

State of Texas

**Advanced Technologies and
Manufacturing Cluster Assessment**

August 2005

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1 – Executive Summary and Recommendations

1.1 – Overview of the Texas Advanced Technologies and Manufacturing Cluster Assessment Report

Even with global changes dictating swings in economic trends, manufacturing is still one of the primary driving forces of technology and economic advancement. Despite statistics that paint a negative picture of job outsourcing, plant closings and job displacement due to the implementation of technology, manufacturing is essential to the economic vitality of a community. (Stanford Economic Indicators, 2005) The perception of manufacturing is changing as plants and companies adopt new methods of production to remain competitive. Assembly lines with employees detached from their work are being replaced with technologically advanced plants, where employees have input into processes and career advancement. Manufacturing in Texas spurs the creation of new companies, new consumer markets and beneficial careers with a rewarding standard of living. The use of advanced technology enables manufacturers to produce the next generation of products faster, cheaper and cleaner. (National Coalition for Advanced Manufacturing)

This assessment report from the Advanced Technologies and Manufacturing Cluster (AT&M) is one of six, each focusing on a target cluster's competitive position. This assessment process has brought together over 250 participants statewide, representing industry, academia, government and entrepreneurial interests, to provide recommendations aimed at strengthening the cluster and enhancing the competitiveness of Texas' businesses.

From visiting the regions, a diverse profile of Texas emerged. The regions had their individual strengths and commitment to economic growth. For example, Houston was strong in attracting government funds for research and product commercialization through NASA and the National Science Foundation (NSF) grants. Dallas/Fort Worth's strengths include the emerging technologies, semiconductors and nanotechnology industry segments. East Texas had a committed university producing top engineers for the medical sciences, food processing and management careers.

Technology associations were strong in most regions, connecting companies and professionals together to focus on driving innovation and the spawning of entrepreneurs. Despite the positive activities from region to region, it was noted that industry, academia and public representatives were concerned about industry trends that are threatening Texas jobs, high-fixed costs to operate manufacturing and design shops and the lack of a statewide economic development plan that focuses on creating competitive clusters. These issues and findings are included in this assessment report.

1.2 – Cluster Assessment Recommendations

Over a five-month period, the cluster assessment process sought to solicit input and recommendations from industry, public and private agencies and academic stakeholders. From meeting discussions, an electronic survey, interviews and regional forums, four top themes emerged as imperative components to the growth of the AT&M Cluster:

- Workforce and Education
- Capital and Commercialization
- Business Climate
- Collaboration

These overarching themes create starting blocks for the development of the economic development strategy that the state of Texas needs to drive innovation and productivity. Key strategic recommendations from the AT&M Cluster team and assessment process are outlined below.

1. Workforce and Education

The AT&M Cluster team recommendations for workforce and education focus on developing a “just-in-time” workforce, which may be defined as a workforce that meets the current skill and demand levels of industry. The workforce must be available and prepared to complete tasks required for employment. In a 2004 survey, the National Association of Manufacturers stated that one of the top challenges employers face is access to a high-tech skilled workforce to work in the labs and manufacturing plants of tomorrow. The cluster contributors outlined the key elements of an effective workforce and education program for the state, which include:

- Creating a workforce pipeline that meets industry skill needs
- Cross-training the workforce to enhance productivity
- Identifying opportunities within high-growth career paths

Studies and data show that Texas’ dropout rate is increasing and that lower numbers of students are prepared for post-secondary education. As a state, we must explore alternative options for students that do not follow an academic path but demonstrate an interest in programs designed for early entry into the workforce. Creating programs such as workplace internships, on-the-job training, industry standard certifications and apprenticeships are options to prepare the up-coming workforce for industry. The contributors to this report encourage and support additional funding to ensure adequate job training.

- Provide information regarding career options and opportunities to enter apprentice and internship programs through career counselors, local workforce boards and industry job fairs.
- Create partnerships between colleges, universities and industry to design flexible curricula that is responsive to industry demands for a workforce pipeline in high-growth and transitioning industries. Curricula should incorporate theory and emphasize application-based skills. Updates must be developed and implemented rapidly to keep current the skills of the workforce.

- Secondary education programs need to offer degrees and or certification. Industry should expect that students who achieve program completion have the required skills outlined in the curriculum.
- Increase salaries to retain and attract key faculty. The requisite need to attract and retain top scientists and educators to universities and higher education institutions is paramount and will require the ability to offer higher than traditional salaries.

2. Capital and Commercialization

The future competitiveness of an economy relies on the ability to develop new products and technologies through innovation and commercialization. The AT& M Cluster contributors explored solutions to bridge the gap between entrepreneurial ideas and the launch of a new business. The following recommendations focus on centers of innovation, increasing cluster representation across Texas and the policy environment necessary for success.

- Ensure that the Regional Centers of Innovation and Commercialization (RCICs) serve as conduits to assist entrepreneurs and new business start-ups in high-growth market segments. The recently passed Texas Emerging Technology Program legislation will aid in the development of these regional centers that provide resources and services to stimulate innovation and development. Technology focus areas may include nanotechnology, advanced manufacturing (tools, processes, digital manufacturing), robotics, food processing technologies and advancements for the automotive and transportation industries (alternative fuel sources, hybrid technology and material sciences).
- Offer incentives to business through legislation that supports the donation and or purchase of equipment that can be used in partnership for workforce training, R&D, product testing, facility improvement and commercialization. Remove barriers so that equipment can be donated to an academic environment or an incubator. Incentives could be in the form of tax rebates, property tax abatements or training dollar grants.
- University and college R&D policy must be changed to encourage industry and academia partnerships to commercialize research into viable products. Professors and research supervisors must have the opportunity to work with industry to see the benefit of commercialization. This will require changes in patent regulations, licensing and research objectives.

3. Business Climate

On a daily basis, employers face challenges associated with managing operating budgets. Fixed costs such as energy, transportation and employee benefits as well as healthcare or workers' compensation may prevent a company from being able to operate competitively in Texas. Business representatives participating in the cluster assessment noted that Texas has a business friendly environment, but could do more to help businesses reduce costs. Through providing resources and partnership networks, the state can play a role in strategically aiding companies to reduce their fixed costs of operation.

- ***Supply Chain Resource Bank*** – Create a statewide, best-practice supply chain resource bank that provides business leaders (operation managers, chief executive officers, logistic and supply chain managers) with the theory and hands-on

application tools for lean manufacturing and streamlining distribution channels. The resource bank should be electronic and accessible to all employers.

Global competition has been at the forefront of the cluster assessment discussions. Education regarding cost-effective supply chain solutions will elevate a company's profitability, reducing the risk of Texas losing companies to offshore competition. Financial models for businesses to leverage working capital through improved inventory models, transportation consolidation, integration of technology and process optimizations, should be included. See example in appendix.

- **Workers' Compensation Reform** – Workers' Compensation is one of the highest, non-flexible overhead costs for businesses in Texas. Due to the cost, some eligible employers are opting not to carry Workers' Compensation, creating a non-competitive field and unsafe working environment. The state of Texas should reduce the cost of the system for the employer to lower the number of companies that opt out. Regulation changes in HB7 relating to claims, length of time off work and access to quality care need to be enforced before the program will be attractive to companies viewing Texas as a location option.

Cluster participants applaud the creation of an effective, well-supported physician network that is affordable and meets the national treatment standards. However, the AT&M Cluster team recommends the state raise awareness of the Workers' Compensation system among smaller firms and create financial assistance programs for those wishing to provide safety and workplace training to reduce number of injuries in the workplace. The state should partner with the Texas Manufacturing Assistance Center (TMAC) and Occupational Safety and Health Association (OSHA) to achieve these objectives.

- **Sales Tax Exemption** – Currently the sales tax exemption for manufacturing equipment excludes R&D machinery and lab equipment. Texas should follow the example of other high-tech leading states that have legislated exempting R&D machinery and equipment from sales tax. As advanced technologies are embedded into the manufacturing process, the state will need to continually address tax exemptions that encourage growth and expansion.
- **Economic Development Strategic Plan** – The cluster initiative laid the foundation for the state of Texas to leverage its knowledge of its economic assets and regional growth opportunities. Economic development agencies and state representatives must work together to create a strategic plan that is cohesive and competitive with other states. The AT&M Cluster team recommends this plan
 - a) Engage regional industry leaders to promote, recruit and retain companies.
 - b) Offer incentive plans that encourage current Texas businesses to recruit vendors and suppliers.
 - c) Conduct exit interviews with companies that decide to leave or cease business in Texas and in partnership with regional economic development agencies.

4. Collaboration and Strategic Partnerships

As changes in technologies and lean manufacturing processes that advance the production of goods and services are adopted, collaborative partnerships between industry, academia and government will have to be established. These collaborations will encourage competitiveness and the incorporation of leading edge technology into the commercialization process.

- ***Advanced Manufacturing and Innovation Advisory Council (AMIAC)*** –The AT&M Cluster team recommends the creation of this council of representatives from industry, associations, economic development partnerships and academia to implement the following:
 - a) Promote the integration of advanced manufacturing technologies to improve products and processes.
 - b) Develop networks of industry partners and associations that assist in the adoption of technology and lean manufacturing processes. Associations such as the Texas Manufacturing Assistance Center (TMAC) or National Association of Manufacturers (NAM) could play a role in aiding companies to make the transition.
 - c) Promote procurement and assessment of technologies among participating companies. This will aid in establishing best practice policies.
 - d) Address the issues of retaining intellectual property (IP).
- ***Statewide branding and marketing campaign*** – Texas has been successful in branding itself as a business friendly state. This cluster assessment identified additional assets and potential growth areas across the state that should be incorporated into the strategic economic development plan.

This plan should incorporate regional and industry strengths. These may include academic institutions, federal and state funded programs (space, nanotechnology, transportation), workforce and industry clusters. Marketing efforts should recognize regional strengths to direct companies considering Texas to the location that best addresses their needs. Some examples include:

Austin - Semiconductors and Electronics
- Nanotechnology and Advanced IT
- Entrepreneurship and Commercialization

East Texas - Food Processing and Advanced Manufacturing
- Medical Devices
- Distribution Centers

The Rio Grande Valley - Components and Final Assembly
- Aerospace and Defense
- Food Processing

Regional economic development agencies need to generate their own message and branding based on the statewide vision. This strategy will also aid the state in proper allocation of funds and resources to the regions.

1.3 – Technology Targets of Opportunity for Texas

One of the strengths Texas has is its ability to innovate and adopt new technological advancements. The AT&M Cluster team reviewed the data collected during the assessment process and isolated technologies that could create profitable business opportunities:

- Nanotechnology
- Micro-electromechanical systems (MEMS)
- Advanced digital manufacturing (layered manufacturing process)
- Supply chain distribution and fulfillment
- Robotics
- Sensors
- Hybrid vehicle technologies (alternatives to gasoline driven vehicles)
- Polymers, advanced materials and new plastics
- Advanced tools for manufacturing and design

Advancements in technology will create new markets and jobs in Texas. The Cluster Initiative findings have shown the connections between the AT&M Cluster and other cluster technologies. The application of technology to advance the clusters will create stronger collaborations between industry, academia and government.

1.4 – Cluster Team Working Groups: Part of a Competitive Plan

This assessment reviews the findings of a statewide outreach to industry, government and academia. Its content reflects the concerns of and proposed actions by representatives from regions throughout the state. The AT&M Cluster team proposes to act as a liaison between the regions and state leadership to continually identify priorities of action for the growth of the cluster. The team plans to create sub-groups that will focus on

- Recommendations to the Legislature based on the assessed needs among the regions
- Models for building a responsive and highly skilled workforce pipeline and strategies for job creation
- Support for associations and resource providers that promote and guide the integration of technology and lean manufacturing processes
- Elevate the status of Texas' higher education institutions

Outreach through the Cluster Initiative captured the names and interest of leading experts across the state. The AT&M Cluster team proposes to establish and promote access to services and resources that will aid new and established companies to do business in Texas. The team should continue to address policy, workforce, business climate, education and outreach program issues, acting as a communication channel to state decision-makers.

2 – Summary of Assessment Findings

One of Texas' primary strengths may be its regional diversity. Identifying the assets of a region in terms of technology, workforce and physical and virtual infrastructure, forms the basis for a more comprehensive economic development plan that will serve to network Texas' regions for more efficient statewide implementation and economic growth. Participants in the regional forums contributed the majority of this information. The location of these forums was selected based on the greatest concentration of employment for this cluster. This summary first introduces Texas' strengths and assets then highlights assets by region that are imperative to the growth of the AT&M Cluster.

Texas – Statewide Strengths and Assets

- Strong technology associations promote and foster networks that generate entrepreneurship and company alliances.
- Presence of original equipment manufacturers (OEMs) and mid- to small-tier companies form the core of AT&M Cluster activity. Related activities include research, design, manufacturing, product testing, sales and operations. These companies create jobs and the innovation behind technologies that result in the origination of new customer markets.
- Transportation (air, sea, highway) and trade hubs – Houston, Central Texas, The Rio Grande Valley, El Paso, Dallas/Fort Worth and East Texas all have infrastructure that is imperative to the supply chain. Investment also includes broadband telecommunications.
- Demonstrated ability to attract federal dollars for research and spawn of new companies, including funding from Department of Defense (DoD), National Science Foundation (NSF), National Institute for Science and Technology (NIST), Department of Labor (DOL) and Department of Health Sciences. Government contracts and grants provide dollars for jobs, manufacturing, R&D and facilities.
- Post-secondary academic institutions with established communication channels to industry for the development of curricula and training programs to upgrade workforce skills.

The table on the next page outlines the strengths identified in each region. Included in the chart are cluster attributes and infrastructure that must be maintained in order to advance the industry cluster. The six regions described in this chart reflect the six regional forums that were held across the state over a six-week timeframe. There are other assets that comprise this cluster that will be highlighted in other sections of the report and or the appendices.

Table 1.1 Regional Cluster Attributes and Representation¹

Region	Industry Cluster Attributes	Infrastructures and Resources
Houston	NASA. Government agencies. Nanotechnology, micro-electromechanical systems (MEMS), medical devices, IT and sciences. Strong energy and telecommunication networks. Manufacturing in food, plastics and raw materials. Stewart & Stevenson, organic metals and carbon nanotubes.	Transportation hub – air, sea, highway. UTH, UTMD, Rice Alliance, Community College System. Houston Technology Center. Strong Economic Development. Partnerships. TMAC
Austin and Central Texas	Semiconductors, IT - Hardware, software, applications. MEMS, nanotechnology. Freescale Semiconductor, AMD, Applied Materials, Samsung, SEMATECH, Photonics, Cerium Labs, Nano Vance.	UTA, Austin Community College District (ACCD), Venture Capital presence and incubators, IC2. R&D investment. Austin Technology Council NAFTA corridor. Baylor University and TSTC in Waco.
The Valley and Weslaco	Maquiladora – access to workforce at lower wages. 2 nd and 3 rd generation of manufacturing workforce. OEMs. R&D. Manufacturing – electronics, raw materials, food processing, final assembly, agriculture. Trico Products, Cameron Works, Jabil Circuit, Brunswick Company.	UTPA, TSTC, UTB, TMAC, Advanced Manufacturing Council. Availability of funds for the creation of new companies. Co-op logistic partnerships. NAFTA/CAFTA corridor.
El Paso	Maquiladora – manufacturing in Mexico, access to workforce. Automotive, consumer products (commercial), raw materials, electronics. Chemical, petroleum, final assembly. Defense and security. Delphi, GE Medical, Phelps Dodge.	UTEP. DoD government agencies. Mexico/Texas broadband network investment. Economic Development Partnership. EPCC.
East Texas – Tyler	Food processing. Medical sciences and services. Manufacturing of new materials, plastics, raw materials. Distribution and call centers. Trane, Tyler Pipe, Target, Pizza Hut, Pilgrim’s, Alcoa.	UT of Tyler. UT Medical center in Tyler. Real estate, highway system, distribution center strength. BMC Athens. Family owned businesses loyal to region.
Dallas/Fort Worth	Texas Logistic Capability Council. Strong presence of OEMs and technology associations. Nanotechnology, medical sciences, robotics, material sciences, wireless. GPS/GIS. Sensors, tracking devices and stealth technology. Zyvex, GM, Texas Instruments, Raytheon – Elcan Optics, Williams Pro, Triquint, National Semiconductor.	Metroplex Technology Business Council (MTBC), Dallas – Technology Business Council (TBC). Venture capital , STARTech, Fort Worth Technology Center. NTEC. UTD, UTA, TCU, UNT, SMU. Dallas and Tarrant County Community College. TMAC, SIA.

A full review of the SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis is included in this document for review (See section 7).

3 – Cluster Definition

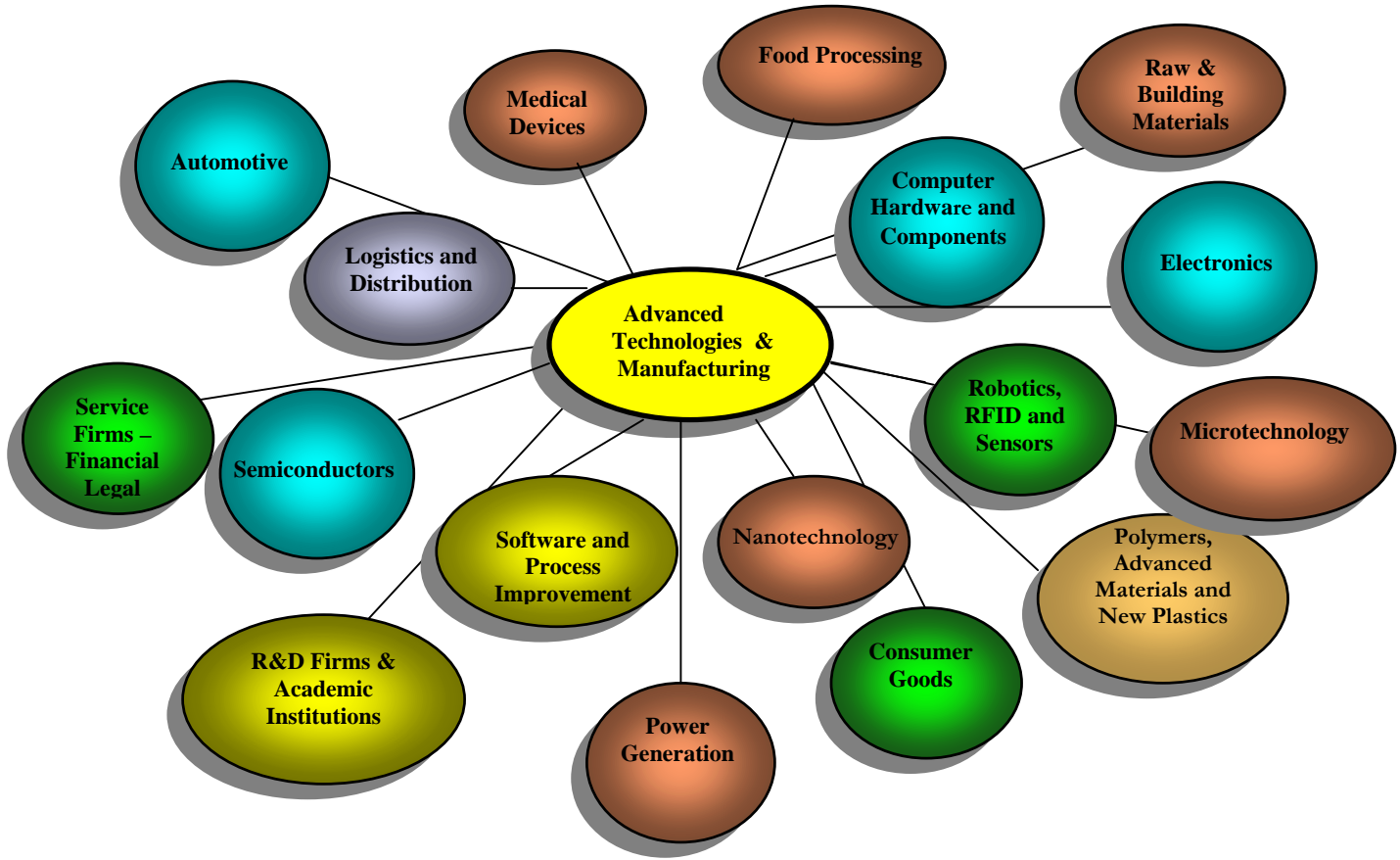
For the purpose of this assessment report, Advanced Technologies and Manufacturing may be defined as the integration and utilization of technologies in a system of production to improve processes and techniques to produce goods and services faster, cheaper and cleaner. AT&M demonstrates how imbedding technology into the manufacturing process improves workflow in the production process and streamlines fulfillment and distribution channels to increase global competitiveness.

At the beginning of the assessment process, a snapshot of industries and stakeholders in the cluster was proposed. The core industry representatives and stakeholders included:

- Automotive and Related Transportation
- Computer Hardware and Components
- Software Development & Packaging
- Electronics for Commercial Purposes
- Polymers, Advanced Materials & New Plastics
- Robotics
- R&D Firms and Universities
- Related Service Firms
- Logistics and Transportation

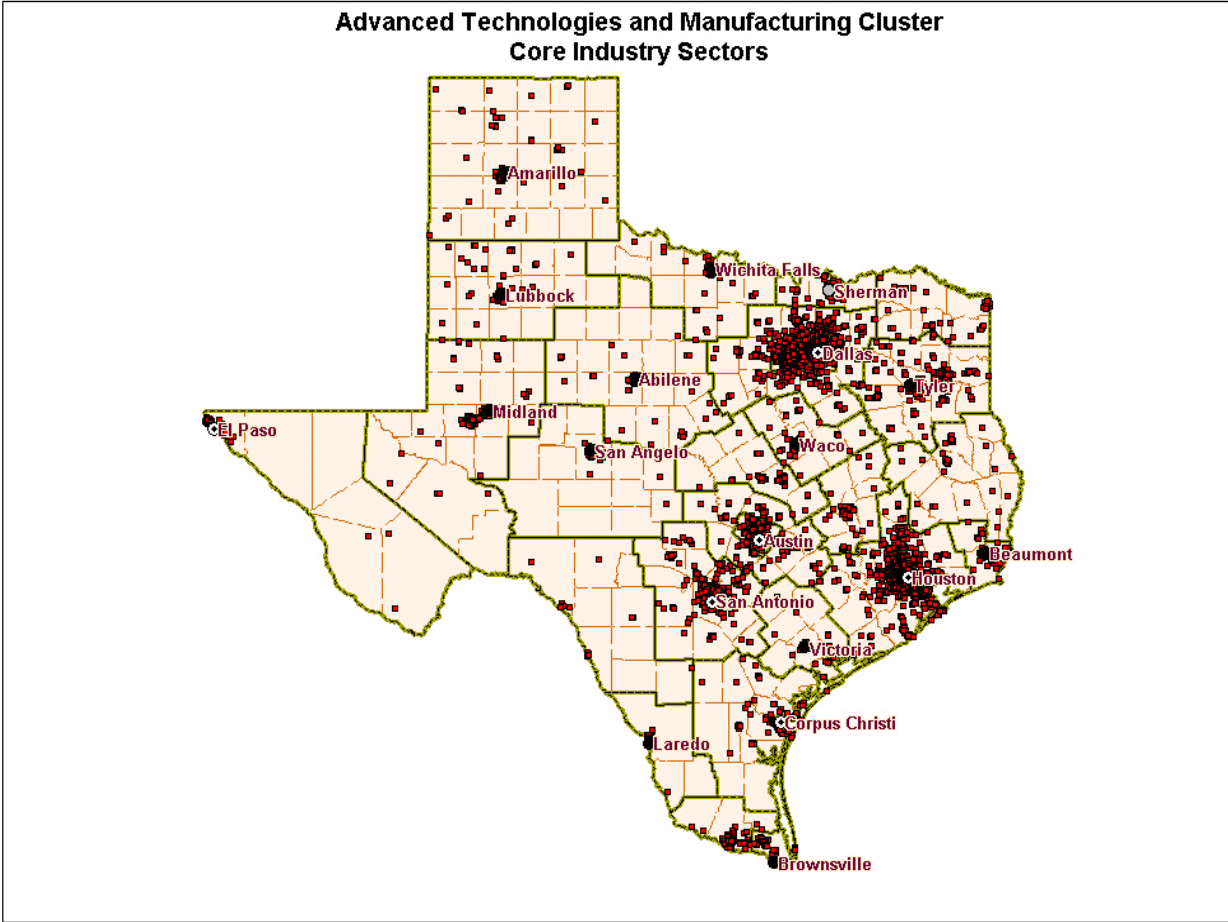
During the course of the AT&M Cluster team's work and assessment, a deeper more dimensional picture of the cluster emerged. Through the analysis of data and input from the regions, many more industries and stakeholders were added to complete this representative picture. This model looks at market segments that comprise the cluster, included primary manufacturers, automotive, food processing, electronics, building materials, robotics, Information Technologies such as computers, sensors and hardware, semiconductors and nanotechnology. It also includes service companies that directly support the core industries including logistics and distribution, power generation and service firms that support cluster activities. Those include research labs, academic institutions, workforce providers and capital investors. All parties must be contributing to the overall output of the cluster in order for the cluster to thrive. The outcome of the assessment is depicted in Figure 3.1.

**Figure 3.1
Stakeholders and Industry Representatives for the Advanced Technologies and Manufacturing Cluster Team²**



The AT&M Cluster entities around the state of Texas have been plotted on the map depicted below. The map shows centers of activity, high numbers of employees in manufacturing and support industries, R&D and related industries such as distribution centers. The data applied to map the activity in this cluster across Texas was generated using the North American Industry Classification System (NAICS) codes for pure manufacturing and the associated industries. They include those industries which represent a core function, product and or technology within the cluster. Service and support industries not found in the selected NAICS were not plotted on this map.

Figure 3.2 Advanced Technologies and Manufacturing Regional Cluster Concentration³



High-centers of activity include Dallas/Fort Worth, Houston and Bay Area, Austin, San Antonio. This is to be expected as the metropolitan areas had strong access to workforce, logistic and supply chain channels, the presence of OEMs and supporting associations for technology growth. These four metropolitan areas had high concentration of high-tech manufacturers and R&D presence in semiconductors, nanotechnology, electronic and medical devices, transportation and component manufacturers, as well as defense contractor manufacturing. Other areas of activity include South Texas, The Rio Grande Valley, Brownsville area, Midland, Corpus Christi, East Texas and El Paso. Industries such as energy, refining, food processing, automotive, component and final assembly for the electronic, consumer goods and medical device market segments can be found in these five regions across Texas.

4 – The Competitive Landscape

In the 2005 AeA, Cyberstates Report, Texas was ranked second behind California for high-tech employment. Texas was also recognized for its number of manufacturing and skilled technician jobs. For example, in the semiconductor manufacturing market segment, Texas has more than 36,900 employees. (Cyberstates 2005 Report, AeA). However, 2004 was the fourth year of declining employment in the high-tech manufacturing industry. As part of a global economy, cluster participants identified global industry trends that threaten the manufacturing and engineering job stability in Texas.

- The U.S. is experiencing permanent job losses due to overseas competition.
- Small, newly established companies are unable to compete with global leaders that have adopted advanced manufacturing technologies to produce goods quicker, faster and cheaper.
- Inexpensive, low-wage laborers decrease the cost of doing business. Companies in Texas have overhead fixed costs (workers' compensation, healthcare and benefits) and wage expectations that create a barrier when competing against foreign workforce wages.
- Companies that do not adopt smart supply chain strategies, which encompass finance, distribution and inventory models, are unable to compete globally.

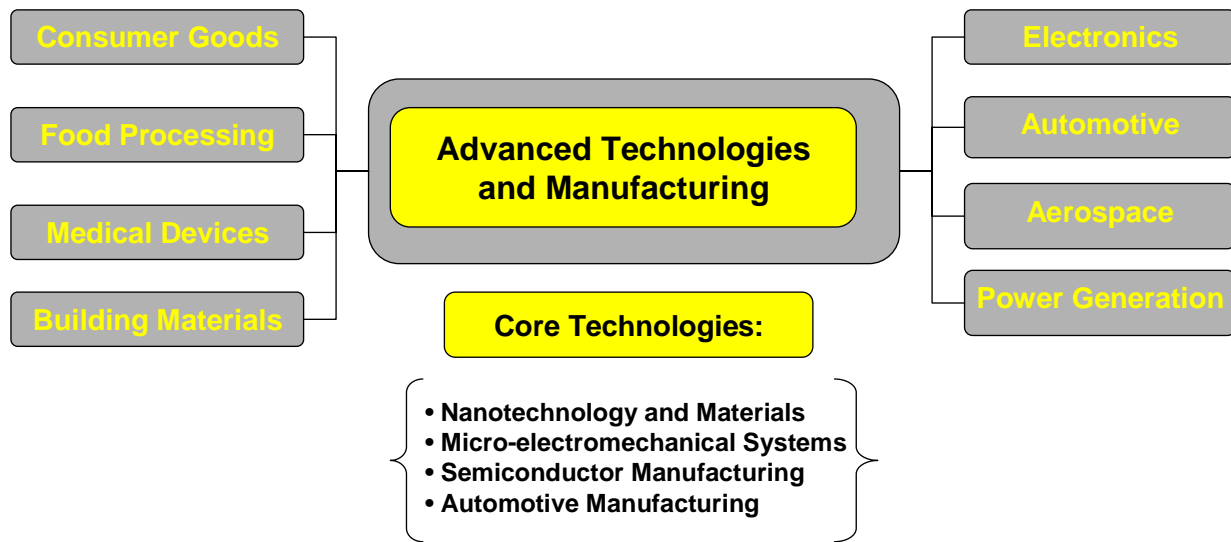
Once the threats to jobs and company retention were identified, participants attempted to propose solutions to increase global competitiveness. Solutions included identifying converging technologies among the other target industry clusters as well as advanced manufacturing processes and technologies that increase efficiencies in the production of goods.

Solutions additionally focused on technologies and the elevation of the definition of “Advanced Technologies and Manufacturing.” The specific technologies and their utilization in a system of production and distribution of goods and services are outlined here to show the connections that demonstrate converging technologies. The converging technologies assessed for the advancement of the AT&M Cluster are

- Nanotechnology
- Advanced materials
- Micro-electromechanical systems
- Semiconductors
- Robotics
- Wireless (GPS, GIS, smart networks)
- Power generation

These technologies are imbedded within some of the technologies and processes outlined below.

Figure 4.1 Cluster Converging Technologies⁴



Producers are taking steps to transition from traditional manufacturing to production that integrates technology and less-labor intensive environments. Advanced manufacturing technologies, such as nanomanufacturing, are predicted to have an impact of more than \$91 billion on the industry, allowing producers to generate products faster, cheaper and cleaner. Market trends continue to push prices down, forcing manufacturers to increase efficiency and find new ways to add value in order to maintain profitability. Investments in technology, a commitment to research and innovation, cross-training the workforce and streamlining the supply chain are among the strategies being employed to reduce costs associated with production and distribution.

Cluster team members were asked to forecast future industry trends, focusing on those factors that will shape the AT&M Cluster. The table summarizes the findings.

Table 4.2 Changing and Future Industry Trends⁵

Future Trends	
Industry – Business	<ul style="list-style-type: none"> • Streamlined, high-tech, high production manufacturing plants are smaller with fewer employees • Adoption of new supply chain distribution strategies that reduce fixed costs. • Introduction of new technologies and advanced applications makes it difficult for industry to keep up. Movement away from traditional manufacturing to more skilled workforce and sophisticated plants • Standardization and system interoperability must link systems together across platforms and geographic locations • Global standards and creation of new customer markets
Technology	<ul style="list-style-type: none"> • Integration of technologies that lead to cheaper, faster and cleaner processes within the production cycle; for example, mobile and wireless technologies that are transforming supply chain and manufacturing processes • Process technologies that increase fulfillment and supply chain efficiencies • RFID, nanotechnology, wireless, advanced materials, sensors, chips, robotics, IT • Intelligent Controls and Systems • Advanced Energy Efficiency Technologies • Securing intellectual property via technology and education

Future Trends	
Workforce & Education	<ul style="list-style-type: none"> • Workforce will have a mix of education, industry certifications and continual on-the-job training • Workforce will be required to have a standard level of technology skills – IT, robotics and others • Students will be required to increase science & math training at the K-12 level. Students will need to focus on application learning • Aging/retiring workforce will need to be recruited to transfer knowledge with up-coming workforce. Education system will need to integrate this resource into workforce pipeline • Increasing emphasis on soft skills • Education system must respond to need for just-in-time workforce model. • Higher level of collaboration with government and industry • Creating, funding and sustaining successful public/private collaborations and partnerships drive regional growth • Downsizing due to outsourcing and off shoring has short and long term regional implications. Downsizing due to the introduction of technology has longer-term implications • Will see an increased need in technicians, maintenance and standard skillsets
Starting & Growing Companies	<ul style="list-style-type: none"> • Ability to leverage cross-cluster collaboration will be critical • Federal and private R&D must be increased and leveraged • Commercialization and collaboration using existing IP key to growth and spawning of new companies • Resources within incubators and large OEMs must be made available to start-up companies. This will aid with financial constraints and lower company failure rates
Globalization	<ul style="list-style-type: none"> • Accept as a trend. Retain service industry excellence, final assembly and innovation in Texas • Partner and collaborate with India and Asia, as they continue to advance in setting standards and investment in advanced manufacturing technology markets such as distributed control systems and programmable logic controllers • Companies must develop strategic plans that include global market expansion, however, ensure IP is retained in Texas • Fulfillment and distribution solutions that increase productivity and reduce cost

These observations and recommendations will aid in shaping what the AT&M Cluster profile will be in the near future. It should be noted that the findings outlined above also highlight which industry trends could prevent the growth and expansion of manufacturing in Texas. Through education and training courses around supply chain and business variable costs, IP and workforce reform, Texas could drive ahead of other states in preventing the loss of economic prosperity in the manufacturing and R&D segments. Again, collaborating with alliances will also ensure the proper allocation of resources and the creation of new technologies that build competitive companies.

5 – Assessment Methodology and Approach

In order to engage a broad set of stakeholders and to capture their ideas for building an AT&M Cluster strategy, statewide activities were launched to include:

- An electronic survey to capture state and regional opinions around technology, entrepreneurship and cluster strategies
- Interviews with 40 key stakeholders (government, academia, industry)
- Four regional forums (Austin, Weslaco – The Rio Grande Valley, Houston, Dallas/Fort Worth and Tyler - East Texas)
- Ongoing legislative and policy discussions with the cluster team

The intent of this qualitative approach was to gain valuable insight, commentary and guidance from over 250 industry leaders, public agency representatives, academia, vendors and suppliers. The ultimate goal to determine best practices and allocation of resources to foster the growth of the cluster.

Complementing the qualitative and participant information was an extensive process of quantitative data collection from several third party and original sources. These sources included:

- RAND Corporation’s RaDiUS (Research and Development in the U.S.) database on federal funding
- Schoenfield & Associates database on private sector R&D
- CHI Research patent database
- Texas Workforce Commission (TWC) employment data
- Input from the AT&M Cluster team

These sources provided the information on assets and activities building the knowledge base for this cluster. Through this approach, a series of recommendations were created for the cluster assessment.

6 – Qualitative and Quantitative Data

6.1 – Qualitative Data – Survey of the State and Regional Mindset

Online surveys were taken by AT&M Cluster stakeholders. The survey results paralleled the cluster participant input from the regional forums and one-on-one executive interviews. A survey summary focuses on responses that fall within the common themes surrounding workforce, education, technology and commercialization and business climate issues.

The majority of responses focused on improving the business climate and reducing the fixed costs of operation for Texas businesses. Those whom contributed opinions and expertise emphasized the importance of collaboration with academia, government and other competitive industries.

- Reduce the regulatory burden by eliminating over-lapping and duplicative regulations. Streamline standards and eliminate labor-intensive administration due to disconnected legislative policies.
- Extend tax incentives to businesses hiring and training unskilled workers

- Leverage existing resources and advancements in nanotechnology, medical sciences, semiconductors, alternative fuel and power sources, to advance the AT&M Cluster. Explore areas of converging technologies
- Leverage proximity to Mexico and other border areas
- Develop entrepreneurial culture. Provide links to best practice resources through incubators and access to funds
- State needs to support the channeling of research into commercialized products. Areas of focus may include semiconductors, nanotechnology, IT, robotics and medical sciences

1. Workforce and Education Issues

From the survey responses, it was evident that the participants were concerned about the lack of a skilled workforce pipeline from which to draw future employees. The gap must be decreased between industry needs and the skills graduates have mastered upon entering the workforce. The following recommendations addressed this issue.

- The state and its agencies need to encourage and support the re-establishment and funding for vocational programs within the K-12 grades.
- Currently, thirty percent (30%) of students that graduate from high school in Texas go to college. While efforts to increase that percentage should continue, those students ready for the demands of the workplace should be encouraged to apply for apprenticeships, internships and or certificate training that support the industry need for skilled electricians, insulators, mechanics and welders.
- Higher emphasis on application-based learning
- Industry must interface with academia for curriculum development.

2. Big Ideas / Best Technology Bets

The focus on what technologies will provide business opportunities stems from the premise that clusters thrive in areas of technological innovation. Within the AT&M Cluster several advanced technology opportunities were identified including

- Medical devices, pharmaceutical manufacturing and the convergence of technology within the life science cluster
- Digital manufacturing – processes and layering technologies
- Nanotechnology – materials, structures, carbon nanotubes, nano-electronics
- Microsystems – integrated circuit technologies, biotechnology.
- Technology for the automotive industry, including production within that industry – hybrid technologies, alternative fuels, multimedia, robotics, tracking and sensors

Survey respondents also outlined the importance of streamlining advanced manufacturing processes, through supply chain applications and integrating technology into the production process.

3. Commercialization and Innovation

In the survey, innovation was described as the creativity process sparking new products and services leading to accelerated growth in revenue, sales and or recognition. The respondents

were asked questions around research, commercialization of ideas and their level of satisfaction with business services supporting innovation within a cluster.

- 90% of respondents indicated that it is very important to attract and retain entrepreneurial managers, talented scientists and engineers
- 50% of respondents felt that the cluster would progress further through investing in entrepreneurial talent
- 95% of respondents felt that product innovation is very important to the cluster
- 66% felt that progress is being made in terms of companies having access to capital and access to new markets
- In the area of public investment to further the success of technology/science clusters in Texas, respondents felt that university research, access to workforce training for skilled employees, business recruitment, retention of commercialization infrastructure and tax incentives were important to the growth of the cluster.
- For the process of innovation, employees were ranked highest as contributors to the development of ideas and products. Customers, buyers, competitors, suppliers, universities and research organizations were ranked in order after employees.
- When asked about their level of satisfaction with regional business support services as they relate to AT&M Cluster industries, respondents ranked accounting, legal, banking and trade and professional associations highest, with ratings of forty to fifty percent (40-50%) responding “satisfied to very satisfied.” University technology transfer and economic development services had the lowest satisfaction ratings with thirty to thirty-five percent (30% and 35%).

4. Business Climate Issues

Respondents also had an opportunity to answer several narrative questions. The following list reflects feelings on positive reasons for relocating to or expanding business in Texas:

- Quality of life
- Climate
- Lower cost of living and doing business
- Tax structure and lack of government regulations
- Can do/entrepreneurial spirit
- Central location in the U.S. – prime for international business
- Uniqueness of Texas cities and regions
- Texas University System

This list should prompt legislators to focus on areas that require resources to maintain standards of excellence and ensure policy does not increase the cost of doing business.

6.2 – Qualitative Data – Stakeholder Interview and Regional Forum Perspectives

Information gathered from interviews and regional forums fell into five major categories – the T&M Cluster, workforce, education, business climate and commercialization and entrepreneurship. Common themes from these are presented below.

Table 6.1 Summary of Regional Common Themes from Interviews and Forums⁶

Advanced Technologies & Manufacturing Cluster

Common Themes

- A unifying perspective would define the cluster as specific technologies and their utilization in a system of production and distribution of goods and services. A system rather than a function or series of functions.
- There are insufficient structures and government financial assistance for dedicated research into cluster activities.
- Texas has vast expertise in logistics and supply chain. Texas should be branded as a hub of excellence.
- Important to link and explore opportunities in converging technology arenas with the other five clusters.
- Outsourcing and off shoring are threats to the growth and health of the cluster.
- Proximity to Mexico and other state borders has both advantages and challenges – increased competition, worker mobility and economic development issues.
- Develop logistic strategies which emphasize
 - Ship goods in a condensed form to 2-3 U.S. locations, then add value and move them to their final locations.
 - Source components and design from numerous sources. Perform final assembly in Texas.
- Microtechnology – nearer-term potential than nanotechnology – sensors, integrated circuits, pervasive computing.

Workforce

Common Themes

- Industry must be involved with education for the building of a strong workforce pipeline.
- There is both job growth and job contraction in the cluster. Understanding these trends is vital to all stakeholders.
- Texas' Skills Development Fund is an effective means of specialized worker training.
- Texas must recognize the changing and diverse workforce demographics. Incorporate this in workforce planning.
- Texas requires a “just-in-time” workforce model.
- The lack of understanding and knowledge about career opportunities at the K-12 level is creating a negative impact on the potential labor pool size for this cluster.
- Training the workforce should be seen as a statewide priority. Requires a statewide strategy and funding.
- New, emerging manufacturing technologies in the cluster demand more highly skilled workers.
- Broaden training of engineers – provide them with cross-industry skills to help them adapt to technology shifts.

Education

Common Themes

- Solutions for building a workforce pipeline should include curriculum development, cross-training, industry certification programs, language training reflective of demographics (bilingual), math and science focus.
- Educational attainment in Texas can be improved. Increase number of students eligible for post-secondary degrees.
- Remove programs that do not result in degree or industry recognized certification.
- University/industry collaboration to optimize research; discussion on the benefits of applied verses basic research.
- The state needs a tier-one university.
- Curriculum development has a long lead time – need faster turnaround and need industry involvement.
- Use financial incentives to attract top research and engineering talent to universities

Business Climate

Common Themes

- Texas economic development strategy is focused on attracting and retaining large companies rather than starting and growing Texas companies. There needs to be an established entrepreneurial focus and start-up support network.
- Evaluate new means of funding worker training such as state matching funds.
- An incubator system could help optimize R&D and advance commercialization programs.
- Texas should invest in broadband, wireless, VoIP (Voice over Internet Protocol).
- Fixed costs for manufacturers in Texas impact their ability to compete – address tort reform, workers' compensation, site investment, equipment taxes and healthcare benefits.
- Tax rebates and franchise tax reform would benefit manufacturers and attract new businesses.
- Statewide economic development plan should benefit and incorporate regional interests.
- Resources for companies seeking supply chain advancement, such as financial models and partnering with associations such as TMAC for best-practice solutions for lean manufacturing and streamlining distribution.
- Encourage union flexibility to permit cross-trained workers to fill multiple roles.

Commercialization and Entrepreneurship

Common Themes

- SBIR funding is relatively concentrated and could present opportunity for commercialization efforts.
- System and processes for commercialization of research out of university labs needs to be reformed.
- Insufficient access to capital for start-ups.
- Promote retention of intellectual property within companies and U.S.
- Strengthen Texas' venture capital (VC) and entrepreneurial communities to attract VC dollars. Companies created should be encouraged to stay in Texas. Keep investment in Texas.
- Identify and leverage synergies between advanced manufacturing cluster strengths:
 - Pharmaceutical, medicine and integrated circuit technology: sensors, medical devices and digital manufacturing.
 - Biotechnology and agriculture: value-added crops and livestock, food quality and safety control.
- Leverage proximity to waste streams and support initiatives to recycle / refurbish end-of-life products.
- Leverage proximity to both Mexico and U.S. markets as to form a 'bridge' between Mexico's labor force and U.S. markets.

6.3– Quantitative Data – Unclassified R&D Funding to Texas by Technology Sector

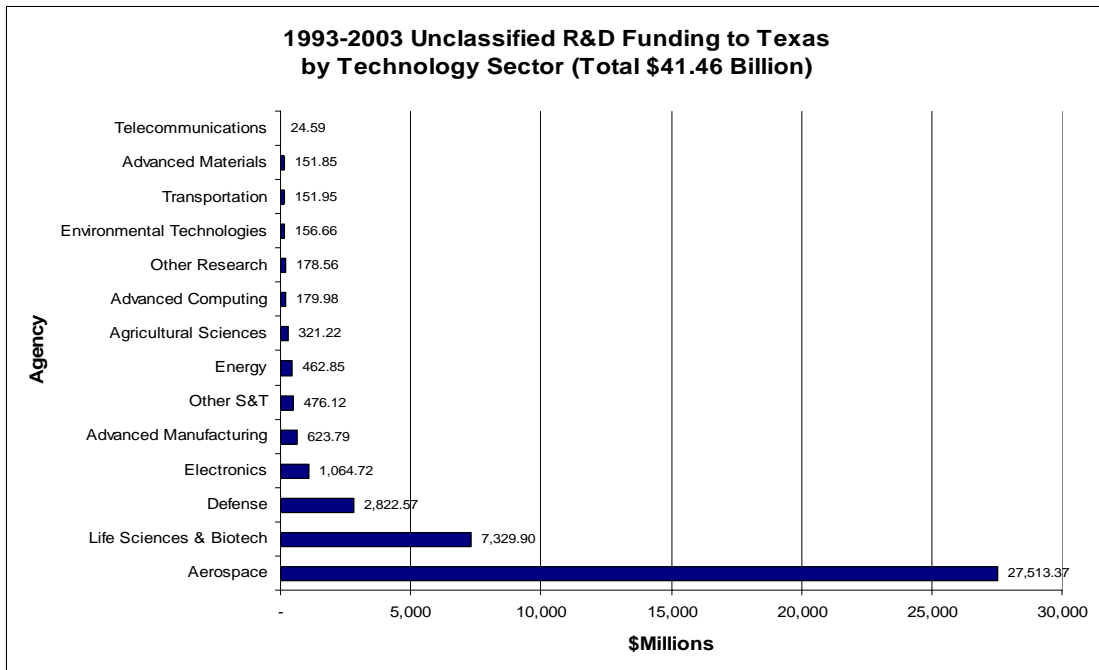
Over a ten-year period between 1993 – 2003, Texas received a total of \$41.6 billion in federal funding. This dollar amount is the result of agencies at a federal level granting funds for the advancement of technology, the education system, social services and the creation of programs to advance manufacturing processes. Agencies may include the Departments of Labor (DOL), Justice (DOJ), Defense (DoD) and National Science Foundation (NSF) to name a few.

Emerging technologies in the AT&M Cluster such as sensors and MEMS and integration of IT systems present new opportunities for federal funding. Over \$600 million in unclassified federal R&D funding for advanced manufacturing has been received by Texas from 1993-2003. Most funding went to Dallas and Brazos counties and came from DoD. This funding peaked in 1994 and has leveled off in the most recent years to just under \$20 million each from both DoD and NSF. Advanced materials funding to Texas during this period totaled \$152 million; 85% from NSF.

Table 6.2 - Unclassified R&D Funding to Texas by County⁷

COUNTY	TOTAL R&D FUNDING
Dallas	\$18.20 Billion
Harris	\$15.33 Billion
Travis	\$206 Billion
Bexar	\$1.55 Billion
Brazos	\$868.71 Million
Collin	\$724.60 Million
Denton	\$569.26 Million
Tarrant	\$527.95 Million
McLennan	\$292.80 Million
Hunt	\$172.87 Million
El Paso	\$115.53 Million
Montgomery	\$30.71 Million
Potter	\$9.06 Million
Brazoria	\$4.21 Million
Fort Bend	\$2.89 Million
Williamson	\$2.66 Million
Randall	\$0.73 Million

Table 6.3 Unclassified R&D Funding to Texas by Technology Sector⁸



6.3 – Quantitative Data – Small Business Innovation Research (SBIR) Data

From 1993 – 2003, Texas received a total of \$209.08 million in SBIR grants. As a state, Texas ranks between eighth and ninth in terms of total national SBIR granted funds. Even though there continues to be an increase in SBIR grants to Texas agencies and businesses, this is still relatively low compared to other states that have comparative research activities and advanced technology companies residing in the state. One reason may be that Texas does not have a strong program for matching funds. The Texas Emerging Technology Fund may provide the conduit to increasing matches of state to federal funds. Unclassified SBIR Funding to Texas is illustrated in Table 6.4.

Table 6.4 Unclassified SBIR Funding to Texas from 1993 – 2003⁹

**1993-2003 Unclassified SBIR Funding to Texas
Total (\$209.08 Million)**

Agency	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	1993-2003 Total
HHS	2.12	3.96	6.16	6.05	8.39	8.96	11.69	9.17	13.03	14.46	15.83	99.82
NASA	3.62	5.17	6.48	6.51	6.09	5.18	6.48	5.03	4.51	6.26	5.30	60.62
DOE	0.18	0.71	0.96	1.38	2.47	2.17	2.34	3.05	2.57	2.89	3.89	22.62
NSF	0.96	1.05	1.44	1.95	1.79	2.10	1.80	1.53	1.45	2.12	2.90	19.07
USDA	0.03	0.05	0.11	0.23	0.34	0.59	0.59	0.31	0.32	0.43	0.58	3.58
DOC			0.03	0.03	0.10	0.07	0.49	0.19	0.29	0.15	0.42	1.75
EPA			0.01	0.01	0.02	0.03	0.01	0.14	0.41	0.33	0.23	1.20
DOT	0.07	0.11	0.07	0.06	0.06	0.05						0.41
DOD*												N/A
FY Total	6.98	11.05	15.25	16.22	19.25	19.15	23.40	19.41	22.58	26.64	29.14	209.08

**DOD SBIR data is restricted*

6.5 – Quantitative Data – Patents

Over a ten-year period (1993-2003), Texas received 73,200 patents. Over 90% of Texas’ patents were from three metropolitan areas – Austin, Dallas-Fort Worth and Houston-Galveston. Austin and Dallas-Fort Worth focus mainly on high tech industries such as computers, telecommunications, semiconductors and pharmaceuticals. While, Amarillo, Houston-Galveston and Midland-Odessa concentrate on more traditional industries such as oil exploration and drilling, industrial machinery and chemicals.

The Semiconductors & Electronics category accounts for around 10% of Texas’ patenting from 1997-2003. This is a higher percentage than the national average for this timeframe. The leading companies in Texas in this technology area are Advanced Micro Devices (AMD), Freescale Semiconductor Inc., STMicroelectronics and Texas Instruments. See appendices for detailed analysis on patents in Texas.

7 - SWOT (Strengths, Weaknesses, Opportunities and Threats) Analysis

Regional forum participants were asked to provide regional perspectives on the strengths, weaknesses, opportunities and threats they recognized locally within the AT&M Cluster. The regions included Houston, Austin, Weslaco - The Rio Grande Valley, El Paso, Tyler - East Texas and the Dallas/Fort Worth area. The following summaries of the regional forum SWOT findings have been labeled according to the regions and broken down to highlight the top recommendations.

Table 7.1 Regional SWOT Summary¹⁰

Houston

Strengths	Weaknesses
<ul style="list-style-type: none"> Advanced technologies across multiple markets – medical, IT, energy, aerospace and Nanotechnology. These industries have strong roots in technologies that drive new consumer market products. Logistic hub– ports, highways, air, IT and broadband. Houston is a center for distribution and supply chain fulfillment. 	<ul style="list-style-type: none"> Low percentage of federal funds that are immersed into Houston result in the commercialization of technology or emergence of new companies. Requires new processes to drive innovation. Academic colleges and institutions need to understand the “just-in-time” workforce concept. Curricula and programs need to focus on training and skills requirements of the workforce.
Opportunities	Threats
<ul style="list-style-type: none"> Recruit retiring experts to teach and train the future workforce. Houston has a growing retiring population and cannot afford to lose the expertise. Houston companies should leverage the global infrastructure assets to expand their customer markets. Business opportunities: nanotechnology, alternative energy sources, medical devices and sciences, robotics and eLearning. 	<ul style="list-style-type: none"> State does not have an effective system that can be leveraged to match federal grant funds for programs such as advanced manufacturing, space, medical research. Air quality Immigration and changing demographic profiles threatens the workforce pipeline and graduate numbers from the K-12 education system.

Austin

Strengths	Weaknesses
<ul style="list-style-type: none"> Strong business associations with close government ties – AeA, Austin Technology Council, Austin Chamber of Commerce and others that promote collaboration between businesses, government and academia Strong promotion for entrepreneurship through the growth of angel, VC and private funds. 	<ul style="list-style-type: none"> Need more emphasis on seed fund channels. Companies and entrepreneurs need to know where to access financial opportunities. Austin has an over-arching theme of promoting slow growth, minimal expansion of companies. Need better “just-in-time” training programs to respond to industry needs.
Opportunities	Threats
<ul style="list-style-type: none"> Propose exit interviews for companies leaving Austin and or the state to aid in recruitment and retention of companies. Creation of a program that focuses on the education and exposure of career counselors in the K-12 and post educational systems. 	<ul style="list-style-type: none"> Semiconductor companies require strong supports from legislative bills that promote expansion, R&D and workforce training. Absence of statewide approach to workforce training and funding is hindering our ability to retain experts in Texas and compete globally.

The Rio Grande Valley

Strengths	Weakness
<ul style="list-style-type: none"> • Location - Easy to access NAFTA, CAFTA and global market channels. Access to customers via air, land and sea. • Breadth of market interconnection - in terms of workforce, technology and customers (space, health sciences, food processing and advanced manufacturing). 	<ul style="list-style-type: none"> • Branding - Because the region is not seen as industry advanced, The Valley needs an economic development and marketing strategy. • Brain Drain - Workforce with skills and expertise are recruited, but leave after term is finished. Graduates leave for better opportunities.
Opportunities	Threats
<ul style="list-style-type: none"> • Leverage the border towns maquiladora and workforce to grow industry base and attract targeted industries. • Available investment dollars need to be channeled into a recognized program that makes finance and entrepreneurial capital available. 	<ul style="list-style-type: none"> • Design and manufacturing centers are moving offshore to China, South America, Indonesia and India, making it difficult to attract economic investment. • Social trends and demographics - dropout rates, crime and clashes between cultures negatively impact economic development.

El Paso

Strengths	Weaknesses
<ul style="list-style-type: none"> • Strong manufacturing activities with access to a talented workforce. Manufacturing in chemical, petroleum, consumer products, automotive, defense and electronics. • Advanced Technology Center exhibits an excellent model for collaboration between agencies, academia and industry. 	<ul style="list-style-type: none"> • Negative image portrays El Paso as having cultural issues. Requires a focus on marketing and branding. • Location - Cut off from major metropolitan centers such as Dallas, Austin and Houston has a negative effect on building collaborations.
Opportunities	Threats
<ul style="list-style-type: none"> • University of Texas at El Paso has invested in research and curriculum programs that meet a “just-in-time” workforce skills need. \$30 million plus increase from past years. • Business opportunities in homeland security, final assembly, MEMS, nanotechnology, automotive and health. 	<ul style="list-style-type: none"> • Close proximity to low-wage workforce threatens economic investment opportunities. • No workforce pipeline to support growing high-tech industries – engineering, researchers and industrial managers.

Dallas/Fort Worth

Strengths	Weaknesses
<ul style="list-style-type: none"> • Strong OEM, mid to entrepreneurial size companies. Companies strong in technology, logistics and research. • Strong presence of secondary education institutions offering varying programs. High number of programs with math, science, technology and management. 	<ul style="list-style-type: none"> • Policy for licensing intellectual property at the university hinders collaboration and commercialization process. Does not favor industry processes. • Economic development strategies are regional and highly competitive. The metro area does not work together to secure projects of benefit to the region.
Opportunities	Threats
<ul style="list-style-type: none"> • Logistic and supply chain assets should be leveraged for regional profitability. Investment in hubs will create lower operational costs for companies, attract new companies and create centers of excellence and best practices. • Leverage the DFW venture capital, incubators, research labs and entrepreneurial channels as a model on how to grow the next generation of companies. 	<ul style="list-style-type: none"> • Global competition for workforce, manufacturing sites and distribution centers. Businesses need to understand the importance of cost analysis and retaining intellectual property in Texas. • K-12 programs are not producing college ready graduates or qualified workforce.

East Texas

Strengths	Weaknesses
<ul style="list-style-type: none"> • Strong base of recognized industry leaders in distribution, call centers, manufacturing components, food processing and research that attract other vendors and suppliers. • Real Estate • Recognized school of Engineering at University of Tyler • BMC in Athens is an asset. 	<ul style="list-style-type: none"> • East Texas needs to attract their share of state dollars to invest in academics and economic development. • ISD does not have a technology focus or a plan to create internships, apprenticeships and shop classes; therefore, graduates lack skills need by industry.
Opportunities	Threats
<ul style="list-style-type: none"> • Build-out IT and telecommunications networks to aid in business recruiting and retention. • Business opportunities in bio, health, food processes and research, supply chain and nanotechnology. 	<ul style="list-style-type: none"> • Need a collaborative effort at the state level to award incentives and reducing operational costs for companies. • OEMs are seeking to reduce number of suppliers. Lean supply chain practices will reduce workforce numbers.

8 – Recommendations and Implementation

8.1 – Strategic Recommendations for Elevating Texas’ Competitiveness

Participants isolated these core issues to address in developing recommendations for integrated approach to the implementation phase of the cluster initiative:

- 1) Education and Workforce – Develop and leverage programs that will enhance the communication between industry, education and government on short and long-term workforce needs. Reduce the gap between the skills industry needs and what is taught in the educational system.

Establish a statewide council to address regional needs, design curriculum to meet industry need and promote programs that result in a degree and or certification. The objective should be to build a workforce pipeline capable of applying industry required skills meshed with academic theory for a well-rounded employee.

- 2) Resources – Promote associations, technology centers and state resources to increase competitiveness and process improvement across the cluster.
 - a) Create a Supply Chain Resource Bank, an inventory of best practices, cost-effective operation structures, distribution partners, logistic hubs and a financial model for fulfillment and process improvement.
 - b) Establish commercialization centers and incubators across the state to show commitment to entrepreneurship; provide access to successful mentor programs, business planning, financial and capital resources. Example: Texas Emerging Technology Fund – Regional Centers for Innovation and Commercialization. (RCICs).

- 3) Capital and Commercialization – State needs to allocate funds that can be specifically used to match federal grants. Other grant matches may include company or private funds. Matches should foster new company or business segment growth, R&D, creation of new jobs in Texas and program development.
- 4) Retention, Attraction and Entrepreneurial Development Strategy – Seek a better balance between attracting, retaining and growing companies. Economic development partnerships and councils need to work from a statewide strategy to maximize regional branding, effectively growing clusters. This will aid in the allocation of state resources to promote job growth, infrastructure, academic institutions and attracting companies that are globally competitive.
- 5) Cluster Growth – The state needs to excel in promoting the AT&M Cluster and other clusters that contribute to the AT&M Cluster. The focus should be on implementing a strategy for economic opportunities, commercializing technology and creating a world-class workforce.

8.2 – Implementation Strategy

The AT&M Cluster team prioritized strategic activities for implementation by regional and state leaders. These priorities complement the recommendations of the State Strategy on Advanced Technologies (SSAT), Texas Technology Initiative (TTI) and SEMATECH and build the foundation for successful clusters – workforce, retention of companies, innovation and technology commercialization and capital. The AT&M Cluster team proposes to continue this effort with expanded emphasis on regional efforts.

Immediate Impact

Collaboration

- Enhance supply chain for reduced material and distribution costs.
- Create a statewide council to focus on emerging technologies and Texas’ ability to grow innovation.

Workforce

- Promote the web site www.workintexas.com, which provides free resources to employers and job seekers and is a developing inventory of Texas’ workforce supply and demand.
- Identify and fund statewide expansion of K-12 educational programs that will build a responsive and highly skilled workforce pipeline based on the needs of industry.

Commercialization

- Provide information about grants and resource assistant programs to help companies secure more federal funding for research and commercialization.
- Market resources and programs of technology associations and assistance centers such as Texas Nanotechnology Institute (TNI), TMAC, etc. Draft policies and legislation that ensures their funding and survival.

Long-term Impact

Collaboration

- Communicate findings of the cluster assessment to regional economic development organizations to encourage the development of strategic plans that complement that of the state.
- Promote curriculum development for industry certifications, apprenticeship and internship programs that includes funding assistance from the state.

Workforce

- Identify corporate programs, which advance and invest in the next-generation workforce. Identify successful programs for funding that promotes statewide adoption.
- Provide tax incentives to companies that develop their own curriculum for skill advancement or retraining of incumbent workers contributing to job retention.
- Identify and invest in industry experts in math, science, physics as well as inventors and top researchers to support technology companies and the creation of a top tier university.

Commercialization

- Eliminate taxes paid on the purchase of R&D equipment.
- Continue to fund the Skills Development Fund, Texas Emerging Technology Program and Texas Enterprise Fund.

8.3 – Assessment Summary and Targets of Opportunity

In summary, the AT&M Cluster assessed the strengths, weaknesses, opportunities and threats within the cluster to identify challenges to the education and workforce systems, opportunities presented by emerging technologies, improvements to the business climate and processes to more effectively commercialize an idea into a viable product in Texas. The implementation phase of the Texas Industry Cluster Initiative must demonstrate committed leadership and allocate resources focused on these key areas.

This assessment explored emerging technologies and possible government funding strategies that have the potential to advance the AT&M Cluster. Technology and infrastructure opportunities are listed below.

- Manufacturing plant design to promote high productivity and cost efficiency
- Alternative energy sources– alternative fuel, wind, solar and gas
- Advanced manufacturing processes/precision assembly – software application tools
- Advanced airport and logistic hubs – commercial and private
- Supply chain strategies – streamlining through technology and financial models
- Incubators and commercialization centers
- Cross cluster converging technologies - biotech, aerospace, defense, life sciences, IT and energy
- Robotics
- Microelectronics (MEMS) and semiconductors
- Nanotechnology
- Sensors and other monitoring technologies

By identifying the technologies, the business opportunities emerge. Collaboration among the six target clusters will enhance shared resources, funding and program validity. It also promotes information sharing and a developing network of experts in technology and product commercialization that will drive innovation.

Collaborative Projects for the State of Texas

The AT&M Cluster team outlined two opportunities to foster growth in all of the clusters. Given focused collaborative effort, investment and nurturing could create economic success for the state of Texas. The first is a supply chain and fulfillment strategy that would be beneficial to all the clusters and particularly the AT&M Cluster. The second project describes an effective incubation to commercialization strategy. Both projects are presented in detail in the appendices.

9 - Advanced Technologies and Manufacturing Cluster Team Contributors

The Advanced Technologies and Manufacturing Cluster team is chaired by Denny Dellinger, COO of Stewart and Stevenson and co-chaired by Betsy Wietzman, Freescale Semiconductor. Cluster team members, contributors and assessment participants include:

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The Advanced Technologies and Manufacturing Cluster team was assisted by the Texas Workforce Commission (TWC), Office of the Governor, Texas Workforce Investment Council and New Economy Strategies, LLC.

¹ New Economy Strategies LLC. Texas Workforce Commission

² New Economy Strategies LLC. Governor's Cluster Advanced Technologies and Manufacturing Executive Team

³ Labor Market and Career Information, Texas Workforce Commission.

⁴ New Economy Strategies LLC.

⁵ New Economy Strategies. Texas Workforce Commission. Regional Cluster Forums.

⁶ New Economy Strategies LLC. Governor's Cluster Advanced Technologies and Manufacturing Executive Team

⁷ RAND RaDiUS. Federal R&D Funding Data – By County

⁸ RAND RaDiUS. Unclassified Federal R&D Funding Data – Technology Sector
Schoenfield & Associates

⁹ RAND RaDiUS. Unclassified SBIR Funding To Texas 1993 – 2003
CHI Research Inc.

¹⁰ Texas Workforce Commission. Regional Cluster Forums