

Engines of Our Economy: The Texas Industry Cluster Initiative

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“The Industry Cluster Initiative is the most important economic development tool in the state today.”

—Texas Governor Rick Perry

Introduction

With that comment at his 2005 Economic Summit, Governor Rick Perry announced to the State the results of the first installment of the Texas Industry Cluster Initiative. Over the past 24 months, the Cluster Initiative has engaged Texans in the development of policy recommendations to the Governor’s Office, to the legislature, to the education community, and to industry on issues and opportunities that will help Texas remain a leader in industry-led innovation and growth for years to come.

But we believe that the Cluster Initiative is not just another government funded “study.” Rather, it is an on-going endeavor to identify “best of breed” practices that facilitate collaboration and innovation, and to anticipate where high-growth, high-impact industries are going over the next five to ten years. The results will help Texas prepare its workforce, education and training systems, and infrastructure for the changes that are needed to successfully compete in a global economy.

In the first two sections of this article, we provide background and basic conceptual information on industry clusters in Texas. We then detail the recommendations on clusters made to the Governor’s Office in 2005, followed by an update on progress made in each of the State’s six industry clusters. We conclude with three additional components to the cluster initiative: cross-cluster initiatives, new product development and commercialization, and rural economic development.

Background: the Cluster Initiative

In 2003, the Texas Legislature passed SB 275, calling for the development of strategies to strengthen the competitiveness of key industry clusters. As a result, the State was required to identify these industry clusters—including a number of specified industries—and develop strategies to address economic growth and quality of life issues.

In 2004, Governor Perry announced his vision for building the future economy of the State. His plan focused on building competitive advantage through target industry groups.¹ While not every industry cluster is a target cluster, the data show that other clusters link to the targets that are driving economic growth. Target clusters are defined by products and services rather than by geography and compete across regions, tending to

¹ The target clusters are based on the 2001 Cluster Mapping project, a multi-year effort to define clusters statistically and analyze regional economies in the United States. This initial work was carried out by Dr. Michael Porter of the Institute for Strategy and Competitiveness at Harvard Business School, and on the work of Dr. Ray Perryman in *Texas Our Texas*, a 2002 report on the Texas economy.

be the core drivers of regional economic competitiveness. Other clusters involve activities serving almost exclusively local markets. Local clusters employ the majority of people in any regional economy, so their efficiency is crucial to regional prosperity. However, these local clusters cannot prosper over time without success in the core clusters.

Out of an initial 28 defined clusters, six were picked as having the highest potential impact, either through growth or contraction. These six major clusters are (1) advanced manufacturing and technology, (2) aerospace and defense, (3) biotechnology and life science, (4) energy, (5) information technology, and (6) petroleum refining and chemical products.

By building a competitive advantage in these industry clusters, Texas will be better positioned to compete nationally and internationally for the jobs of the 21st century. Texas' state government will be able to optimize its resources to monitor specific regional workforce and economic conditions, and to develop action plans to create new jobs in Texas.

What is a “Cluster”?

An industry cluster is a geographic grouping of related industries that support a common core business. There are four broad attributes necessary to the development of a cluster. First, there is firm strategy, structure, and competitive positioning. The conditions in the region govern how companies are created, organized, and managed. Regional competition must be robust enough to promote efforts at differentiation, whether through cost of services or added value to the competing products. The second attribute consists of related and supporting industries: the presence in the region of competitive suppliers or other related industries. The third attribute involves regional demand: there must be market demand for the goods or services. As this local demand is satisfied, strategies will emerge to serve new and wider regions through value-add or cost-based goods and services. The fourth factor revolves around production potential, such land, skilled labor, capital, and intellectual capital, which are necessary to compete in a given industry and region.

Assuming that these conditions are met, cluster industries will pursue “bigger pieces of the pie”. As the local pie is sliced and diced, strategies evolve to satisfy related and new markets, making the pie larger. This in turn drives more rivalry, more investment, and more innovation.

A major caveat exists, however: a technology-based process that delivers a competitive advantage will inevitably be overtaken, and the advantage will erode over time. The first manufacturing company to adopt an enterprise resource planning system as an integrated platform for logistics, operations, and accounting had a significant competitive advantage in several cost-based areas. Now such systems are the standard for many industries, and the companies not adopting such systems either find themselves at a competitive disadvantage or are compelled to develop a separate competency in order to compete.

The key is not to invent a better mousetrap, but to develop a strategy of continuous innovation.

Measuring and Directing Industry Clusters

Cluster teams, were recruited from industry participants, from industry trade associations (e.g. Texas Oil and Gas Association, American Electronics Association [AeA]), from the economic development community around the State, and from education and training partners. The teams averaged twenty-five individuals, with observers from public interest groups and various state agencies.²

Data, key metrics, individual interviews, an on-line survey of industry representatives and trends were analyzed to develop a preliminary Strengths–Weaknesses–Opportunities–Threats (SWOT) chart, which was presented in a series of regional forums, held around the State.

The goal of the regional forums was to foster regional collaboration in the development of a master plan to position Texas as a global competitor in these key industry areas. In 27 forums held in 11 cities, staff and their consultants engaged over 800 Texans to validate the trends identified, and to perform regional SWOT analyses that would provide direct input into the implementation plans for the Initiative. These meetings laid the groundwork for what would become one of the most important outcomes of the initiative – a statewide network of representatives from industry, education, economic development, venture capital, and workforce development – a network that would become the backbone of regional collaboration and cooperation.

The core teams took feedback from the interviews and regional forums, and developed prioritized recommendations for action through legislation and agency initiatives and were included in the Governor’s Legislative Plan. The team chairs delivered those recommendations that did not require legislative action to the governor in a sit-down meeting, where he directed specific action by specific state agencies. What follows is a brief delineation of key recommendations delivered to the Governor, along with subsequent actions taken... (Full information can be viewed at www.twc.state.tx.us/news/ticluster.html)

1. Integrate and streamline regulatory processes to ensure “shovel ready” sites to expedite commerce and industrial expansion. Identify business critical permitting processes that can be further streamlined to foster a better business climate.

The Texas Railroad Commission, the Texas Commission on Environmental Quality, and other agencies have led the way in integrating common permitting processes and making themselves available via web portals.

2. Establish a “Texas model” for collaboration and commercialization.

² The teams were assisted by New Economy Strategies, a Washington D. C. based consulting firm. Chairs for each team were chosen by the Governor.

The foundation for the “Texas Model” was set with the passage of the Emerging Technology Fund, a \$200 million fund to promote commercialization of new technologies, recruit and retain the best and brightest talent for education in the identified critical industries, and support emerging technology research and development that are directed toward the creation of a commercializable product. Additionally, other activities have helped build out the Texas model, including (1) identifying and promoting Texas’ “best practices” for collaboration among regions to attract experts, top companies, incubators, and educational forums, (2) facilitating the process of commercialization of intellectual property in Texas colleges and universities through licensure transformation and the inclusion of commercialization as an alternate path during the tenure process, (3) allowing university administrators and faculty to participate more equitably in the results of their innovation and commercialization, and (4) replicating the biomedical and life science industry workforce development model as a “best practice” to develop a common process that combines local and regional resources along with Department of Labor (DOL) funding to develop a skilled workforce to meet industry needs.

3. Leverage the proposed “just in time” workforce delivery system as a primary economic development strategy for business recruitment, expansion and retention.

The Texas Workforce Commission’s Labor Market and Career Information office is developing a strategic skills assessment application to identify workforce requirements, and training resources for the cluster industries.

4. Leverage Texas’ geographic assets, including ports, airports, rail transport, border crossing, and transportation infrastructure linking Texas to world markets and the enabling trade agreements, such as NAFTA and CAFTA, by developing and promoting state-wide competencies in logistics and distribution.

The Business Climate working group developed proposals to link and integrate geography and infrastructure, including: identifying gaps in logistic and supply chain competencies - product design, manufacturing, distribution and delivery; facilitating regional dialogues to identify resources and opportunities for collaboration around supply chain issues; and developing and deploying a broadband “backbone” across the State to facilitate commerce, connect businesses and promote economic development in both urban and rural areas by promoting a strong technology-based collaborative effort between industry, state and local governments.

5. Expand laboratory and research facilities through grants and loans to public and private entities. Promote national research and testing facilities for wind energy generation. Leverage facilities such as NASA/Johnson Space Center and the National Biocontainment Laboratory at UTMB for technology development and other homeland security applications. Create collaborative partnerships with biomedical and life sciences companies conducting clinical trials in Texas. Pursue and win the futureGen opportunity with DOE.

Various cluster teams, state agencies, and other stakeholders have taken significant steps towards implementing this high priority recommendation. The University of Houston, Texas A&M University, West Texas A&M, Texas Tech University, the General Land Office, Governor’s Office, Good Company Associates, and others are pursuing a

National Renewable Energy Laboratory test facility for large-blade wind turbine blades. Texas has been chosen as a “short list” contender for futureGen. Both the Ector County and Jewett sites were chosen to compete for the final selection of the \$1 billion coal gasification and CO2 sequestration research project. Finally, the Texas Workforce Commission, in conjunction with the Office of the Governor, has developed a grant program to support the six cluster industries, called *Meeting Industries’ Critical Workforce Need*. Biotechnology and Life Science grants have been awarded, and will be followed by Advanced Manufacturing and Technology.

7. Provide technical assistance to education and industry consortia to develop industry specific strategic skills and competency models.

The cluster teams, along with the Texas Education Agency, the Texas Higher Education Coordination Board, the Texas Workforce Investment Council, and other stakeholders, are facilitating an on-going interaction between industry and education; developing and implementing “best practice” models in education and training delivery; working with stakeholders to identify drivers and potential partners for implementing applied math, science and technology educational programs in public schools; providing technical assistance for the development of action plans and follow-on metrics to change educational programs to reflect industry needs; developing articulation agreements among educational institutions; improving the evaluation of the State’s existing workforce and education pipeline; convening forums of industry, education, and workforce to identify issues, gaps, areas of responsibility, potential interventions, and available resources to profile industry needs, available curricula and training programs; and expediting the curriculum approval process to meet the rapidly changing training needs necessitated by new technologies.

A Progress Report on Texas’s Six Industry Clusters

Advanced Manufacturing and Technology

The Advanced Manufacturing and Technology team’s three working groups have identified target opportunities and during the September/October timeframe will focus on assessing and compiling legislative recommendations required to support the sector.

Prime targets include:

- Expanding statewide training initiatives for advanced technology and manufacturing, with the goal of preparing the labor pool to engineer, operate and maintain equipment and support systems. Success requires the full and unqualified support of education working directly with industry.
- Creating a network of Nanotech Commercialization Centers across the State to address issues such as development and manufacture of advanced materials and electronics across sectors, including electronics, medical devices, and biotechnology.
- Supporting investment, development, and commercialization in the area of Nanotech and Biotech applications for the prevention, detection, and cure of diseases.

Aerospace and Defense

The Aerospace and Defense cluster is as much a driver of advanced technology as it is an implementer. The aerospace cluster recommendations focus heavily on complementary resource and supply issues, primarily centered on workforce and education. Given the

high visibility and the allure of historic innovation and achievement, the Aerospace and Defense Cluster appears to be highly marketable to students with interest in Science-Technology-Engineering-Math (STEM)-related careers. High wages and technical skills development opportunities would seem to add to that appeal. Like the other clusters, the Aerospace and Defense Cluster faces recruitment and retention challenges to maintain their success.

Beyond recruitment for the talent pipeline, workforce shortages drive fierce competition for talent throughout this cluster. Innovation and standards setting are fostered through research and development funded by federal grants and contracts. The resulting cyclical staffing patterns associated with constant innovation can be viewed by students and workers as threatening to employment security. While scarcity of core technical literacy compounds recruitment challenges, training needed to seamlessly transition employees from project to project and retain them through program maturity, present complex resource decisions that affect business retention overall. Aerospace and Defense cluster leaders strongly support cross-cluster efforts to identify trends in skills demand, transitional skill requirements, and innovative practices in workforce training.

Strategies to advance and exploit economic targets in this cluster have been identified including unmanned aerial vehicles and systems (UAV/UAS), which will include recommendations for the development of space ports and homeland security; the next generation of the Space Shuttle; and small aircraft transportation. The working group is also focused on building efficiencies in the supply chain to retain market share in the commodity driven sector of maintenance, repair, and overhaul (MRO).

Biotechnology and Life Science

Texas' Biotechnology and Life Science cluster is robust and well positioned for strong economic growth. It ranges from pharmaceuticals and medical devices to agriculture, oil spill and toxic waste remediation, marine and fisheries, and biohazard sensors to renewable energy sources. The team's goal is to expand the biotech industry in Texas by setting priorities focused on targets of opportunity and to develop specific and actionable recommendations that result in measurable economic growth across the State. The cluster's targets of opportunity include: agricultural biotechnology – plant, animal and marine; bio-energy; biodefense/biocontainment; drug and vaccine development and delivery; health-related information technology; health-related homeland security; and medical devices.

Energy

The vision of the Energy Cluster team is to develop a strategic pathway for Texas to become the "energy" state rather than just the "oil and gas" state. The Energy Cluster is one of the most diverse cluster groups in the State, comprised of oil and gas exploration, power generation, mining, power transmission, and renewable and sustainable energy sources. With oil and natural gas prices at historic highs, the activity in this sector has been unmatched in recent history. Over 60% of the drilling rigs in use across the nation are engaged in Texas projects. Continuing development of technologies in the exploration and production processes is lowering the risk profiles of many development opportunities. With this explosive growth in activity, though, have come challenges in

providing and sustaining the skilled workforce needed in the drilling, exploration, and production industries.

A major effort is underway to increase electric generation capacity in Texas. Eleven conventional power plants are in various stages of permitting or siting, and construction is scheduled to begin on the first of the projects in early 2007. Additionally, the South Texas Nuclear facility is beginning the permitting process to increase its output capacity. Critical to the success of these ventures is the availability of specific workforce skills – the “building craft” skills, such as advanced welding, pipefitting, etc. With multiple projects in close proximity to each other, regional workforce capacity will be strained.

When it comes to renewable energy sources, and especially wind energy, Texas is “greener” than any other state. The American Wind Association reported that Texas has surpassed California as the nation’s top wind energy producer, producing 2,370 megawatts or enough electricity to power 600,000 homes, up 19 % in 2006 alone. As hot as that market is, it only accounts for 2.5 % of the State’s energy. The largest obstacle to increasing that number is the lack of transmission lines. Existing wind farms are in West Texas and there are plans for a major offshore wind farm. The industry is waiting for clarification from the Public Utilities Commission to make it easier to permit and build both the farms and lines to carry electricity to the cities that need it.

Refining and Chemicals

As in the power generation and transmission sector, much attention is being given to workforce issues. Specifically, many of the “building craft” skillsets common to other sectors are becoming scarce, as experienced workers either migrate to other, less cyclical, sectors or retire. Simultaneously, industry is undertaking a massive initiative to build 10 liquefied natural gas plants on the Texas coast. While the plants themselves will employ an estimated 80 operators, the workforce required to construct the facilities is significant. Both the U.S. Department of Labor and the Texas Workforce Commission are addressing the need for these specialized skills through a series of Requests for Proposals and Customized Skills Development grants.

Information and Computer Technology

The Information Technology Cluster is already a well-developed part of Texas’ overall economy. It offers unique regional legacies that influence local economies and position Texas in the global marketplace. The IT cluster represents a broad range of industry segments, from computers to software to telecom to IT-centric services. It is an industry unto itself but also a critical contributor to all the other clusters. The IT Cluster targets of opportunity include logistics/supply chains; cybersecurity; homeland security; digital media arts; border security; RFID/smart cards; supercomputing, and wireless.

Cross-Cluster Initiatives

Cross-cluster initiatives are those efforts that support change and development in multiple industries. Many of the issues described in the regional forums fit in this bucket, and are

being addressed by teams representing multiple industries and led by core team members covering business climate, education, and work-force.

The **Business Climate** team established four working groups. The Business Climate Assets and Marketing Group proposes maximizing the use of intellectual and technical resources already available across Texas by launching a business oriented asset database. Initial listing on the database will encompass research centers/programs, incubators, commercialization and technology transfer organizations, associations/regional groups, universities, community colleges and training programs (with manufacturing/technical support services to be added later). The Asset Group will assist agencies in marketing the database to potential users, including the dissemination of topical information regarding workforce availability, industry best practices, and awards of state economic development funding. Ultimately, the Asset Group envisions creating a network based upon the use of the Asset database to facilitate direct matchmaking between businesses and providers of intellectual, technical, and research services. The greatest opportunities for the Business Climate Team are two-fold:

- First, there is an opportunity to establish a university-sponsored plan to move ideas from applied research to commercialization more quickly and effectively. Development of a Patenting Fund should be the initial focus: the inability to file, defend claims, file extensions, etc. to secure patents appears to be a key roadblock for Universities. Establishing a fund in this area, jointly managed by the Emerging Technology Fund and key universities across the State, would immediately address this issue. This fund should be established on a revolving account basis, with funds replaced as patent proceeds are earned.
- Second, is to establish pre-permitted manufacturing sites and streamlined (one-stop) regulatory licensing/permitting, across the State. Other states have implemented many of these practices.

Turning to the **Education Cross-Cluster**, they recognized that the workforce talent base is a critical asset, an opportunity, and a development challenge. Texas' growing, young population of women, African-Americans, Hispanic Americans and Native Americans places the State in an advantageous position relative to the rest of the nation. However, they will require some degree of remediation in higher education and workforce training, requiring immediate and long-term steps to align education and the workforce with career opportunities and skill requirements to those industries that will drive the State's economy. The State's education and workforce agencies are aligning programs in the development stage to the needs of industry.

At the highest level, Governor Perry provided direction to Cluster team chairs to reach out to education leaders and support efforts that have resulted in the creation of the Emerging Technology Fund, the Nanotechnology Workforce Development Initiative, and a revision to Texas A&M University System's guidelines for granting tenure to add weight to research that leads to revenue.

Currently, the Texas Workforce Commission is releasing a series of grants to support developing talent in the cluster industries. Several grant recipients are developing

articulation agreements and tools that better link the job pipeline to career opportunities in the cluster industries. Online accessibility extends the reach to rural areas and simulated learning experiences increase understanding of skill requirements that shape learning objectives and guide career planning. The cluster teams chairs briefed the Texas Education Agency and the Texas Higher Education Coordinating Board on the findings and recommendations of the Cluster Initiative, emphasizing the critical role of education in a rapidly advancing global market.

Dr. Shirley Neeley, Commissioner of Public Education, directed alignment between the State's adoption of the U.S. Department of Education's Career Clusters to the State's six industry clusters. The career clusters offer a guidance tool to help students plan their education based on their career goals, and provide an organizing tool for redesigning schools, small learning communities, academies, and magnet schools. The Texas Education Agency's STEM Initiative is also aligning with the six industry clusters. This initiative recognizes that employers face dramatic shortages of skilled workers engineers, scientists, and technology experts because too few Texans acquire the requisite STEM skills to pursue higher-level courses, training, or advanced degrees in STEM-related fields. These efforts will promote high school redesign and professional development of teachers, and the sharing of best practices through six development centers.

The clusters recommend the development of articulation agreements that support seamless transition from high school to 2-year to 4-year without losing credits; recruitment into higher education programs; programs that stay current with industry needs, demonstrate excellence in training, and communicate with each other; and better inform students about specific career options. Seamless transitions and credit retention is crucial to increase the numbers of students who may be the first generation in their families to seek higher education or certification.

The final cross-cluster is the **Workforce Cross-Cluster**. Employers want employees that meet their entry level needs, but also have an interest in mastering new skills and advancing in their careers. A need for strategic workforce planning was identified by every cluster in every part of the State as a critical issue and opportunity for Texas. The cross-cluster working group on workforce was formed with the objectives of identifying the critical jobs, skills and competencies needed by the workforce within the six industry clusters of Texas; conducting a gap analysis of workforce critical skills, knowledge and abilities including a forecast of workforce availability in one, three and five years; and developing an implementation plan to bridge the gaps, including timelines, resources and funding options.

New Product Development and Commercialization

Some of the most significant strides in cross-cluster efforts have been made in the area of new product development and commercialization. As discussed previously, the legislature established the Texas Emerging Technology Fund. The ETF has not only added capital to the commercialization process, but acts as a catalyst to attract new investment capital to Texas.

At the recommendation of Chancellor Robert D. McTeer, The Texas A&M University System Board of Regents voted to add “patents and the commercialization of research, where applicable” as a sixth criterion to the existing list of five tenure policy criteria that A&M System universities take into account in considering and recommending faculty tenure. This change will permit the consideration of commercialization as a recognized output of faculty scholarship in the tenure process. The change also reduces the possibility that faculty-researchers will wait to pursue commercialization until after they have received tenure. The tenure policy change won’t affect the administration of the tenure process nor will it create requirements for patents or commercialization, even in the areas in which opportunities for technology commercialization primarily exist—science, medicine, the life sciences, engineering, business and agriculture.

Improved processes are needed for the transfer of existing technologies to new applications in the target industries, especially with such technology outlets as NASA and the Department of Defense Office of Technology Transfer at Fort Hood, given that the transfer of dual use technology has a relatively lower risk than the development and application of new technologies to new uses in new industries.

Issues and Opportunities in Rural Economic Development

In 2006, healthy incomes in agriculture and rural manufacturing should continue to propel strong economic activity in rural Texas. While farm incomes are expected to stay strong, growth in jobs and wages in high-skilled industries continue to be a welcome sign in the quest for new economic engines in high-skilled activities.

Rural policy and programs should encourage more regional partnering among firms, communities, and governments. Alliances are a critical way for rural Texas to seize new economic opportunities. Investments in regional competitiveness can open up powerful economic synergies. Capitalizing on these policies and programs will allow rural Texas to pursue new opportunities, such as pharmaceuticals grown in fields, advanced manufacturing, renewable sources of energy, and e-based commerce. But these opportunities will develop only with new policies and new models of partnership that lever the power of regions.

New Competitive Advantages for the 21st Century

To compete in the 21st century, rural industries will need to be innovative in finding business solutions that go well beyond low-cost land and labor. Technical innovation and entrepreneurship will be the hallmarks of prosperity. Success will depend on management skills in addition to production capabilities. New products will need to be developed and new technologies will need to be adopted to increase production efficiencies and create a new comparative advantage for rural industries. Technological innovations and entrepreneurial approaches are helping some rural businesses find new ways to compete in a global economy. New regional partnerships will be needed that extend beyond governmental boundaries to build a critical mass of raw materials, processors, workforce providers, and capital. Specific recommendations for Rural Texas Clusters include building regional alliances to drive regional strategies; finding a competitive niche, and building clusters around it; opting for organic growth in “make or

buy” decisions; improving and leveraging quality of life opportunities; investing in people; and tapping technologies suited to specific rural regions.

This article is the collaborative effort of the Texas Workforce Commission's Office of Employer Initiatives and the Office of the Governor.

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