broad economic forces and internal institutional needs are converging in ways that call for a much stronger institutional role in economic development. Moreover, the "new imperative" also offers a "window of opportunity" for colleges and universities to respond in proactive ways that strengthen their institutions and enhance their ability to serve the public interest.

Not every institution of higher education will want to play this new role, but public colleges and universities will undoubtedly be prodded to do so. They have a unique set of resources and depend on heavy public financial support and, therefore, have a stronger obligation than that of private institutions to contribute to economic and social problem solving.

In the survey conducted by AASCU, 47.7 percent of public, four-year higher education institutions responding reported playing a significant role in the economic development of their service area, and 46.2 percent said they engaged in occasional activity relating to economic development. Only 23.4 percent had undertaken a formal examination of their role in economic development.

Dangers and Opportunities

Like any major shift, newly developing college and university roles in economic development will present institutions with new dangers as well as new opportunities.

Some universities may add new functions that are inappropriate for them because of careless initiation of models from different institutions (witness the empty research parks and incubators around some campuses). Others may develop roles that conflict with their missions. Increased involvement off campus may impair the institution's teaching role. Community activities can weaken the university's position as an objective observer and social critic. Some faculty members may be enticed to leave and join industry. Increased levels of industry sponsorship of research could, if not handled correctly, distort institutional priorities and threaten academic freedom. Even state sponsorship of research in particular areas of economic importance to the state may conflict with faculty research interests and lead to the politicization of research awards. Increased funding in technical areas may lead to decreased support in more traditional fields.

Another particularly serious danger is unrealistic expectations. Colleges and universities may be unrealistic about what they can accomplish. Similarly, communities and industry may be unrealistic in what they expect. And all parties may underestimate how long it will take for the benefits to manifest themselves. (E.g., it took two decades before Research Triangle became "successful.")

On the other hand, many specific benefits can accrue from effective and appropriate involvement in economic development. These can contribute to the institution's teaching, research, and public-service missions.

In teaching, closer ties with the community and with industry can provide students with real-life problems to study. Industry assistance and consulting activities can generate case materials for businesss school classes. New relations with industry can offer new dimensions to liberal arts programs, particularly in communications, sociology, psychology, languages, and international studies. Industry representatives can be recruited to teach and may offer students access to specialized equipment.

Close ties with industry can result in new scholarship programs for students, internship and co-op opportunities, and improved employment prospects. Industry and community leaders can become important allies to the university in developing new educational programs and in securing state approval and resources for them. And finally, closer ties with industry and development of more responsive curricula can attract new, older adult students, an important objective in this time of declining enrollments.

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In research, industry can greatly assist in identifying new research needs an topics. Industry itself can provide important financial support and assist a universit in securing additional state or federal government research funds. Industry migh also provide a university with new equipment or facilities or make its own equip ment and facilities available to university researchers. Joint efforts with industry ca enable a university to attract faculty members interested in exploring new researcl topics.

Finally, involvement in economic development can offer a college or universit an excellent way to increase its public-service role. Providing service can mean workin with local governments, community organizations, small business, economic develop ment organizations, and local industry. In this way, education, training, analysis research, and technical assistance activities of the college or university can produc direct and indirect benefits. Direct benefits include higher enrollment or funding indirect benefits include a stronger tax base (less constraint on appropriations) an less distance between town and gown.

In sum, effective and appropriate involvement in economic development ca help make any higher education institution more dynamic, vital, and responsive In light of the new economic realities and society's demands for making more effec tive use of knowledge-based resources, the greatest danger facing public colleges an universities is not the possibility of a mistake, but the risk of inaction. Inaction mean missed opportunities for an institution—a failure to secure the benefits, to strengthe itself institutionally, and to enhance its capacity to serve the public interest.

Taking advantage of new opportunities requires action by colleges and unive sities. What will they do? How will they do it? Chapter 2 addresses the "what"—th range of roles. Chapter 3 addresses the "how"—the way different institutions develo different roles.

Note

[1]Marc Tucker, "State Economic Development and Education: A Framework for Policy Development," paper prepared for the National Conference of Lieutenant Governors, Task Force on Education and Economic Development, June 1985, p. 11.

2

While needs grow and pressures intensify for colleges and universities of all kin to become more active in economic development, these trends vary according locale and hence require varying responses. As a result, colleges and universit assume a variety of roles. Seven broad categories describe the spectrum of new univ sity roles in economic development:

- Human resource development—tailoring education programs to meet the eme ing human resource requirements of the new economy
- Economic and policy analysis and research—providing objective information a new knowledge to public and private decision makers about an area's econor
- Capacity building for economic development—assisting a wide variety of co munity organizations in developing the capacity to participate more effectively economic development
- Technical assistance to apply existing knowledge to industry—helping firms lea about and adopt effective management and engineering concepts
- Research to develop new knowledge—conducting basic and applied work to p duce new knowledge that can result in new products and services or improv forms of production
- Technology transfer of newly developed knowledge to industry—purposefully he ing firms to take advantage of state-of-the-art technology developed within t university
- Support for the development of new knowledge-based businesses—having t university take a direct role in promoting new enterprises that utilize knowled developed within the university.

Some institutions develop the full range of roles while others focus on one two. The choice will reflect their interest as well as their capacity.

Table 2 provides a framework for understanding the range of roles available colleges and universities. It summarizes examples of what colleges and universit can do in each of the seven action areas. It also highlights the economic and insti tional benefits associated with each action area, as well as potential concerns. T institutional examples listed in the table are described below.

Targeted Human Resource Development

Perhaps the key role colleges and universities are undertaking is human resou development, particularly in fields relating closely to new industrial needs. Hum resource development is a traditional role higher education institutions have lo played. However, economic changes have created new challenges for colleges a universities. New fields develop (e.g., biotechnology) requiring new skills. Shortag in other areas (e.g., electrical engineering) hurt some industries. Technologi developments affecting established industries also create new demands for labor. (E. the auto industry now needs more electrical and fewer mechanical enginee Employers want more effective managers and workers who have critical thinki and communication skills. Also called for are new styles of labor-manageme relations.

Underpinning all these changes is the recognition that individuals need to rece frequent retraining in the current environment of rapid technological and inforn

Table 2

The Spectrum of College and University Roles in Economic Development

Economic Objective	College and University Roles	Examples	Possible Economic Benefits	Possible Institutional Benefit	Some Potential Concerns
Human resources development	New education programs Continuing education Professional development Extension programs	Arizona State Center for Eng. Excellence George Mason Institute of Science & Tech	Skilled workers Means of updating skills Lifelong learning	New students New programs Revitalized curricula Increased responsiveness	Misreading labor market Vocational orientation Inflexible programs Need to cut some programs
Economic research and analysis	Economic data gathering Economic base analysis Industry analysis Strategy development	Cleveland State College of Urban Affairs Eastern Oregon State Regional Services Inst	Better information Improved decisions Effective strategies	Public-service mission Community image Student opportunities	Needs not well understood Government/academia conflicts Involvement in local politics Work seen as too academic
Capacity building	Training Technical assistance Building partnerships	Univ. of Colorado–Denver P/P Center Western Carolina WNCT Tri-State Conference	New local capacity New partnerships	Public-service activity Community support Taps faculty skills	Lack of ties to community groups Needs not well understood Involvement in local politics Work seen as too academic
Technical assistance	Small bus dev. centers Productivity centers Industrial extension Faculty consulting	Georgia Tech Industrial Extension Service University of Alabama/GM UT–San Antonio CED	Aid to new and small business Knowledge of mgt. and and eng. tools	New business support Research opportunities Consulting opportunities Student experiences	Drain on faculty time Not seen as prestigious Faculty resistance Lack of special resources
Research	Centers of excellence Research consortia Cooperative research Industrial affiliates	University of Akron EPIC University of Cal MICRO Michigan State Biotech Center	Technical edge New production processes New products and services	National visibility New research revenues Understanding of needs Access to labs, equipt.	Politicization of research Conflicts of interest Threats to academic freedom Economic pay-offs are long-term Undergrad education may be hurt
Technology transfer	Tech. transfer program Shared equipt/facilities Faculty consulting Sabbaticals	Ben Franklin Partnership Washington Research Foundation Michigan Industrial Technology Institute	Access to technology	New revenues (royalties) Feedback to classroom Student learning Taps technology base	Lack of industry linkages Faculty resistance Competition with pivate firms Lack of organizational vehicle Academic/industry conflicts
New business development	Incubators Research park Financing program Entrepreneurship	Utah Innovation Center Texas A&M INVENT Ohio University	New start-up firms New Jobs Increased tax base	New revenues (equity) Faculty income Improved industry ties	Lack of strong research base Requires supportive services Restrictive regulations Detracting from teaching roles Replicating inappropriate models

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tional change. (E.g., the half-life of an engineer's knowledge is now thought to be 3-5 years.) This implies the need for closer university-industry communication and collaboration in continuing education, professional development, and lifelong learning.

All colleges and universities regularly review and revise their curricula. The difference today is the rapid rate of change in the various fields and the increased need for industry interaction to enable institutions to keep abreast of those changes and synchronize offerings with the changing labor market. Responsiveness in today's economy will call for the development of new disciplines or the adaptation of established disciplines to meet changing conditions and needs. It will also demand more creativity and flexibility in offering courses and degrees (e.g., off-campus classes, part-time study, classes using new technology, expanded continuing education). The common thread is institutional response to changing human resource needs that must be met for an industry to remain competitive and area residents to secure good jobs.

Developing a New Educational Capacity for a High-Tech Economy

Arizona State University (ASU) considers targeted human resource development to be critical to local industry. Over the past ten years, Arizona has become home to a number of high-technology firms. The new Arizona economy needs new kinds of workers with different levels of technical skills, a challenge that local universities like ASU had not previously met.

Concern developed as some high-technology firms began leaving the state in search of adequately skilled labor. In 1978, C. Roland Haden, the newly appointed dean of the Arizona State College of Engineering and Applied Sciences, undertook a strategic assessment of the university's position as a resource to Arizona and Arizona industry. He found that industry was not getting an adequate supply of workers in several skill areas. He also found that ASU had potential to develop new programs and thus help industrial development. Through its assessment process, the school discovered a high level of corporate interest in helping ASU realize this potential.

As a result, Haden convened a public-private Advisory Council for Engineering. The council assembled a detailed five-year plan for creating an ASU "Center of Engineering Excellence" to address human resource development needs. The governor and legislature accepted the plan. Funding comes from state government, federal sources, and the private sector.

In establishing the center, ASU had to overcome three obstacles: opposition from other universities in the state, concern from faculty members outside the engineering departments that funds would be diverted from their programs, and a worry that a new emphasis on graduate education would weaken the university's commitment to undergraduate teaching. Fortunately, the other universities and the nonengineering departments were able to secure additional resources and did not suffer from the ASU engineering initiative. In addition, the new engineering center has increased graduate and undergraduate enrollment at almost the same rate. The keys to ASU's success were industry's willingness to identify its needs, a receptive climate in the state legislature and the governor's office for expanding the ASU role in economic development, and the development of a well-defined plan of action.

Continued success hinges on the documentation of ongoing benefits to industry

(to maintain original and attract new support) and to ASU (to defuse opposition and recruit additional institutional allies). Success will also depend on the ability to make midcourse corrections as the needs of industry change. ASU is currently implementing Phase II (1985-1990), which entails adding a new specialization in telecommunications and enlisting the expertise of other departments (especially the business and humanities schools) in economic development activities (e.g., enlisting the sociology department to analyze the effects of specific technologies on the work force). This close attention to recruiting allies and addressing concerns has proven critical to ASU's success in targeting human resource development.

Redirecting Institutional Programs to Meet Changing Regional Needs

A similar example of targeted human resource development can be found at *George Mason University* in Virginia. Like ASU, this institution began a reassessment of its relationship to industry in 1978. The reassessment coincided with the appointment of George Johnson as university president. The effort involved a series of intensive discussions about how the university could best serve the interest of its region. The result was the identification of three priority areas: high technology, public policy, and performing arts.

As part of the assessment, university officials reviewed all current programs and found many to be unfocused and too costly. Ultimately, they eliminated eleven academic programs and adopted a strategic plan for sharpening the university's competence in its three priority areas.

The cornerstone of the strategic plan is the effort to address the human resource needs of high-technology industry. The George Mason Institute of Science and Technology (GMI) was established in 1981. The institute initially began as an internal committee of faculty members and administrators concerned about university-business relations but soon was expanded to include an industry advisory board of eighteen corporate executives. This group helped design new programs that would provide local industry with high-quality graduates in both technical and nontechnical areas and offer access to graduate education for current employees.

Because of the private-sector involvement, George Mason was able to create a new School of Information Technology and Engineering. Corporate leaders provided $3 million for endowed professorships and fellowships, donated equipment, and lobbied the state legislature for further support. The legislature responded by funding fifty new faculty positions at a time when state government employment had been frozen. The state also made $12.5 million available for a new engineering/science building. According to current estimates, the school expects to have ninety full-time faculty members and an enrollment of about 2,500 by 1990.

Overall, George Mason illustrates how a university can tap into the influence and financial resources of local industry to create a whole new capacity that not only serves the regional economy but also benefits the faculty and the institution itself. Its no-holds-barred self-assessment and integration of business leaders in program development have been critical to the success of its initiatives. Such self-assessment is often necessary to ensure continued relevance to the needs of the community. Realistic self-criticism can demonstrate to the community the university's seriousness

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about its role in economic development. The involvement of business leaders adds a new dimension to the assessment and ensures that new directions will match industry and community needs.

Economic and Policy Analysis and Research

Communities need sound information about important economic variables such as industrial trends, economic climate, infrastructure capacities, and the effects of public policies on development. Such information can be used by state and local governments, chambers of commerce, and other organizations concerned with economic development. It can also serve as the basis for establishing an overall regional economic development strategy. Such information has become critical to effective policy making in this era of rapid and often confusing economic change.

Colleges and universities may be especially well equipped to gather and analyze information about local economic and policy issues. Institutions with strong programs in regional economics, city planning, urban studies, and public policy can assist local leaders in diagnosing problems and analyzing alternative approaches. Those with strong schools of business, science, and engineering can offer insights into the status and prospects of key local industries in terms of markets, technologies, and other factors.

Many institutions have undertaken these types of activities in recent years. Some have established special units or institutes to provide an explicit focus for ongoing information collection and analysis. Others have organized special, one-time efforts or worked on a project-specific basis. While much of this activity has proven useful, colleges and universities—recognizing the differences in academic and governmental perspectives—need to stay alert to the need for political sensitivity and practical analysis in their work.

Helping an Industrial Center Undergoing an Economic Transition

One university that provides economic information and analysis to assist local economic development is *Cleveland State University* in Ohio. Cleveland State was founded in 1965 as an urban university with a strong educational mission. Under the direction of its second president, Cleveland State defined an urban mission that has led to the university's important role in monitoring and assisting in the economic transformation of the Cleveland economy.

As early as 1974, the university initiated efforts to address urban economic issues. The president was actively involved in the early meetings of the Association of Urban Universities, which urged congressional action on a land-grant act for urban universities. Although Congress passed the act, no funds were ever appropriated. In 1975, the president started an urban mission master plan intended to specify how each of the colleges could respond to local urban issues. In 1975, a College of Urban Affairs was approved at Cleveland State and opened in 1977 at a time when urban studies programs were being abolished elsewhere. Through considerable advocacy by the university, a state program was established to help implement the objectives of the urban university. The Ohio Urban University Demonstration Project was established in 1979 and has provided support to eight universities for urban affairs initiatives.

Since 1977, the College of Urban Affairs has provided data collection and technical

assistance to a wide variety of state, city, and neighborhood organizations. One of the college's earliest studies was an analysis of the regional economy revealing the shift from manufacturing to services. At the time, the study was criticized by industry and government for the gloomy picture it painted of the economy. The study presaged the loss of more than 100,000 manufacturing jobs between 1979 and 1984—a problem still confronting the region.

The college has always been willing to provide technical assistance on call, but it has been careful to maintain neutrality in its work. Cleveland has been much in need of consensus building and an agenda for action. The College of Urban Affairs has acted as an advocate for process and understanding—political, administrative, and technical. In recent years the college has developed a strong supportive relationship with the mayor's office and community, which it had hitherto lacked.

The Cleveland State program has played a useful supporting role to the community in analyzing economic development issues. Strong leadership from the president of the university and the college dean, combined with a more receptive local community, all in the context of a hard-hit regional economy, have provided the necessary impetus for program development. In the process, Cleveland State has found that its College of Urban Affairs has become an important vehicle for enhancing the university's reputation as a valuable local resource in the region's economic evolution.

Ongoing efforts by the college are designed to help the region better understand the economic changes it is undergoing and develop effective new directions for revitalizing its economy. Although economic development had always been a concern, it was made a priority by the dean of the College of Urban Affairs in 1978 when the city encountered serious fiscal problems. Recent projects have included training local elected officials and city administrators in new approaches to economic development, developing a data base on regional economic, labor market, and population trends, and analyzing local retention and expansion economic development programs for effectiveness.

University Assistance in a Troubled Rural Economy

While Cleveland State illustrates what an urban university can do in economic research and policy analysis, rural universities have undertaken similar activities that assisted local economic development and benefited the institution. A prime example is *Eastern Oregon State College*, a small school of less than 2,000 students serving ten rural counties that constitute 46 percent of Oregon's land but only 6 percent of its population.

In the early 1970s, there was talk of closing the school because of an ill-defined mission—a sense that the institution was drifting. In 1975, with the appointment of new leadership, a stronger mission was articulated to serve the varied educational and service needs of a well-defined rural region. This spurred a new continuing-education effort to meet the special needs of regional residents. It also resulted in a Regional Services Institute that was initially funded by the state legislature at $50,000 annually beginning in 1979. The institute has since used state funding to leverage other funding to expand its activities.

Because of their small size, many local governments in the region find that they cannot afford the professional staff necessary to analyze complex economic development issues. Many are just beginning to prepare for economic development, and

assistance in planning infrastructure or assembling a marketing package to attract industry could be valuable. Eastern Oregon State's Regional Services Institute works directly with government leaders to help meet their needs by conducting surveys and special studies, writing grants, and obtaining information from state and federal bureaucracies.

The college has found that its involvement in local economic development yields several benefits. According to the college president, the Regional Services Institute has become a major political asset. It has given the college much higher credibility among economic-development-minded public officials and opinion leaders. Locally, this has helped increase the prestige and enrollment for all programs. Statewide, it has resulted in the recognition of Eastern Oregon State as an institution with a clear mission that is an asset to the region. This recognition has translated into increased state funding for the college as a whole.

In addition, the institute has enabled students and some faculty members to work in a real-life laboratory by helping regional leaders solve actual problems. However, although the institute is not a stand-alone program, deeper integration into the college is constrained by faculty teaching loads. As the college attracts more attention and funding from the state, the time pressures should ease and open the way for increased faculty involvement. Another strategy is to develop the role of the college in linking expertise from other state universities together with representatives of local groups needing assistance.

Capacity Building for Economic Development

Many institutions are helping locales build their capacity for economic development by instructing local leaders—in government, labor unions, community organizations, economic development agencies, cooperatives—in new problem-solving and strategy development approaches.

Institutions engaged in capacity building for economic development assume the role of facilitator-teacher. Capacity building involves working closely with local public and private organizations, helping them define their own problems and find their own approaches to those problems.

A variety of regional and local community groups have benefited from college and university involvement in this area, ranging from large public-private planning organizations to small nonprofit development corporations and neighborhood groups. Assistance has come in the form of both individual leadership training in new techniques and group-oriented facilitation and instruction in new problem-solving approaches. In both cases, several institutions have discovered they can contribute to grass-roots economic development by tapping the problem-solving abilities of their faculty and transferring these skills to local individuals and organizations.

Building the Capacity for Public-Private Partnerships

One of the most impressive examples of capacity building is found at the *University of Colorado at Denver.* Two special centers within the university's Graduate School of Public Affairs have become the foci for capacity-building assistance to a variety of groups throughout Colorado and the Rocky Mountain region. One is the Center for the Improvement of Public Management, which trains mid- and upper-level managers to handle the challenges of political leadership, conflict resolution, pro-

gram evaluation, and fiscal management in areas such as economic development and strategic planning. The center was established expressly to stimulate creative thinking and broader perspectives—not to provide specific answers.

The companion program is the Center for Public-Private Sector Cooperation, which brings together parties with little experience in addressing community issues such as economic development, and serves as a catalyst for collaborative action. The center's Denver Community Leadership Forum trains individuals with dissimilar backgrounds but common concerns. The center also works directly with community groups to build new public-private relationships, fostering new ways of approaching issues rather than specific solutions. Its expertise in strategic planning, program management, financing packages, media relations, and public participation programs has made the center particularly valuable to organizations interested in moving beyond old policy prescriptions and into new problem-solving realms.

The University of Colorado at Denver has succeeded in its capacity-building role because of several factors. First, the dean of the Graduate School of Public Affairs has been active in securing funding for both centers. Second, because of the focus on community capacity building, two prominent local foundations became convinced that fostering better regional problem solving would be enhanced by taking the unusual step of investing $1 million in the centers. Finally, the dean made a point of recruiting faculty members eager to apply their knowledge to solving community problems. Although this practice may have concerned some university academics, the centers have proven to be an important resource in the region and have attracted national attention to the university. Throughout, the support of the university's president has been helpful in moving forward the agendas of these somewhat nontraditional programs.

Enhancing the Capacity for Rural Economic Development

An example of capacity building for rural economic development is provided by *Western Carolina University* in North Carolina. Although involved in a number of economic development related activities—ranging from counseling small businesses to conducting feasibility studies for local industries—the university has a distinct capacity-building activity organized under its decade-old Center for Improving Mountain Living.

A key activity is providing main staff support to Western North Carolina Tomorrow (WNCT), a public-private leadership council composed of representatives from the seventeen westernmost North Carolina counties. University staff members assist WNCT in establishing task forces, councils, and other problem-solving groups to address economic develoment and other regional issues. According to a recent analysis of the university's activities, "The thrust of these efforts has been on promoting informed and responsible decision-making on regional issues and on increasing local and regional expertise in economic and industrial development."

To foster economic development, a developers' group was organized with representatives from county governments, chambers of commerce, community colleges, and the state department of commerce. WNCT has also worked extensively with a statewide citizens' goal-setting effort known as NC 2000. In such cases, the center is helping regional groups organize, define agendas, and improve their capacity to address prob-

lems in new, more collaborative ways.

The university has also benefited. The recognition and visibility of the center (and the university) has increased in direct proportion to activities and publications associated with WNCT. At the same time, within the university, ties to various academic departments have developed more slowly. Faculty reluctance, however, has been overcome as community capacity-building activities have proven successful, offering little threat to academic freedom and attracting additional resources.

Assisting A Region in Economic Distress

Linkage of a community organization and several universities is exemplified by the *Tri-State Conference on Steel*, which operates in Pennsylvania, Ohio, and West Virginia. Although institutional involvement is not as formalized as in the two previous examples, it nevertheless has helped a key community organization to build capacity, moving from a small advocacy organization to a major voice in the region.

The Tri-State Conference on Steel strives to save what is economically viable of the heavy concentration of metals industries in the region. Efforts have centered on plant closings, attempts to find alternatives to keep individual plants open, and publicity, through symposia and conferences, of the steps necessary to revitalize this industrial sector. The conference involves labor, church groups, and local governments collaborating under a unifying, regional, problem-solving entity.

Several universities in and around Pittsburgh have played an important role in the development and operation of this community organization. The Labor Studies Departments at Pennsylvania State University-Kensington and Youngstown State University and the Institute of Public Policy Studies at Temple University have been major contributors. Others include the University of Pittsburgh, Carlo College, and Allegheny Community College. In most cases, involvement has been decentralized; that is, faculty and administrative staff members participate as individuals, not as part of a coordinated effort. Faculty members assist through staff symposia, research that will define organizational activities, and advice on legal and economic matters. Administrative staff members, including university presidents, serve on the organization's board of directors, lending their prestige and guidance on new directions.

Technical Assistance to Apply Existing Knowledge to Industry

New global competition challenges American industry to become as productive and efficient as possible. Many firms, especially small and medium-sized businesses, find they need basic management and engineering tools (existing knowledge) to become or remain competitive. Needed approaches may include statistical quality control, quality circles, or just-in-time inventory. Colleges and universities can help companies implement these and similar approaches by providing technical assistance.

Technical assistance to industry generally attracts fewer resources, involves more individual case work, and generates less attention than the more glamorous leading-edge research efforts. However, it is still an important role. Many institutions possess the array of business and technical talent necessary to provide assistance to local firms, without requiring large amounts of additional funding or institutional

development.

Colleges and universities provide technical assistance in many ways. Some have organized special technical assistance units or small business development centers; the most advanced have industrial extension services patterned after the agricultural extension services. Some hire special staff to provide this function. Others hire technical staff members as brokers between firms and faculty members who possess the expertise they need to tap. The benefits of technical assistance for the college or university appear to be greater when the full range of institutional resources (e.g., faculty, students, facilities) is employed. Technical assistance efforts have produced additional consulting opportunities for the faculty and research contracts, as well as an improved image, for the institution.

Federal programs have been important in helping institutions initiate technical assistance efforts. Economic Development Administration (EDA) university centers, Small Business Administration small business assistance centers, Department of Defense procurement assistance programs, and similar programs have enabled colleges and universities to become involved in technical assistance efforts. As federal budgets shrink, however, more states begin to support such activities.

A Statewide Industrial Extension Service

One particularly successful technical assistance approach can be found at the *Georgia Institute of Technology*. For twenty-five years, the Georgia Tech Industrial Extension Service has been helping the state's industries solve management and technical problems. The service operates through a network of twelve regional offices, staffed with resident industrial engineers familiar with local needs and backed up by the faculty at the university. Georgia Tech students also work at five of the twelve centers and benefit from addressing real-life problems. Using state funds, the service provides free assistance to any Georgia firm for up to five person-days. After that, a firm can negotiate assistance on a fee basis.

Staff have backgrounds in both engineering and business problem solving with diverse industry experience. They typically work one-on-one with clients, mainly small firms that could not otherwise afford the expertise. Most assistance projects are short term and involve manufacturing processes, facility planning, materials planning, methods improvement, or cost control. On occasion, on-site expertise consists of faculty and staff members from Georgia Tech's Atlanta campus. Faculty can sometimes use their technical assistance experience to generate research contracts for the university.

The Industrial Extension Service can boast of several accomplishments. Because of the success of the eight original centers, the state legislature recently approved expanding the number of industrial extension offices to twelve. During fiscal 1984-85, the centers together assisted over 1,000 businesses, logging about 2,500 person-days at a measured benefit/cost ratio of 20:1.

Although Georgia Tech increasingly participates in leading-edge research, it still finds its industrial extension efforts valuable, both to the Georgia economy and to the institute. Some faculty members view these efforts as less intellectually rewarding than new research, but the Georgia Tech Industrial Extension Service has generated far more benefits than burdens for the university. It remains popular with the state

legislature as well as local industry, has helped enhance the university's image, and has increased public support for the institution.

Preventing Plant Closure Through Technical Assistance

Technical assistance to help prevent the closing of a General Motors (GM) plant was pursued at the *University of Alabama at Tuscaloosa*. In 1982, GM decided to close a local assembly plant because of high operating costs. After protests from UAW and the community, GM agreed to keep the plant open if annual operating costs could be cut by $2 million. Plant managers and employees could only identify $1.5 million in cost savings. In desperation, they turned to the university, proposing to sell the 325,000-square-foot facility to the institution, lease it back, and continue to work on cost cutting.

Under strong leadership from its president, the university saw the proposal as a unique opportunity and arranged for the plant to become an instructional and research center for the students and faculty by leasing 50,000 square feet for three years.

Results have been remarkable. The needed cost savings were achieved in only eight months instead of the projected three years. Current annual savings now exceed $1 million. The plant received a vote of confidence from GM when the firm decided in 1984 to invest $14 million to turn it into a highly automated operation.

The benefits for GM and the community have been many. The plant remains open and jobs have been saved. University faculty members and students introduced a fresh perspective that has led to many productivity improvements. Professors from many disciplines have provided insights in areas that would not normally be considered. For example, a university micropaleontologist suggested tapping an aquifer located under the plant to serve as a cheaper source of water. Students have conducted a variety of data-collection and cost-analysis tasks. University administrators have served as mediators between the plant and its union to help forge new arrangements to avoid a shutdown.

The university has benefited as well. The plant provides a "laboratory" for students and faculty members in many disciplines. The school's energy management service conducts energy audits. The engineering faculty and students have designed a new electricity-conserving air conditioning system. A law professor—an expert on interstate shipping—has discovered that the plant's trucking contracts were overpriced and suggested a new competitive bidding process. Business management students have devised an automated inventory analysis system. The School of Communication helps publish an inhouse newsletter for the plant and has prepared a forty-minute videotape documenting the plant's progress. Nursing students work in the plant's medical stations, and home economics students test the durability of fabrics worn by workers. In all, over 200 faculty members and students have participated in more than twenty productivity improvement projects.

The feeling that university-industry partnerships can produce payoffs for both parties has rippled through the faculty and the community. According to Barry Mason, a business professor who served as coordinator of the GM/University task force, "Industries now are coming to us. . .and faculty members are coming to us with more ideas for cooperative programs." Because of this entrepreneurial energy, the university recently established, through a cooperative agreement with Alabama Power Co., a

state productivity center to sponsor research and provide technical assistance in a variety of areas critical to Alabama industry.

An EDA Center Working With Local Business

Another technical assistance activity that has benefited both university and business is the *University of Texas at San Antonio's* Center for Economic Development (CED). Organizationally, CED is located in the university's College of Business, but physically it is off campus, in downtown offices lent by the City of San Antonio. The center was established with a $100,000 grant from the Economic Development Administration in 1979 and has secured additional funding from the Minority Business Development Agency and the Texas Department of Community Affairs.

The center has a fifteen-person staff separate from the university. However, unlike many technical assistance efforts of this kind, the center staff works closely with the faculty and students. In 1984, for example, thirty-eight faculty members participated in CED's nearly 400 consulting projects. A total of sixty-five students were also involved in CED-monitored internships or courses and eighty-five participated in non-credit workshops.

CED has also become active in helping the City of San Antonio implement its new economic development strategy. To shift the emphasis from attracting large manufacturing plants to fostering small, entrepreneurial firms, Mayor Cisneros is establishing a new Center for Entrepreneurial Training, which CED will staff.

As in similar examples, what has made technical assistance successful is the high level of direct faculty and student involvement. Their involvement has ensured that such activities benefit not only the businesses receiving assistance but also the university. Both students and faculty members get the opportunity to tackle real problems, build skills, and develop a positive image in the community, the corporate sector, and state government.

Research to Develop New Knowledge

An economic development role that has always been important for colleges and universities, but which has become even more so in the wake of technological change, is basic and applied research. The bulk of this activity takes place at the nation's leading research universities, many of which are flagship campuses of state university systems whose work is widely known (e.g., Research Triangle in North Carolina). Smaller public institutions may not have the resource base, facilities, or links with industry to undertake extensive research activities. However, some of these institutions have begun to develop their research role by concentrating their limited resources on a well-defined target area ("steeples of excellence") and by building new partnerships with major research universities, special state government programs, and industry.

Increasingly, today's university research is supported by industry funds or state funds contingent on an industry match. A number of new research approaches and relationships have developed, such as new industry-university cooperative research centers, industrial affiliates, and joint industry-state research programs.

Helping an Industrial Community to become "Polymer Valley"

A prime example of targeting limited resources is found at the *University of Akron*

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in Ohio, in the development of the Edison Polymer Innovation Corporation (EPIC). Historically the rubber industry capital of the United States, Akron had fallen on hard times with the departure of much of its manufacturing base.

What remains is the corporate and R&D headquarters for such companies as Goodyear, Goodrich, and Firestone. The university has used this unique regional advantage to build a research capacity in polymers. EPIC is expected to create commercial products and processes that will offer new opportunities for investment and employment in the polymer industry.

Partnerships have been developed with local industry as well as state government through Ohio's Thomas Alva Edison program. In addition, the university works jointly with one of Ohio's leading research institutions (Case Western) to implement the new research effort, tapping into that institution's expertise, facilities, and industry network and becoming associated with its prestigious research reputation. The efforts of the University of Akron are a major element in the community's plan to cease being the "tire capital" of the world and become "Polymer Valley."

The research undertaken through EPIC has far exceeded what the university could have accomplished on its own. The key to success has been recognizing the special resources of the community (local rubber and chemical companies), focusing efforts to attract needed supplemental funding, and working aggressively to find ways to meet industry's needs by applying university resources.

A Public-Private, University-Systemwide Research Initiative

Another example demonstrating how public universities can participate more actively in new research benefiting economic development is being pursued among members of the *University of California* (UC) system. The partnership is called the Microelectronics Innovation and Computer Research Opportunities Program (MICRO). The MICRO Program was established in 1981 by the State of California to support innovative research in microelectronics technology and computer sciences, thereby strengthening two of the state's key industries. It provides funding for research projects proposed by individual faculty members at nearly all of the UC campuses. Although the flagship schools of the system receive much of the research funding, several of the smaller institutions do participate—collectively attracting about 25 percent of program funding.

The underlying philosophy of this joint public-private program is decentralization and entrepreneurship. Individual faculty members must secure industry funds for half their project, the other half being provided (matched) by the state. The program is based on the belief that UC researchers and their industry counterparts—not the state legislature or a central committee—are best qualified to judge what research is appropriate considering university expertise and industry willingness to provide financial support. A peer-review process is employed in funding decisions.

Thus far, the program has been well received by industry, the universities, and state government. During fiscal 1984-85, over eighty projects were supported with $3.4 million of state funds and $8.0 million of industrial contributions. Industry has access to leading-edge research and graduate students well-trained in these areas. Universities acquire the needed financial support for their educational missions and access to expensive equipment and facilities for their faculties and students. The state

gets economic development advantages because the program helps California reinforce its leadership in the microelectronics and computer science industries.

California's MICRO program has also given the smaller colleges of the University of California system the opportunity to build new research capacity, thereby enabling these institutions to play a larger role in state economic development.

Capturing Technology for the State's Economic Benefit Through A New Center of Excellence

The new Michigan Biotechnology Institute (MBI), located at *Michigan State University*, represents one component of the state's comprehensive research and development strategy to make better use of current expertise and to build new expertise throughout the state university system in order to foster economic development.

Although the system's flagship university, University of Michigan at Ann Arbor, has been the recipient of much of the new state funding for research, the state has also established new capacities at its other public universities—such as Michigan State and Wayne State—so that they, too, can undertake new research to support state economic development.

Established by the state in 1983, the Michigan Biotechnology Institute is a biotechnology development center for all of Michigan. Start-up funds were provided by private foundations and the state's Economic Development Authority. The institute fosters the commercialization of existing biotechnologies as well as more rapid development of new techniques and processes. It brings together researchers, business entrepreneurs, and venture capitalists, both to assist existing industries in the state and to encourage the creation of new commercial biotechnology enterprises in Michigan. A key concept promoted by MBI is that of "technology capture"— that is, developing technology that can be "captured" for the state's direct economic benefit.

The strategy pursued by MBI is well focused. Rather than creating a program that competes with others for funding and constituency, the state targeted MBI to take advantage of the existing knowledge and technology base. The MBI also represents an opportunity for a nonflagship state university to conduct significant research by becoming an explicit component of a multicampus state economic development strategy.

Technology Transfer to Apply Developed Knowledge to Industry

Although the United States has long been a research leader, there is great concern that the application of that research to industry is not as effective as it could be. The Japanese, for example, have a weaker research base in some areas but have been relatively successful in taking American research and converting it into useful technology and commercializable products. Thus, it is imperative to economic development that ideas be effectively transferred from the university laboratory and classroom into industry. This involves more than routine technical assistance—it also involves a strategic program of technology transfer from university to industry.

Universities address the technology-transfer function in a number of ways. Some institute formal technology transfer programs; others encourage faculty consulting. Some arrange with industry to share equipment, facilities, and laboratories; others

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allow faculty sabbaticals in industry or permit industry representatives to spend time on campus.

A Public/Private Statewide Technology Development Initiative

One of the best-developed examples of technology development and transfer integrating state universities, state government, and private industry is the *Ben Franklin Partnership* program of the Commonwealth of Pennsylvania. The Ben Franklin Partnership began in 1982 with a challenge grant program for the establishment of four advanced technology centers, each to be operated by a consortium of business, labor, financial institutions, universities, colleges, and local economic development districts. The program is considered the largest state technology program in the country and focuses on both mature industry and enterprises based on new technology.

The partnership provides state universities the opportunity, the incentive, and the financial means to collaborate closely with industry and to transfer technology of importance widely throughout the state's economy. Activity is focused at the four Advanced Technology Centers, where research and development partnerships are organized. Each of the Advanced Technology Centers has its own research thrusts building on university and industry strengths in the regions (e.g., robotics at Carnegie-Mellon). Since 1982, over 1,700 private firms as well as eighty of the state's 135 colleges and universities have been involved in projects at the Advanced Technology Centers.

One recent $1.5 million project created a computer facility to support R&D in the application of computer graphics to manufacturing processes, the development of computer-controlled automated assembly stations, and the refinement of flexible manufacturing systems. A $270,000 project attempts to make robotics more accessible to a consortium of small manufacturers. Also, twenty metal companies are working with university researchers to establish an R&D and technology transfer program intended to revitalize Pennsylvania's steel industry.

In addition to university-industry partnerships, the program supports the notion that universities of many kinds can "carve out a piece" of new state technology development or economic development strategies. With well over half of Pennsylvania's universities participating, the Ben Franklin Partnership enables Pennsylvania State University as well as smaller institutions to play a new economic development role that benefits all participants.

An Intermediary Vehicle for Transferring Technology from Universities

Another technology transfer model is the *Washington Research Foundation.* The foundation, established in 1981, licenses patents resulting from research throughout the state university system, redirecting most of the royalties back to universities and faculty members to support further research. Similar models operate at the University of Wisconsin, the University of Maryland, and the University of Pittsburgh.

The foundation is a facilitating mechanism: it increases the rate of technology transfer by identifying and assessing possible innovations, arranging for patent licensing, providing financial and marketing advice, and encouraging private-sector entrepreneurs and venture capitalists to provide the energy and moneys for commercialization.

This approach has proven profitable for both the universities and the faculty researchers. It supplements income for state universities in an era of dwindling resources. It also provides a financial incentive for faculty members to generate innovations and a mechanism to capitalize on their ideas. This tends to attract and retain top academic researchers, enhancing the university's prestige and ability to attract additional funding and top faculty members.

The key to the research foundation's success with technology transfer has been the establishment of an intermediary organization linking researchers to commercial interests, while taking care of licensing and legal arrangements. Removing barriers to commercialization in this way has profited many universities throughout the country.

Promoting Advanced Manufacturing Technologies In an Industrial State

A final example involves a more targeted institution-based approach. The *Industrial Technology Institute* is based close to the University of Michigan at Ann Arbor. Created by a $2.75-million state appropriation in 1981, the institute pools the research and development capabilities of the state's universities and colleges in advanced manufacturing technologies. These include advanced robotic sensing and computer integrated manufacturing processes, fields especally important to Michigan's major industry sector—motor vehicles.

In this model, the state established one entity to organize technology development and transfer in a research field vital to the regional economy. The institute attracts expertise as needed from universities throughout the state system. It also clearly signals the private sector (and university administrators) that Michigan is giving high priority to technology transfer, providing both groups an opportunity to tap into state funding and play a new, targeted role in promoting economic development.

Support for the Development of New University-Initiated Businesses

Many states are attempting to duplicate the Silicon Valley and Route 128 economic success stories. Both have resulted largely from close university/industry ties in research and development and spin-offs from university R&D activities.

Studies showing that most new jobs come from small and medium-sized businesses also encourage states to emphasize new businesses development rather than plant attraction. Not all such efforts can succeed: Stanford and MIT are unique institutions and their programs are not easily replicated. However, interest continues to increase in involving universities in new business development. A variety of university roles has emerged. In some, universities play a supportive role, seeing that on-campus research progresses to the commercial stage. In others, universities have begun to provide management and technical assistance to budding entrepreneurs, whether faculty members or not. Some have established entrepreneurial training programs. A few have developed research parks and incubator facilities to provide a supportive environment for new business. A few have even involved themselves in providing financial assistance, taking an equity position in new firms.

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Promoting New Technology-Based Ventures

The *Utah Innovation Center*, a privately sponsored center located on land leased from the *University of Utah*, it was founded in 1978 with a grant from the National Science Foundation. The center has since developed a two-pronged approach in education and venture development. Working with the Colleges of Engineering and Business and through the Utah Innovation Foundation (a nonprofit education and research organization), it offers courses in "Innovation and Entrepreneurship." Students formulate strategic plans for new kinds of businesses, building the skills needed to become future entrepreneurs.

The center's major thrust, however, is new venture development. Entrepreneurs affiliated with or independent from the university submit ideas to the center staff. Faculty members from the schools of engineering and business are sometimes hired to perform technical and market feasibility studies and help formulate a business plan for the most promising ideas. If the project is deemed exceptional, the center can take an equity position in the venture, receiving equity and royalties from the new firm in return for seed money, use of its consulting services, office space, laboratory equipment, and other "incubator" facilities.

The center's effect on economic development has been significant. In the last year, fourteen technology-based start-ups employing more than ninety people were housed in its facilities in the university research park. Because of demand, two more facilities have recently been added, more than quadrupling total space for technical assistance staff and incubator facilities.

The burden on the university has been minimal. In fact, the success of the center has enhanced the national prestige of the university and bolstered prospects for future financial returns. In the short term, the center's funding is being covered by rents, commissions, and fees from seed capital pools, consultations, and other projects. In the long term (within ten years), it is expected to become completely self-supporting through equity and royalty returns from the companies it helps create.

The center is also entertaining the possibility of expanding its operations across the country. Center officials have received countless inquiries and visits from local, national, and international groups interested in starting innovation centers. Ground was recently broken for the Tennessee Innovation Center in Oak Ridge. This initiative is patterned after the Salt Lake City Center and is a joint venture between the Utah Innovation Center and Martin-Marietta, operator of the Oak Ridge National Laboratory. In addition, a new center is being established at Utah State University.

The Utah Innovation Center is still evolving a relationship with the University of Utah, which has received an equity position in some firms at the center. However, judging from the level of outside interest and the success the center has had thus far, the new innovation center approach appears to be a useful tool for a university interested in an economic development role.

Supporting Inventors and Entrepreneurs

Another successful approach to providing support for new knowledge-based businesses is *Texas A&M University's* Institute for Ventures in New Technology. Created in 1983 with a $1-million appropriation from the Texas legislature, the institute provides a variety of services to inventors and entrepreneurs, including evaluation of

technical feasibility, potential markets, production costs, and financial viability.

To protect the university from spending staff time and resources on ideas that lack potential, strict guidelines must be met. To date, over 175 projects have been considered and rejected; only four have reached the point at which the university helps develop a formal business plan for outside investors. Like the Utah Innovation Center, the institute benefits by receiving an equity share of successful ventures and anticipates becoming fully self-supporting within ten years.

Although the institute does not provide incubator facilities for new businesses, it nevertheless plays a critical role by helping hone ideas, developing strategic business plans, and providing a bridge between inventors and investors. The complex process it has adopted to evaluate entrepreneurial ideas protects the university from overextending itself yet also gives the institution an opportunity to enhance economic development and its prestige. The institute demonstrates that nonflagship universities do have many of the kinds of resources important to burgeoning knowledge-based start-ups.

Developing a Small Business Incubator, Innovation Center, and Research Park

Colleges and universities have developed a variety of small business incubators, innovation centers, and research parks. One interesting example is the Innovation Center and Research Park at *Ohio University in Athens*. The region's economic core consists of coal mining, subsistence agriculture, and a few unrelated, medium-sized businesses. Beginning in 1982, with strong leadership from its president, Ohio University resolved to help foster new economic development in its region, using an approach that combines incubator facilities with faculty involvement.

The incubator receives an equity interest in new firms in return for access to the university faculty, facilities, and equipment. Clients are allowed to negotiate directly with faculty members and to make use of virtually all university equipment when not being used for academic purposes. The center also helps identify potential investors and maintains files on funding sources. Staff members help write federal and state R&D funding proposals. So far, the center has raised hundreds of thousands of dollars of federal financing and over $3 million through the state's Thomas Alva Edison economic development program.

The Ohio University Innovation Center and Research Park attempts to foster economic development in a particularly difficult situation. University resources are limited and the local economy is weak. Business support to expand university capacity is also limited. The university has sought out federal and state funds to support new enterprise development because that is one of the few economic development alternatives viable for the region.

Colleges and universities can play a range of roles in the economic development of their regions. To a large extent, the unique environment outside and within each institution determines the depth and breadth of involvement. Many activities depart from tradition, but just as many represent opportunities for universities to supplement and complement their current missions in ways that benefit faculty members, students, and the local economy. The key question—addressed in the next chapter—is how different colleges and universities go about determining an appropriate role.

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Given the wide range of roles universities can play in economic development, how do the roles develop? The answer concerns an institution's mission, program quality, and location.

Economic Development and Institutional Mission

Public colleges and universities in the United States typically have three missions: teaching, research, and public service. A surprising number (37 percent in the AASCU survey) acknowledge involvement in economic development as part of their mission. Nevertheless, they cannot be all things to all people. Instead, they have many responsibilities, some of which conflict.

College and university involvement in economic development works most effectively when it supports and complements an institution's primary missions. Thus, a major research university is more likely to develop collaborative research programs with industry than to develop a technical assistance program for neighborhood businesses. The former activity supports its primary mission while the latter appears peripheral.

At the same time, a college's or university's mission is not immutable: it changes to reflect new realities. For example, to meet new demands for higher education, teachers colleges broadened their missions and became comprehensive universities.

Different Types of Public Higher Education Institutions

Colleges and universities are diverse institutions. In a discussion of their role in economic development, five categories seem useful:

- Regional—a comprehensive university that primarily serves a specific area, usually within a single state
- Urban—a university that serves a major urban center and may be identified with an urban/public service and teaching mission
- Historically black—an institution that may be urban or rural and is seen as serving a primarily black constituency
- Technological—a college or university whose program is primarily technical (science, engineering, business, industry), as opposed to a comprehensive university
- Statewide—an institution that serves the entire state (may be a flagship university)—the leading institution of a statewide system rather than just one city or one part of the state, often with a strong research orientation.

These categories are not all inclusive; however, they apply to most public colleges and universities with important roles to play in economic development.

Table 3 summarizes the different types of universities and their primary forms of involvement in economic development.

Regional Universities

Most public colleges and universities fall into this category of comprehensive institutions whose service area extends beyond a single city and may include a substantial region of the state. Many of these institutions were teachers' colleges or technical schools that evolved into larger, comprehensive colleges or universities to meet the

Table 3

Types of Higher Education Institutions and Their Involvement in Economic Development

Type	Example	Constituency	Likely Roles
Regional	U. of Texas at San Antonio San Jose State University George Mason University Western Carolina University	City or Region Rural area	Education Economic analysis Capacity building Technical assistance Applied research
Urban	Cleveland State University University of Houston	City Urban area Small business	Education Economic analysis Capacity building Technical assistance Applied research
Historically Black	Jackson State University Tennessee State University	City or Region Black community statewide	Education Economic analysis Capacity building Technical assistance
Technological	Georgia Institute of Technology	State Industry High tech	Education Technical assistance Applied research Technology transfer Basic research Business development
Flagship	U. of Colorado at Boulder Pennsylvania State University	State Industry	Education Technical assistance Applied research Technology transfer Basic research Business development

increased demands for higher education after World War II. Unlike flagship campuses, these institutions tend to emphasize undergraduate teaching and applied research missions rather than graduate work and basic research.

Because their focus is narrower than that of the statewide institutions, they have unique opportunities to develop economic development roles tailored to their regions.

San Jose State University—Carving Out a Niche in Silicon Valley

San Jose State University grew out of the first public college in California. (It was originally a teacher's college.) After World War II, the state selected the school as the site for a new engineering college. Since that time, San Jose State has evolved into a comprehensive university, now with 25,000 students.

The growth of San Jose State has coincided with the development of the Silicon Valley. The valley prizes entrepreneurship and creativity in its academic institutions as well as its business enterprises. Over time, San Jose State has developed a series of close working relationships with high-technology business and industry. Because San Jose State is within commuting distance of Stanford and University of California-Berkeley, two of the nation's leading research universities, it has had to carve out its own special niche.

San Jose State has chosen to target its educational programs to the needs of the middle professional level of industry and business and to adopt an applied research orientation. The university has worked aggressively to establish close working relationships with industry, business, and the community. Essential to this process has been an ongoing dialogue between the university and these external groups that has involved everyone from President Gail Fullerton down through deans, department heads, and individual faculty members. The university now expects the faculty and students to interact with industry and the community on a regular basis.

As a result, San Jose State is becoming more involved in the community and with industry. It now supplies area firms with more engineers than do Stanford and Berkeley combined, and it is considered a primary source of continuing education for engineers and scientists in the area.

Its engineering school is undertaking a project, with the support of the region's leading firms, to raise additional public and private resources to increase the size and quality of its engineerng program ("Project 88"). The engineering and business schools are working together to establish a new manufacturing management program that will address industry needs directly. The mathematics and computer sciences department offers "clinics" for local firms and nonprofit organizations in which faculty members and students work on mathematics and computer-related issues.

In recent years, the university's nontechnical programs have also taken advantage of the opportunities in the valley. The English department, for example, has developed an outstanding program in technical writing, and many of its graduates secure jobs in writing user-friendly technical manuals for high-tech industry. The art and music department has specialized in the study of computer art and music and, with support from local firms, is sponsoring a "Silicon Valley festival of electronic arts."

San Jose State's approach creates a climate that encourages "bottom-up" entrepreneurial activities by departments and faculty members. University leaders see their job as providing recognition and positive reinforcement for these kinds of activities, and removing any obstacles. There is no central coordinating mechanism: it is felt that any effort along those lines would be stifling. The university is currently revising its mission statement, which may lead to further entreprenuerial opportunities.

University of Texas at San Antonio—Growing Up with a Growing City

The *University of Texas at San Antonio* (UTSA) is the newest member of the Texas public university system, having opened its doors in 1973. Over the past twelve years, it has grown from 700 to 12,600 students in fifty-three graduate and undergraduate programs. As a commuter campus, it draws most of its students from the fast-growing San Antonio and South Texas areas. Given the growth in this region, the institution expects to have 18,000 students by 1995.

UTSA's mission statement is unusually strong in its emphasis on applying knowledge to solving regional problems and to engaging actively in public service consistent with its academic fields. This mission is taken seriously by President James Wagener and the university officials he has recruited. Wagener considers seeking knowledge and applying it to problem solving "complementary and co-nurturing pursuits."

Consistent with its mission, UTSA has developed strong ties with area industry and government and has played a key role in San Antonio's emergence as an economically strong urban center. The university emerged at a time when the city of San Antonio was undergoing a period of community building, a process in which Henry Cisneros, an assistant professor at UTSA and now mayor, played a major role. As new government, ethnic, and business leadership took hold in the mid and late 1970s, the university was seen as a readily available resource for the community's development. Thus, UTSA has always been oriented toward the community, and a strong synergistic relationship between the two has emerged.

This synergy appears in a number of areas. UTSA's business school, led by a former businessman, has developed programs such as technology management that are geared to meet the needs of San Antonio's growing high-tech sector. The Institute for Studies in Business has focused on research topics related to the interests of local industry and maintains a variety of data bases of interest to local industry. UTSA's Center for Economic Development (described in Chapter 3) is also a part of the business school.

UTSA's College of Engineering and Science was able to add its engineering program in 1982 by using strong business and local government support to overcome initial resistance from the state university system. The college has developed joint programs with Southwest Research Institute, a leading independent research center, which permits a sharing of research facilities and professional expertise. It also conducts regular seminars to bring together practicing engineers and students and has an active internship program in local industry.

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A center for entrepreneurial training is also being established at UTSA, consistent with the city's desire to encourage new and small business development. And with support from the Texas Research and Technology Foundation, UTSA is building on its strengths in medical research by developing new programs in biotechnology, in hopes of spurring a biotechnology industry in San Antonio. Plans are also under way for a new research park sponsored by the Texas Research and Technology Foundation, with advice and support from UTSA.

Clearly, UTSA has been built around the needs of San Antonio. The university and the city have, in effect, grown up together. All indications are that UTSA will continue to move in these directions: its role in economic development has not only made it more responsive to community needs but a finer institution.

George Mason University—Reinvigorating an Institution Through New Roles in Economic Development

By working aggressively with business and community leaders, *George Mason University* has found an important niche in a fast-growing and dynamic region. Located in Northern Virginia, outside Washington, D.C., George Mason was originally founded in 1957 as an extension of the University of Virginia and became an independent campus in 1972. It has grown by more than 12,000 students since the early 1970s, reaching over 16,500 in 1985. During this time, the university has gained recognition as an important resource for the region.

In 1979, the university developed a strategic plan to link its growth to the needs of the region. After extensive discussion with local leaders, it chose to focus on high technology (Northern Virginia has over 800 high-tech firms), public policy (it is close to Washington, D.C.), and the fine arts (recognized as important to the quality of life in the region). The university began building quality programs in these three areas and eliminating programs outside them.

The first major activity in addressing the needs of the high-tech community was the formation of the George Mason Institute of Science and Technology (described in Chapter 2). The institute, known as GMI, has helped establish a Center for Improvement of Productivity, a Small Business Development Center, and an assistance program for the management of high-tech enterprises. GMI conducts an industrial liaison program, visiting businesses in the region to determine their specific needs in engineering, cooperative education, and career placements. The program provides ongoing information for the university in designing its overall programs. GMI also helped obtain the new state-funded Center for Innovative Technology for Northern Virginia.

Overall, GMI has served as the primary organizational vehicle for industry's interaction with the university. It has provided a means for the corporate community to communicate its needs to the university and a vehicle for helping the university implement its strategic objectives in high technology.

In addition to GMI, the graduate school at George Mason is experimenting with a number of new arrangements encouraging faculty entrepreneurship. Through a foundation established to support faculty efforts to commercialize innovations, the university has provided support for computer software development, development of films for writing instruction, and development of a computer data bank on con-

gressional voting patterns. In each case, the university has received a share of the royalties. The graduate school views these activities as "incubating academic innovators."

Key elements in George Mason's emergence as a top-ranking regional institution have been an entrepreneurial president (George Johnson) who established the strategic plan, an executive vice president (Wade Gilley) who directed the activities of GMI, the development of close ties with industry leaders, and the institutionalizing of the university/industry relationship through concrete programs and activities. George Mason's aggressive role in community and economic development in Northern Virginia has increased support for its programs, developed allies for the university, increased quality educational and research activities, and enhanced its overall image and reputation.

Urban Universities and Colleges

Urban universities and colleges are a special set of institutions. Their specific area of service is a major metropolitan area. Cleveland State University in Ohio, University of Houston in Texas, and City University of New York are examples of this type of institution. They emphasize their teaching mission and tend to provide educational opportunities for inner-city residents and immigrants. They serve large numbers of commuting and night school students. Many do not even have dormitories. Frequently, they engage in public service to the urban area. The research they do is usually applied rather than basic.

Cleveland State University—Evolution of an Urban University

Cleveland State University was created in 1965 as a result of a State of Ohio commitment to provide opportunities for higher education for thousands of Ohio residents not then served (e.g., inner-city residents). From its inception, Cleveland State has attempted to provide a setting in which local urban economic issues could receive objective attention. Cleveland State's leadership charged its deans with developing strategies to address the transformation of the local industrial economy, to be accomplished in three ways: education, research and development to address industry needs, and public service programs to aid local government in adopting more helpful economic perspectives.

Serving the local population has never been easy. Many of Cleveland State's students were the first in their family to enroll in college. The education needs of many could only be met through evening classes. Most students were commuters. In addition, the area's population and work force were decreasing. Later, the university found itself in a manufacturing economy rapidly shifting to a service economy with a population that did not have a tradition of higher education.

Cleveland State has responded to its educational mission by tailoring its curricula and program schedules to the special needs of its student population. For example, the university designed classes to complement those of the local community college (also created around the same time). It made special efforts to encourage students to remain in school—or reenter if they had to drop out. (The university has a 50-percent drop-out rate.)

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Responding to the challenge of increasing research and development in Cleveland—particularly relating to industry's needs—has also been difficult. Cleveland lagged far behind other Ohio cities, such as Cincinnati and Columbus, in university-sponsored research. Other than that at Case Western Reserve, virtually no university research was going on in Cleveland prior to 1980. This absence created a major void for Cleveland State to fill.

The university had modest research programs from its inception. In 1984, it hired a dean to expand Fenn College of Engineering into a major force in the region's industrial research base. The new dean, an academician who had worked in European and Canadian universities, was encouraged to make the engineering school more interdisciplinary and to set up programs in industrial technology. In 1979, the university president called together local manufacturers to develop a new program in manufacturing technology. The university had defined a specific role for itself: to teach manufacturing engineering and to develop a research program. These initiatives had begun before the business-led Cleveland Tomorrow group and the State of Ohio started discussing a center for advanced manufacturing. The Cleveland State effort ultimately became one component of Cleveland's new Advanced Manufacturing Program (CAMP).

Fenn College has also made strides in building its research program and contractual relations with industry. The college participates in Ohio's Thomas Edison program. The engineering school performs research for and transfers advanced manufacturing technology to local industry (through courses, seminars, publications, and continuing professional education). The program's style is characterized by active communication with industries to negotiate contracts and undertake research that will result in commercializable technology. The level of commercial funding of research at the college is growing rapidly as a result of the new leadership, perspective, and style.

Recently, the university's colleges of business and engineering have been working to develop a new business assistance center. If developed, this center would permit businesses to gain access to new technologies, such as CAD, CAM, and CAE, with faculty assistance to reduce costs. The university business school's center on entrepreneurship has been in operation for twelve years. The school works with the chamber of commerce (Cleveland Growth Association Council of Small Enterprise) to organize seminars on critical business issues such as business start-up and fund raising.

Cleveland State has continually assisted the region's governmental institutions in improving their role in economic development. Cleveland State is perhaps best known for its College of Urban Affairs (described in Chapter 2) and its programs in local urban issues. The faculty and students have conducted research, training, and technical assistance projects for a broad range of local clients since the program began in 1979. The college has tried to play an objective role in the many debates over urban policy issues in Cleveland through its research, training, and assistance efforts and has helped develop economic data bases for policy making.

Overall, Cleveland State has attempted to build an entrepreneurial structure into its colleges and centers. Although the university started primarily as a teaching institution, it has expanded its activities in research and development (which grew from $200,000 in 1973 to $4.5 million in 1984) and in public service through its programs in urban affairs, engineering, and business. Cleveland State University bets heavily on its deans, on their ability to mobilize new public and private resources, and on

its ability to contribute to the resolution of pressing economic problems in Greater Cleveland. Increasing public awareness of the university as an active contributor to the community is a continuing objective.

Historically Black Universities and Colleges

Historically black institutions are located predominantly in the South. Most were established in the nineteenth century. Over time, many have developed strong economic development roles in helping blacks build economic capacity, both in rural areas (Tuskegee Institute in Alabama) and in urban areas (Tennessee State in Nashville).

Black institutions today face a number of challenges involving the availability of resources, the quality of programs, and the nature of their role in their communities. However, they retain a strong constituency.

Jackson State University—Becoming a Resource for the Entire Community

Jackson State University, a historically black institution located in Jackson, Mississippi, is the only university in the state capital, which is also the state's largest city, at 350,000. Jackson State offers academic programs in the liberal arts, business, science, and technology (excluding engineering) to a student body of 6,500, mostly undergraduates.

Historically, Jackson State has had relatively little involvement in the economic development of either the city of Jackson or the State of Mississippi and has had few linkages with industry. In fact, other than providing educational opportunities, Jackson State has not been heavily involved in the economic development of the black community.

In 1979, the state designated Jackson State as its "urban university" and gave it an explicit mission to link its teaching, research, and public-service activities to urban issues. The appointment in 1984 of President James Hefner (the former Provost of Tuskegee Institute) provided the new leadership the university needed to carry out this new mission.

In the last two years, steps have been taken to increase the university's involvement in community and economic development. Jackson State has begun to reach out to the full community, moving beyond its traditional black constituency. It has, for example, organized a president's council of community leaders to help shape its community and economic development program. And it has begun working with leaders in the community on a revitalization effort.

The institution has been especially active in providing information and policy analysis to city and county governments on economic development issues. This accomplishment has been possible, in part, because of the emergence of blacks in leadership positions within local government. The university hopes to perform such services for the state government as well.

In 1985, Jackson State joined three other state universities to become part of the state's new Institute for Technology Development, a collaborative vehicle for uniting the research strengths of the state's leading institutions. Other initiatives being developed include an expanded continuing education program to meet the needs of professionals and employers in the region, a program of technical assistance to

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small business, and the formation of a new public-policy school. Plans are being developed to revise promotion and tenure procedures to provide greater recognition to the public-service role being played by the faculty.

There is no question that the Jackson community now recognizes the need for stronger university resources and involvement in community and economic development, and the university is anxious to address these needs. The institution faces the challenge of overcoming decades of underfunding in order to secure the resources needed to strengthen its programs and improve its image. Concurrently, as a predominantly minority institution, it needs to continue working for greater acceptance in the community of Jackson and the State of Mississippi. At the same time, it needs to ensure that Jackson's black community does not lose the institution as a special resource.

Science, Technology, and Industry-Specific Institutions

A relatively small number of public institutions have been developed with an orientation to science and technology or the technical needs of a specific industry. Georgia Institute of Technology is the leading state-supported science and engineering university. (MIT, Rensselaer, and Carnegie-Mellon are private.) The Colorado School of Mines exemplifies a public institution focusing on a specific industry. The technical focus need not be constant. Virginia Polytechnic Institute, which had a traditional science and engineering focus, recently moved toward becoming a comprehensive university. On the other hand, Purdue has developed a strong enough technical emphasis over the years to be classified with Georgia Tech.

Both their technical nature and history give these specialized institutions a much closer linkage with industry and a stronger role in such areas as research and technology transfer. These institutions can readily use this base to forge new roles appropriate to today's economy.

Georgia Institute of Technology—Strengthening an Already-Strong Technological Resource

Georgia Tech is a state-supported science and engineering university located in Atlanta. Having celebrated its centennial year in 1985, it is the only engineering school in the state and currently has about 11,000 students—8,000 undergraduate and 3,000 graduate.

The Georgia legislature established the school with a practical orientation, modeling it after Worcester Free Institute (now Worcester Polytechnic Institute) rather than giving it the more theoretical orientation of a Boston Tech (now MIT). From its beginning, it was explicitly seen as an institution that would work closely with industry and "stimulate economic growth" in Georgia (such language is included in its mission statement). Even today, it remains primarily an undergraduate institution with an emphasis on applied research.

Georgia Tech participates in economic development in almost every possible way. Its pattern of involvement with industry and economic development can be described as three-phase. During the first, emphasis was on producing highly qualified engineers and scientists and transferring knowledge and technology to Georgia businesses. The

Engineering Experiment Station was established at Georgia Tech in the 1930s as an analog to the agricultural experiment station at the University of Georgia. The station was established as an independent, nonprofit, client-oriented organization chartered by the state legislature and housed at Georgia Tech. It has developed seven major laboratories covering such fields as electromagnetics, energy and materials sciences, economic development, and systems engineering.

The Economic Development Laboratory conducts economic research and analysis for state agencies and local development groups and for selected industries. The lab houses the EDA University Center, the Georgia Productivity Center, and various other technical assistance activities and operates an industrial extension service with twelve field offices around the state (see Chapter 2). The EDA center has been particularly successful in involving various university schools in its program.

Many of the activities begun in this first phase continue to be important today, as evidenced by expanded state support for the EDL's economic development research program and industrial extension service. However, in the early 1970s, Joseph Pettit became president of Georgia Tech, bringing with him many of the ideas developed at Stanford University, where he had been dean of engineering. Thus, policies and organizational arrangements are in place that encourage and facilitate faculty involvement with industry.

Now, during its second phase, Georgia Tech has begun to work more explicitly with high-technology industry, particularly in and around Atlanta. Research has been given greater emphasis at the university, and the Engineering Experiment Station has become the Georgia Tech Research Institute. The research institute has evolved into a $60-million, 500-professional operation, part of the university but separate from the academic schools. It now ranks third in the country in sponsored research, just behind MIT and Johns Hopkins University.

In 1980, the Advanced Technology Development Center (ATDC) was established on campus as a state-funded business incubator to link university resources to the needs of new technology-based enterprises. ATDC is now working with some fifty firms in the Atlanta area. During 1983, Georgia Tech played a key role in the state's bid to be the site for the Microelectronics and Computer Technology Corporation (MCC). And although MCC chose to locate in Austin, Georgia Tech's strong role so impressed state officials that they established a new $30-million microelectronics center on campus.

In its third and still-emerging phase of involvement, the university is changing from a solid engineering institution with predominantly undergraduate students and an emphasis on applied engineering to one of the top graduate research institutions in the country with major emphasis on theoretical advances. Georgia Tech has already played a major role in the development of a high-tech corridor in the Atlanta area. Now discussions are underway about the possible development of a major university-sponsored research park.

Throughout its evolution, Georgia Tech has built on its strong engineering and science focus and close ties to industry to become a major resource in the state's economy and to strengthen itself as a university. An interesting challenge facing the institution as it reaches world-class status is the extent to which state officials see it as more nationally focused rather than Georgia-focused.

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Flagship Universities

All state university systems have their flagship campuses. In Ohio, it is Ohio State; in Texas, it is the University of Texas at Austin. Many were originally established as land-grant institutions. Their mission is statewide, not regional or community based. Their programs are comprehensive, and they tend to do more research than other institutions in the state university system.

Some states, depending on how their state system evolved, may have more than one flagship university. Indiana, for example, has both the University of Indiana at Bloomington and Purdue University. California has a three-tiered system of higher education: the University of California with nine campuses, the California State University with nineteen campuses, and the California Community College system with 109 campuses. All campuses within the University of California system—not just Berkeley, but UCLA, San Diego, Irvine, Santa Cruz, and the others—can be considered flagship universities. New York, on the other hand, has no equivalent to a University of Texas at Austin or a University of Michigan at Ann Arbor. The closest equivalents are the universities at Buffalo, Stony Brook, Binghamton, and Albany.

Pennsylvania State University—Becoming a Key Actor in a State's Industrial Transformation

The *Pennsylvania State University* is the state's land-grant institution. It has an enrollment of 64,000 students—35,000 at the main campus in University Park, 27,000 at other campuses, and 2,000 in community credit classes statewide. It has a long history of involvement in economic development and has developed a reputation of being a pragmatic, service-oriented university.

Since its origin, Penn State has had strong involvement with Pennsylvania's agricultural industries. This role remains strong today (agriculture remains one of the state's key industries), and the Agricultural College still has the largest budget on campus. Penn State has also worked with nonagricultural industries. However, its involvement with manufacturing industries has greatly intensified in recent years, and the university has a variety of activities underway.

The range of economic development activities at Penn State is impressive and far-reaching. They include continuing education, educational outreach, regional economic analysis, technology development activities through the Ben Franklin Partnership, technology transfer activities through the Pennsylvania Technical Assistance Program (PENNTAP) and its EDA University Center program, small enterprise research, small business counseling, and management training and development programs. These activities are complemented by faculty consulting and one of the nation's largest industrial research programs.

Much of this involvement has been prompted by external forces including the university's need for new sources of income, the state's economic difficulties, and the development of useful vehicles for university involvement such as the Ben Franklin Partnership (described in Chapter 2) and PENNTAP.

PENNTAP is generally regarded as one of the nation's best technology transfer programs. It works to ensure that the results of research become available to organizations that could use the new data to achieve economic benefits, and thereby help

business and industry to become more competitive. A network of transfer agents, a program of continuing education, and a library information system form the key elements of its delivery system.

The Ben Franklin Center at Penn State in University Park focuses on electronic materials, coal, energy conservation, and biotechnology. It coordinates cooperative applied research by industry and universities, education and training, and entrepreneurial development.

The coming of a new president in 1983—Bryce Jordan—has been a key factor in the university's involvement in economic development. The university considers economic development activities to be consistent with its basic teaching, research and service missions. Examples abound of faculty involvement with business that provides new case studies for the classroom; involvement with industry leading to the donation of advanced equipment for classroom and laboratory use; and industrial problems offering useful research and publication opportunities for faculty members and students alike.

Economic development is becoming a new mission for the university and a means of promoting excellence on campus, much as the agricultural college promoted excellence in agriculture. Concerns have arisen about the potential loss of institutional independence if the university becomes too dependent on corporate support, the possibility that an already pragmatic university could swing too far in that direction, and the potential to slight teaching. But the positives appear to outweigh the negatives at present, and strong state pressures are likely to make the university's role in economic development evolve even further.

Conclusion

Different institutions have developed their roles in different ways appropriate to their circumstances, mission, and capacity. Each institution has a unique and dynamic set of strengths, obstacles, leaders, and opposing voices. To prescribe a particular role that colleges or unversities of a particular type should play in economic development is to ignore their uniqueness. However, the key factors that shape the role a college or university can take have been identified and are discussed in the next chapter.

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The variety of ways colleges and universities approach economic development, the different roles they develop, and the varying success they have makes it clear that effective involvement in economic development doesn't just happen. Certain factors constrain a college or university's involvement in economic development and others support it. Table 4 shows the results of the AASCU survey on key factors that support and hinder an institution's participation in economic development, along with steps institutions take to make their involvement more effective. The AASCU survey and the examples already described suggest some of the ways these factors interact.

The reasons a college or university may not become involved in economic development vary. It may be a question of mission. Some members of the academic community may feel that such involvement does not jibe with institutional mission. They may see conflicts of interest in close ties with industry or threats to academic freedom. Faculty members may see involvement as interference with their teaching or research. In addition, their system of promotions, salary, and tenure decisions may not reward them for economic development activities. In comprehensive colleges and universities, the allocation of resources to economic development may raise tensions between the arts and humanities faculty and the engineering, science, and business faculty.

For some institutions, resources may not match community and industry needs. A college or university may not understand community and industry needs or recognize how it could respond to them. Conversely, a community or local industry may not recognize the resources available at an institution of higher education or how to tap them. Poor communications with the community and with industry can make it more difficult for a college or university to play an effective role in economic development. In many cases, the college or university simply lacks the resources needed to mount an economic development initiative.

Finally, some institutions may have most of the needed characteristics but have administrative policies that constrain involvement (e.g., excessive restrictions on consulting) or departments that have difficulties in developing effective relations with off-campus groups (e.g., lack of a focal point for industry liaison).

Table 5 identifies the principal barriers to institutional involvement and suggests some of the strategies colleges and universities have used to overcome these barriers.

Prerequisites for Success

Of the range of factors that affect an institution's role in economic development, ten appear essential for success. Some of these prerequisites are beyond the direct control of the college or university (e.g., location), but most can be altered or at least influenced by the institution. Developing coherent and appropriate roles requires that an institution incorporate these factors into an overall perspective.

The ten key factors are:

- entrepreneurial leadership
- a clear mission
- well-defined and understood community and industry needs
- institutional capacity

Table 4

AASCU Survey Results: Factors Influencing College and University Involvement in Economic Development and Steps Being Taken to Enhance the Effectiveness of Such Involvement

	Percent Agreeing
Supportive Factors of Major Importance	
Leadership support	89%
Ties to the private sector	73
Special resources	68
Well-defined needs	67
Administrative flexibility	66
Faculty Incentives	58
Mission for economic development	58
Ties to economic development agencies	51
Special organizational arrangements	38
Major Barriers to Involvement	
Lack of resources	71%
Lack of faculty rewards	41
Lack of clear objectives	25
Lack of faculty interest	25
Bureaucratic obstacles	23
Lack of ties to private sector	19
Lack of ties to economic development agencies	13
Different time dimensions (industry needs vs. academic calendar)	9
Conflict with mission	8
Perceived conflicts of interest	8
Steps to Make Involvement More Effective	
New institutional linkages	68%
New organizational arrangements	52
Securing additional resources	52
Mission/policy statement	43
New procedural policies	27
New rewards for faculty/staff	23
Use of brokers	7

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Table 5

Overcoming Barriers to College and University Involvement in Economic Development

Barrier	Solution	Example
Unclear mission	Strong leadership Restatement of mission Development of new mission	Eastern Oregon State University
Faculty resistance	Incentives and rewards Recruiting new faculty Recognition	Cleveland State College
Arts/sciences conflicts	Involvement of arts and humanities with industry and community	San Jose State University
Possible conflicts of interest	Development of policies to protect university interests	University of Utah
Lack of understanding of community and industry needs	Ongoing dialogue Periodic surveys, assessments	University of California, San Diego
Lack of public awareness of university resources	Communications activities	George Mason University
Lack of resources for economic development	New industry support New state programs	Ben Franklin Partnership California MICRO
Administrative constraints	More flexible policies New organizational vehicles	Georgia Institute of Technology
Poor internal communications	Interdisciplinary activities	University of Michigan
Lack of linkages to industry and community	New organizational arrangements	Jackson State University

- a strategic location
- strong working relationships with the public and private sectors
- the availability of special resources
- an institutional culture that recognizes the importance of economic development
- a policy climate that supports involvement
- special organizational arrangements.

Entrepreneurial Leadership

The most important key to successful institutional involvement in economic development is entrepreneurial leadership. In the AASCU survey, it was given the highest rating (88 percent) of any factor supporting the college or university's role in economic development.

Colleges and universities are conservative institutions; they require strong leadership to change—to recognize and take advantage of new opportunities. The adjectives used to describe the leaders at the more involved institutions are "energetic," "innovative," "strategic."

The role of the president is particularly important. The leaders of the more involved institutions have been aggressive in developing relations with their communities and with local industry and in promoting a campus environment supportive of such relations.

Entrepreneurial presidents have developed new relationships and roles for their institutions in ways consistent with the institution's mission. Such presidents have been able to develop a vision of the institution's role in economic development, recruit leaders and administrators who share that vision, articulate how involvement in economic development relates to the institution's mission, and balance such involvement with the institution's other obligations.

The process can be seen in the institutions reviewed in Chapter 3. Although Jackson State adopted an urban mission in 1979, it wasn't until President Hefner's arrival in 1984 that effort was begun to carry out the mission. President Pettit brought to Georgia Tech his experiences at Stanford and the philosophy of Fred Terman (former Stanford Dean of Engineering and the "father of Silicon Valley") and used them to help strengthen links with industry and build a stronger role in the economy.

Leadership can be "bottom up" as well as "top down." A number of deans and other administrators have exerted entrepreneurial leadership in their schools and programs, changing the inward-looking, ivory tower model to an outward-looking model (e.g., the dean of the Fenn Engineering School at Cleveland State).

Clear Mission

A clear mission that supports or complements involvement in economic development seems necessary. More than half (57 percent) of AASCU survey respondents saw this as an important factor. Moreover, 27 percent of the institutions surveyed reported some reference to economic development in their mission statement. Nearly every public college or university has some mission for service as well as education, and research. But missions can compete and different institutions view them differently.

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Institutions that have strongly defined service missions (e.g., Cleveland State University) and those that go so far as to define economic development as a major part of their mission (e.g., University of Wisconsin at Stout) seem to be more strongly involved in economic development. Many newer institutions, such as the University of Texas at San Antonio, have been created with strongly defined community involvement roles. They also carry less of the "institutional baggage" that can hinder established institutions from moving in new directions.

Mission statements, however, need not be static: some older institutions have taken an event such as a centennial celebration or the coming of a new president as an opportunity to rethink their mission in strategic ways. Georgia Tech is using its centennial to consider its transformation from a good engineering school to a world-class research university. The arrival of President Johnson at George Mason University provided an opportunity to reconsider how the institution related to its service areas. President Fullerton at San Jose State is updating the mission statement to reaffirm the university's commitment to the community and local industry.

Well-Defined and Understood Needs

What a college or university can contribute to economic development is partly determined by the needs of the area economy and industry. Most (67 percent) of the institutions in the AASCU survey saw this factor as important to their role in economic development.

Such needs, however, are often not well understood or articulated, particularly as the economy changes. Communication between the college or university and the community and its industry is often weak. Learning about these needs can be difficult, especially when the institution has little history of involvement in economic development. In such situations, the community and local industry may react to college or university involvement with suspicion—or resist it.

Institutions need to work at understanding local needs and how they can help address these needs. The University of California at San Diego, for example, conducts an annual survey of business to determine technology-related needs that ought to be reflected in the university's curriculum and research program. Universities such as Jackson State have established advisory councils and other linkage mechanisms to keep in touch with area needs.

Developing a solid understanding of community needs can also be critical to helping an institution strengthen itself. For example, President Johnson and Vice President Gilley strategically linked George Mason University to the changing needs of Northern Virginia and in the process developed new allies for the university and reinvigorated their institution.

Institutional Capacity

How an institution responds to economic development needs depends on what its real capacity to respond is, or could be. There is no substitute for quality, and it is no accident that the leading economic success stories have involved the nation's leading institutions. Institutions must assess their particular areas of excellence and relate them to their region's economic needs.

The leading research universities tend to be better equipped to work with indus-

try on research and advanced technology. Institutions should not attempt to duplicate—or succumb to pressure to duplicate—the Stanford and MIT models until they have the capacities and resources of those institutions. However, even a small college can have some capacity that is outstanding and can become an economic asset to its community or region.

Institutions with a strong technical (engineering and science) and business capacity may have an edge in providing certain kinds of assistance to industry. On the other hand, urban universities may be particularly well suited to provide technical assistance to local government, community organizations, and small business.

A four-year liberal arts college is not likely to have a strong role to play in the revitalization of the machine tool industry, while a teaching-oriented university may not be able to help local industry develop a new line of technical products. Such institutions, however, may be best able to educate a new generation of managers or show a company how to introduce new production technology humanely into the work place.

Institutions that have been successful in economic development have matched their capacities with the needs of their service area and not attempted to do what they are not qualified to do. They have identified their "market niche." Penn State, for example, now uses its considerable technical and research capacities to help meet the needs of Pennsylvania's mature industries as well to help new industries. San Jose State has focused its educational and applied research capacities on high-tech industry's needs, leaving basic research to University of California-Berkeley and Stanford University.

In some cases, new capacities may be developed. Once Arizona State perceived a need for more engineering graduates in the Phoenix area, it worked to strengthen engineering by establishing the Center for Engineering Excellence supported by both industry and the state. Jackson State has embarked on a program of capacity building as it attempts, after years of underfunding from Mississippi State, to provide service to the entire Jackson community.

Strategic Location

Location also shapes the potential college or university role in economic development. The question of location is not simply a matter of urban vs. rural or sunbelt vs. frostbelt, but of proximity to industry and to other universities, and of the economic context in which it exists.

Clearly, a Detroit location makes it easier for Wayne State to develop relations with Michigan's automotive industry, while Northern Michigan University is closer to forest products. Similarly, Georgia Tech's Atlanta location makes it easier to develop relations with industry (most Georgia manufacturers are centered there), while the University of Georgia is seventy-five miles away, in Athens.

From an economic development viewpoint, states whose major institutions have been located far from their population and economic centers may be at a disadvantage. Illinois and Mississippi are examples. In such cases, new arrangements may be necessary to link university resources with the needs of the state's industry. Linkage needs may be the justification for establishing new campuses. Mississippi State,

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however, decided that the Institute for Technology Development and the state's R&D Center—which bring together the resources of the state's four universities—would be headquartered in Jackson, the capital city and industrial center.

Economic context is also important. Universities in the middle of an emerging high-tech area are likely to be offered opportunities such as collaborative research. Others located among mature industries going through an economic transformation may have a different set of opportunities, such as technology transfer, to help make industry competitive again. Colleges and universities in areas without much economic activity may need to play a role in generating new development, as Ohio University is doing in Southern Ohio.

The final consideration is proximity to other universities. The role an institution develops is shaped to some extent by its neighbors. With Stanford and Berkeley nearby, San Jose State developed a strong applied, rather than basic, research orientation. It is also significant if an institution is the only university in the community. The University of Colorado at Colorado Springs may play more functions in the community than does the University of Massachusetts at Boston simply because UCCS is the only university serving its community while UMass is just one of dozens in the Boston area.

Effective Relations with the Public and Private Sectors

Many colleges and universities have looked inward rather than outward, and this perspective has constrained their relations with other sectors. Nearly three-quarters (73 percent) of the institutions in the AASCU survey identified ties to the private sector as a major factor in supporting their role in economic development while over half (51 percent) saw ties to economic development agencies as a major factor. Moreover, the establishment of new institutional linkages was the most frequently mentioned strategy (68 percent) colleges and universities use to increase the effectiveness of their involvement in economic development.

There is abundant literature discussing the differing perspectives among governments, public institutions, and industry that need to be recognized. Table 6 highlights these differences, using a model developed by Peter Szanton in his book, *Not Well Advised*.

The more involved institutions have aggressively sought to deal with these differences and develop positive relationships. They have used various approaches: community and industrial advisory boards, ombudsmen and industry liaisons, exchange programs for university faculty and industry personnel, industry sabbaticals, and more. Perhaps even more important than the formal approaches, however, is the development of a campus climate that encourages such relationships. For example, it is commonplace (and virtually expected) that faculty members and students at San Jose State will be actively involved in the community and with industry.

New relations need to be built slowly and informally at first, particularly if past relations have been weak or troubled. Steps need to be taken to start a dialogue if none exists. They may be informal ones at first, formalized later as appropriate.

Debates will probably continue for a long time about institutional relations with outside sectors, threats to academic freedom, and institutional integrity. Yet, with in-

Table 6
Three Cultures: University, Government, and Industry

	Culture		
Attribute	Academic	Public	Private
Driving interest	Respect of peers	Approval of voters	Profit
Time horizon	Long	Short	Short/medium
Mode of thought	Generic	Particular	Particular
Mode of work	Solo	Collaborative	Collaborative
Mode of expression	Abstruse, qualified	Simple, absolute	Simple, absolute
Desired outcome	Original insight	Reliable solution	Commercial application
Preferred form of conclusion	Multiple solutions, uncertainties emphasized	One best solution, uncertainties submerged	Profitable, uncertainties resolved
Concern about feasibility	Small	Great	Great
Stability of interest in topic	Low	High	High
Confidentiality interests	Freedom to publish	Public access to information	Proprietary interest

Adapted from Peter Szanton, *Not Well Advised* (New York: Russell Sage Foundation, 1981), p. 64.

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creased experience, institutions are developing policies and procedures that protect their interests. Moreover, academic leaders increasingly see these ties as an opportunity to keep at the leading edge of knowledge and help strengthen the relevance of the university in society—especially in light of the nation's changing economy and fast-moving technology.

Availability of Resources

The AASCU survey found the availability of special resources to be the third most important factor influencing the effectiveness of institutional involvement in economic development. Two-thirds of the institutions considered it of major importance. Lack of such resources was seen as the major factor hindering involvement by 71 percent of the institutions responding. Securing additional resources was identified as a strategy adopted by over half (52 percent) of the institutions to enhance their role in economic development.

The concern is primarily with special resources for economic development. Federal resources such as the EDA University Center program (as well as other programs sponsored by NSF, SBA, DoC) have been an important source of such funding in the past. However, as federal resources decline, state governments become an important source of such support—as evidenced in the establishment of various centers of excellence (e.g., Ohio's Thomas Edison program) and expansion of industry-related programs (e.g., Arizona State's Excellence in Engineering program).

In addition, entrepreneurial institutions find that industry itself is an increasingly important source of funding for activities and programs that relate to local economic needs. Funding can be for research contracts, endowed chairs, or general programs. Some institutions, such as George Mason, have found economic development activity to be one of the best ways to address the fiscal pressures of revenue shortfalls and declining enrollments.

An issue that often arises is the competition for funds among different schools and departments within the college or university (e.g., between liberal arts and engineering). In response, a number of universities have worked to involve their liberal arts programs in program expansion brought about by economic development. For example, at University of California-San Diego, the Asian studies program and the business school are working together to develop a new Center for International Relations and Pacific Studies, an initiative seen by the state as helpful to improving California's trade and relations with the Pacific Rim nations. At San Jose State, the English department works with local industry in technical writing and the art and music departments work with industry on electronic art and electronic music.

Another issue concerns the flexibility of resources. Some state systems closely restrict how an institution may use state resources, making it difficult to use resources in the creative new ways often required in economic development. Greater flexibility can make resources more productive for economic development purposes and enable an institution to develop new roles even without special funding.

Supportive Culture

Every institution has its own culture—a set of attitudes developed over the years—that will shape its involvement in economic development. Many academics may not

assign a high priority to economic development. Others may not believe that service is an appropriate mission for the university. Such attitudes—particularly if they come from the top and prevail throughout the campus—would obviously constrain involvement in economic development.

In part, this may reflect the essential conservatism of colleges and universities and their resistance to change. Often, faculty members take the position that universities should be detached and objective observers and critics of the world around them—not active participants in it. Faculty members too burdened with teaching loads and administrative functions rarely want to develop another active role. Some have more loyalty to their discipline (e.g., economics, physics) than to either their institution or its service area. However, a recent GAO report on industry-university cooperation listed the first condition for success as "a commitment by both faculty and administrators at a university to the concept of orienting some portion of university research and expertise toward industrial needs and opportunities."

Thus, if an institution does not have a supportive culture, it needs to build one. Some colleges and universities with strong executives have taken action through their leadership, recruitment efforts, new mission statements, new policies, and reward systems to change campus culture. They aim to promote a better understanding of the benefits of involvement in economic development among the faculty and staff. In fact, some have recruited new presidents, deans, or senior faculty members for their interest in economic development and used early retirement strategies to open up slots for new faculty and staff members who share a positive perspective on economic development.

Supportive Policies

Lack of rewards for faculty and staff involvement was identified as a major barrier to institutional involvement by 41 percent of institutions in the AASCU survey, making it the second most mentioned barrier.

As any college or university president knows, it is difficult to "mandate" involvement in economic development. Colleges and universities are unique institutions—knowledge based, decentralized in their operation, and dedicated to academic freedom. They vary greatly in institutional climate.

Institutions in the "ivory tower" category tend to see involvement in economic development as inconsistent with the basic purposes of a university. Others are extremely active in encouraging faculty and staff members to involve themselves with industry and the community in a variety of ways, believing that such involvement enhances the institution's mission and place in society. Thus, colleges and universities are not policy-neutral in economic development.

At present, most outreach and services provided by American colleges and universities are provided by peripheral units, with only limited faculty involvement. The institutions that have been working most actively with industry and most actively involving themselves in economic development have tended to develop policies that encourage active faculty involvement. The best policies protect the institutional integrity of the university while expanding its ability to respond to community and industry needs.

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Policies have been concentrated in four key areas:

Rewards for public service. New directions include release time, monetary payment to faculty consistent with levels paid to outside consultants, in-kind assistance to the faculty such as secretarial or graduate assistant support, and awards (with or without a cash component) for outstanding public service.

Promotion, salary and tenure policy. The university's reward system can include explicit consideration for involvement in public service or industry activities, as well as for traditional teaching, research, and publication. Credit can be given in such systems for public service, consulting activities, applied research, and the like.

Faculty consulting. Policies vary widely from frowning upon, to hands off, to active encouragement. Typically, faculty members are allowed one day per week. Policies should ensure the effective use of faculty expertise without detracting from other academic duties. The benefits for the institution include supplemental income for the faculty, development of additional faculty expertise, maintenance of industry linkages, and attraction of additional research contracts for the institution.

Policies on patents, publications, and intellectual property rights. There have been problems in this area, but they are being resolved as universities gain more experience. The key is to balance the interests of industry, the college or university, the faculty involved, and the community at large. Universities generally seek to retain publication rights, minimize the use of proprietary information, and share in the rights for products developed. Arrangements are also being developed to share financial rewards among the faculty, departments, and the university.

Table 7 lists key policies affecting university-business programs.

Facilitative Organizational Arrangements

There are many examples of ad hoc involvement with industry and in economic development that has succeeded. But as the pressures for such involvement continue to grow, more formalized arrangements may be necessary. Over half (52 percent) of the institutions in the AASCU survey report creating new organizational arrangements for economic development in recent years, making it the most often mentioned of the steps taken to make involvement in economic development more effective.

Such arrangements are necessary for at least four reasons:

- to coordinate involvement in economic development
- to help promote interdisciplinary approaches on campus
- to free the institution from state bureaucratic constraints
- to facilitate communication with industry.

There are a number of models. The *centralized model* appears the most common. Coordination comes from the president's, chancellor's, or development office. Jackson State uses this approach and has organized a President's Advisory Council to help shape its community and economic development program. A second model might be termed the *academic model* and is more decentralized. Most efforts under this arrangement are focused in specific colleges or schools. This approach is taken at the University of Michigan.

Table 7

Predominant Institutional Policies Affecting University-Industry Collaboration

Institutional Policy	Percent Using
Activities should be consistent with university goals.	88%
Cost of use of university materials and facilities must be reimbursed.	77
An administrator or committee must approve outside faculty research agreements with industry.	68
Faculty members having ownership or substantial financial or policy roles with organizations, companies, and agencies with which the university does business present a conflict of interest.	53
Faculty outside work is limited to specific time periods.	51
Proprietary rights, licensing, and patent rights for products developed from industry support belong to the sponsor unless otherwise agreed.	40

Source: Lawrence Logan and Jacob Stampen, "Smoke Stack Meets the Ivory Tower: Collaborations with Local Industry," *Educational Record*, Spring 1985.

Some institutions set up *centers for economic development* that coordinate much of their involvement in economic development. The EDA-supported Center for Regional Progress at Marshall University in West Virginia is an example of this model, as is the Regional Economic Assistance Center at SUNY Buffalo.

A few schools have *industrial extension programs*. Most were modeled in some way after the agricultural extension programs sponsored by the U.S. Department of Agriculture, although they in no way compare in size or scope of activity. Georgia Tech is the leading example, with twelve regional offices providing technical assistance to industry around the state.

In recent years, a number of schools have developed *centers of excellence*, often with support from state government, industry, or both. Ohio's Thomas Edison program, for example, led to the establishment of a series of centers of excellence around the state, such as the Edison Polymer Innovation Center at the University of Akron.

A few universities operate *research institutes* separate from their academic schools (e.g., Illinois Institute of Technology). SRI International operated as Stanford Research Institute until its institutional separation from Stanford University in 1969. The Georgia Tech Research Institute (GTRI) is now the leading example of a research institute at a public institution. It is a $60 million, 500-person operation dedicated to applied research ranging from electronic defense to economic development. Like the centers

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for excellence, the research institute provides an excellent vehicle for encouraging interdisciplinary work and facilitating ties to industry.

Some universities have chosen to put some of their economic development activities in *independent organizations*. The Utah Innovation Center at the University of Utah, for example, is a highly regarded business development program closely linked to the university but legally separate from it. The Washington Research Foundation is an independent institution that handles patent, royalty, and licensing functions for State of Washington institutions.

In addition, a growing number of *interuniversity* arrangements are emerging. In some, smaller institutions forge formal links with the state's major universities to strengthen their ability to engage in economic development (e.g., Eastern Oregon is developing such relations with the University of Oregon and Oregon State). In Mississippi, the Institute for Technology Development was created to unite the research strengths of the University of Mississippi, Mississippi State, Southern Mississippi, and Jackson State.

The State of Georgia has developed the Georgia Research Consortium involving the state's leading public and private institutions to establish centers of excellence around the state. In California, a program called MICRO (Microelectronics Innovation and Computer Research Opportunities Program) has been established to facilitate joint state/industry support of innovative research at UC campuses.

The State of Illinois has organized a faculty resource network as a clearinghouse for faculty interested in working with industry. In the Midwest, the Midwest Technology Institute has been created to try to increase the linkages between Midwest industry and more than a dozen higher education institutions.

Conclusion

Taking account of all these factors requires that the college or university develop a strategy for its involvement in economic development, rather than just letting it happen in ad hoc fashion or reacting to external pressures. Chapter 5 focuses on the development of such a strategy.

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Colleges and universities are generally conservative, stable, and slow to change. However, the new demands and pressures they face and the new opportunities now available can make change rewarding. To obtain the rewards, colleges and universities need to become more strategic and entrepreneurial—to find effective roles in economic development.

Higher education institutions are in a competitive situation and, like business enterprises, need to be strategic in their approach to economic development. They need to examine markets for their products and services and make strategic investment decisions to build up their capacity to compete.

In short, colleges and universities need to do a better job of strategic planning. Institutions of higher education have long been involved in planning. In the 1950s, it was "facilities planning," which shifted to "master planning" in the 1960s, and "long-range planning" in the 1970s. Today, there is a movement toward "strategic planning" in government and industry. Strategic planning is a process of anticipating changes in an organization's environment and charting a new direction toward that environment in order to achieve prescribed aims.

There are eight key steps in strategically developing an institutional role in economic development:

- deciding on an institutional commitment
- analyzing community and industry needs
- assessing university strengths and weaknesses
- determining targets of opportunity in which university involvement makes sense
- defining appropriate new roles for the university
- organizing for these new roles
- establishing new policies as necessary
- implementing the role and following through.

Each of these steps is described below, and although the descriptions may seem formalistic, the points are valid and need to be taken into account. They can help any college or university be more strategic and less reactive in determining appropriate new roles and charting an effective course in economic development.

Deciding on an Institutional Commitment

A college or university needs to consider its institutional interest in and commitment to a role in economic development. It has to decide up front what it wants to gain from such involvement: an improved image? new resources? improved programs? It needs to consider how such a role relates to its basic missions, and to take into account the different views of its many "publics"—the state, the faculty, students, alumni, donors, the community, and industry.

Sometimes, formalizing an institutional commitment means institutionalizing ad hoc activities and incorporating emerging views into a new mission statement to give them more credibility. In other cases, it may be necessary for the institution to engage in consensus building (both within and outside the institution) to define a new mission or redefine a current mission statement addressing economic development.

Explicit recognition of economic development in a mission statement can enhance its legitimacy as a university role. Once a role is clearly agreed upon, it needs to be articulated to the full university community. The role of the president can be especially critical in this area, as demonstrated at UT San Antonio.

Analyzing the External Environment—Community and Industry Needs

Institutions need to develop a clear understanding of community and industry needs in economic development. They need to scan their environment and understand the economic context in which they exist.

This differs from what now occurs in much internal university planning. It will require an active outreach to industry and the community. The institution will need to develop an understanding of the local economy and how it is changing. It will need to discern the key economic development issues facing state and local officials and the institutional capacity-building needs of the area. And it will need to identify the various manpower, technical assistance, research, and technology needs of industries in the area.

It was this kind of analysis that led Arizona State to develop its Center for Engineering Excellence in Phoenix and George Mason to reinvigorate itself as an institution.

Assessing Institutional Strengths and Weaknesses

Once an institution has analyzed an area's needs, it then needs to assess how well its resources and skills match those needs and, accordingly, how it can best contribute. Its capacities in education, research, and public service all need to be examined. Special attention should be given to areas of excellence wherein capacity to contribute is likely to be greatest. At the same time, there may be areas of potential that can be bolstered if they are more closely related to the needs of the local economy.

An institution's capacities need to be objectively compared with those of neighboring institutions. Some roles may best be left to other institutions. Cleveland State, for example, needed to compare its strengths with those of Case Western in determining what economic development role to play.

Determining Where Involvement Makes Sense

No institution can be all things to all people. Every institution needs to determine its economic development niche. In so doing, current areas of collaboration with the community and with industry should be assessed in terms of how well they are working and addressing needs. In some cases, existing programs can be the basis for new initiatives.

Existing areas of strength not currently involved in economic development should be reviewed to determine their potential. Institutions may have to publicize and otherwise inform community and industry leaders of the resource they offer. Steps may need to be taken to encourage faculty involvement in the community.

Finally, assessments should be made of the need for new capacity to meet unmet community or industry needs. Perhaps new degree programs, a new engineering specialty, or a particular new research focus would benefit the economy. The State

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of North Carolina has a proposal for universities to develop "Industry-University Research and Assistance Plans" at the college or department level that would perform this kind of assessment.

Defining Appropriate New Roles

Once the analysis is complete, the college or university can begin to make decisions about which roles in economic development are most appropriate. Roles should, above all else, support the institution's basic missions. Ideally, such roles should build on the strengths of the institution—areas in which it has unique resources or a competitive advantage.

Care should be taken to ensure that the college or university can indeed make a contribution in the area and that sufficient resources are available to do the job. At the same time, the institution needs to take an investment perspective—to be willing to invest in selected areas of comparative advantage that can have a long-term payoff (e.g., endowing new chairs).

The University of Colorado at Colorado Springs, for example, has determined that it needs to enhance its graduate-level engineering programs to better meet the needs of local high-tech industry. It is working collaboratively with the local chamber of commerce and the business community to raise $1 million in local funds that will be used to match $1 million in state funds to upgrade its engineering program.

Organizing for These New Roles

Once roles are decided, the college or university will need to determine where to house its activities. In some cases, existing organizational arrangements may be adequate, especially at experienced institutions such as Georgia Tech. In others, new arrangements may be needed, especially at institutions new to economic development such as Jackson State. New organizational arrangements can give focus to economic development activities (see Chapter 4).

Establishing New Policies

The college or university will need to ensure that policies are in place to support its roles in economic development. Overall, the institution will want to foster a supportive climate for involvement with industry and the community that enables it to respond to local needs but protects its own interests.

This goal may require that public-service activities are more effectively recognized and rewarded, that faculty consulting arrangements are permitted and balanced with academic responsibilities, and that patent, licensing, royalty, and other financial policies are in place before new industry linkage arrangements are formalized (see Chapter 4).

Implementing and Follow-Through

Finally, the college or university will need to determine who will lead the economic development effort and make assignments and communications arrangements clear. Procedures will need to be implemented to monitor and evaluate the effectiveness and impact of the economic development activities. Also, steps will need to be taken to publicize the effort and ensure that the college or university receives

credit for its contributions. As successes are achieved, the institution should look for ways to replicate or build on them. Pennsylvania's PENNTAP and Ben Franklin programs have both been exemplary in this regard.

Following is a checklist of questions that a college or university may wish to consider in developing its role in economic development:

- **Institutional commitment**

  How do the board of trustees, administrators, faculty members, students see the institution's mission?
  How do the community, the state, local industry, and other key actors see its mission?
  How does that mission relate (or how could it relate) to economic development?
  Should explicit recognition be given to economic development in the mission statement?
  What processess can be used to develop a consensus on the college or university role?

- **Community and industry needs**

  What is the nature of the local/regional/state economy?
  What are its key industrial sectors?
  How is the economy changing? What are its future prospects?
  What economic development issues face local/state government?
  What are the manpower needs of the economy?
  What are the technical assistance needs of firms?
  What are the research needs of firms?
  What are the technology development needs of firms?
  What are the opportunities for new business development?

- **Internal strengths and weaknesses**

  What unique resources does the college or university have that relate to community and industry needs?
  How do the academic areas relate to the economy's manpower needs? Is there a match or mismatch?
  How does the research program relate to local firms' technology needs?
  How do technical capacities relate to local needs for technical and analytic assistance?
  How do public service and outreach activities relate?
  Are there new capacities that ought to be developed?
  Are there strategic new investments that need to be made?

- **Determining involvement**

  Are there local needs that can be met by existing college or university resources and programs?
  Are there local needs that could be met by new programs that would be appropriate for the college or university?
  Are there areas of strength/excellence that could be developed as an economic asset?
  Are there current areas of collaboration that could be enhanced?

- **Defining roles**

  What are the institution's competitive strengths?

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Where can it make unique contributions to the local community and industry?
How do its capacities compare with those of other colleges or universities in the area? Which roles should be left to others?
What resources are available to help the institution carry out new roles?
Which roles are most supportive of the core missions?

- **Organizing**

  How well is the college or university organized to carry out new roles?
  Are new organizational arrangements required?

- **Establishing new policies**

  Do current college or university policies support moving in new directions?
  How do policies affect faculty involvement with the community and with industry?
  Are public-service activities given sufficient recognition?
  Do consulting policies balance the use of faculty expertise with academic responsibilities?
  Are patent, licensing, and royalty policies in place?

- **Implementation**

  Who will take the lead in implementing new economic development initiatives?
  How will linkages with government and industry be maintained?
  How will the initiative be monitored?
  How will it be evaluated?
  How will it be publicized?
  How can successes be replicated or amplified?

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Colleges and universities have been pressed to take on new roles before; typically, they have resisted. Some pressures have been little more than a passing fad, as with much of the involvement of universities with the urban problems of the 1960s. Those conditions did not fundamentally change the mission or nature of the university. Others have represented fundamental shifts, as when state teachers' colleges or normal schools were pressed to become comprehensive universities to meet massive new demands for higher education.

Most of the evidence suggests that the pressure on colleges and universities—especially public ones—to become involved in economic development will continue in the years ahead. Such pressure may even increase as the nation and its states and communities struggle to regain competitiveness in the global economy. America's increasingly knowledge-based economy makes it natural to see the primary producer and purveyor of knowledge—the college or university—as a critical resource for local, regional, and state economic development. The natural link between higher education and the emerging knowledge-based economy is too great to ignore. Moreover, declining enrollments and budget constraints encourage colleges and universities to enter new fields to survive.

The call for greater involvement in economic development represents a new societal view of colleges and universities. Without question, the demand that they become an integral part of the nation's new economic infrastructure is a serious one. It is up to higher education to form strategic new alliances with government, industry, and others in helping the nation meet its economic challenges. Such alliances can provide the United States with a unique strategic advantage in the global economy.

Proactive, Reactive, or Irrelevant?

As Clark Kerr notes, higher education institutions are challenged to adjust to important new possibilities.[1] Today's public colleges and universities, working in collaboration with government and industry, can develop a new vision of how education, academic, and service roles can contribute to today's economy. They can do it just as the public universities of a century ago developed and implemented a vision of how they could contribute to an agricultural economy. It is possible to conceive of three scenarios for the future.

Under the first scenario, the public institution proactively and aggressively develops its full role in economic development in ways that support the institution and serve its purposes and missions in higher education. Its role and image in society is enhanced. Its ability to contribute to the public interest is strengthened. The level of resources made available to it increases as its critical role in the economy becomes better understood, and this enables it to expand and improve the quality of its educational and research programs.

Under scenario 2, the college or university reacts to external pressures to get involved in economic development but allows external actors—the state or industry—to set priorities and define its roles. Undoubtedly, this scenario imposes new restrictions on the college or university, threatening its academic independence and freedom. It may be asked to take on responsibilities it is not well suited to handle.

Scenario 3 is worse yet. Here, the public college or university chooses to remain aloof from economic development and becomes increasingly irrelevant. The new

economic requirements—for a better-trained work force, more research, more effective technology transfer—must be met somehow. If the institution remains unable or unwilling to meet them, then state and private resources for education, research, and technology development begin to flow to more responsive institutions. The role of private universities and independent research institutes intensifies. The growing number of industry-sponsored education and training institutions (e.g., corporate universities) expands even further. New institutions, not yet dreamed of, are created to take on the roles that "ivory tower" colleges and universities refused.

This report is intended to assist those institutions interested in achieving the first scenario.

Note

[1]Clark Kerr, *The Uses of the University* (Cambridge, Mass.: Harvard University Press, 1982), p. 108.

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