State of Texas
Information and Computer Technology
Cluster Assessment

August 2005

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1.1 – Overview of the Texas IT Cluster Assessment

Over 300 people, from all segments of Information and Computer Technology (IT) and regions across the state participated in this IT Cluster assessment. Individuals representing industry, education, entrepreneurs, economic development, government, research, venture capital, regional organizations and non-profits worked together to review the state of IT in Texas and to make recommendations on how to strengthen the IT Cluster across the state and enhance its competitiveness across the nation and across the globe.

Among the six industry clusters identified by the state of Texas for focus, the IT Cluster is uniquely broad in the industry segments it encompasses, from computers, to software, to telecom, to IT-centric services. Moreover, IT is both an industry unto itself, but also an important if not a critical contributor to the other five clusters.

The IT Cluster is already a well-developed part of Texas' overall economy. Statewide, Texas has a strong heritage in various parts of the IT Cluster, with unique regional legacies that influence local economies and position Texas in the global marketplace. The Telecom Corridor® Genealogy Project tracks 5000 Texas companies who trace their roots back to Collins Radio and Texas Instruments, plus the presence (and often U.S. headquarter operations) of major global companies like Nortel, Alcatel, Ericsson, EDS and Cisco, as well as hundreds of other Texas entrepreneurial companies.

In the Metroplex, the legacy of reservation and travel systems began with Sabre and spawned Travelocity. The military presence in San Antonio and South Texas has helped those regions develop expertise and industry in Cybersecurity and related fields. SBC is now the 2nd largest service provider in North America and is busily upgrading its Texas and other states networks to broadband capability. Houston and the Gulf Coast's energy companies, Space Center, as well as world-renowned medical complex, depend upon IT technologies in a significant way. Austin's Dell Computer and Houston's Compaq (now HP) represent some of the world's major computer companies.

In April, 2005, the AeA published its *Cyberstates 2005* Report and announced that it was "full of bright spots for Texas high-tech industry." Texas ranks 2nd nationwide in the number of high-tech workers, in the size of high-tech payroll, in the number of businesses and in the value of high-tech exports. Texas is also 2nd nationally with employment in telecom and engineering; and ranked 3rd in venture capital investments.

But probing deeper into Texas' IT Cluster, examining qualitative and quantitative data, some issues surfaced that if not addressed today could jeopardize this positive performance and momentum in the future. And there clearly are opportunities for the IT Cluster to do even better in the future. These issues and opportunities are the core topics of this report.

1.2 – Recommendations

The IT Cluster team generated many specific ideas for programs, projects and follow on activities to address the issues and opportunities raised in this report, all of which it believes will contribute to the growth and health of the IT Cluster over time.

The IT Cluster team has two strong beliefs:

- Incremental efforts can have a beneficial and lasting effects if they are part of an organized strategy.
- Texas can build a perception of Texas as a high tech powerhouse – benefiting all six industry clusters – with a continuous and substantial program of communication to the public.

There was insufficient time in the assessment process to investigate and identify all the important ways that the IT Cluster could integrate with and leverage the other five clusters. Much interaction already naturally occurs as IT companies seek new market opportunities, yet the state should take an active role in driving interaction between IT and the other clusters, including outreach to academia, where such interaction is essential.

Common themes emerged across these clusters, and the establishment of statewide, cross-cluster teams for workforce and education, commercialization, collaboration, business climate, convergent technologies and opportunities would sustain momentum and increase the focus on targeting resources for the economic engines of Texas.

Texas has identified six "high tech" industry clusters as key to its future prosperity at the very time of a precipitous drop in the supply of Texas-grown high-tech-ready graduates, whether from high schools or colleges. This is a broad and multi-faceted societal problem, which goes beyond the scope of the IT Cluster assessment and the concern surfaced consistently in every region of the state. Industry, government and education sectors must unite to address and attack this problem.

Key, strategic recommendations from the IT Cluster team are outlined below, with more tactical recommendations included in Section 7 of this report.

1. **IT Cluster Development**
    Nurturing the IT Cluster, or any cluster, is a long-term job and the state should maintain ongoing activity along with the active involvement of industry and academia. This IT Cluster effort, while having impact in a relatively short time, could only scratch the surface of analysis, idea generation and future planning. An outgrowth of the assessment was greater understanding of the assets and expertise of Texas regions. The state should maintain an ongoing, active program to analyze, debate and promote the needs of the IT Cluster, in collaboration with industry and academia, including strengthening the interaction across regions to gather additional information, identify opportunities, communicate and connect similar initiatives and encourage collaboration within the state.

2. **Statewide Focus on Commercialization**
    While Texas works to attract significant national and global IT companies to Texas in order to have a catalytic effect in stimulating the economy, creating jobs and spawning off-shoot

companies, the state should focus even more effort in developing new IT companies via the commercialization of Texas-developed IT-related technologies. New companies not only create far more jobs but also typically represent the leading edge of where IT is headed globally.

We want Texas to have more than its fair share of the future IT companies not yet created. The recent passage of the Texas Emerging Technology Fund provides excellent opportunities and tools to the state to accelerate commercialization and capitalization.

Texas can take a leadership role to ensure that industry and education use their research engines to develop new programs, policies and funding models to grow existing business and support entrepreneurial efforts. Texas should adopt an aggressive statewide strategic approach to commercialization and engage all stakeholders in development and completion.

A new model for commercialization has been discussed within all the cluster teams. Efforts are underway to develop a "Texas Model" that will use the best practices of several proposals.

The IT Cluster team observed that Texas universities, by and large, place no particular priority on encouraging faculty "research engines" to contribute to the economic development of their surrounding community. In fact, it appears universities may have consciously or unconsciously created barriers in this regard rather than being active promoters and facilitators. One unfortunate result has been the export of Texas-generated research to non-Texas companies.

As part of a new direction for commercialization in Texas, we believe the state should change the "compensation plan" of Texas-funded university leaders such that actual commercialization of university research and ideas should constitute a meaningful portion of incentive compensation. We believe the state possesses other university funding levers that should also be used in this regard. We have no IT Cluster-only recommendation since we believe such a change in university leader attitudes will benefit all six industry clusters.

3. **Institute Workforce Assessment Forecast**
   IT Cluster workforce needs are not being adequately collected, analyzed and acted upon by industry, government and the Texas education and workforce systems. The state must play a key role in driving the development of a shared vision of skills and competencies. This vision must encompass educating individuals from the point of entry into our public education system through customized workforce training to meet the needs of industry.

   The IT Cluster team recommends the establishment of an ongoing, annual workforce assessment forecast that includes skills and competencies for IT workers in three, five and ten year increments including regional and statewide aggregate data. This forecast would enable Texas to establish clear and specific workforce goals so that education, training and recruiting and workforce providers could better plan and ensure an adequate number of skilled and prepared IT workers to meet employer needs.

In addition, more immediate needs must be identified and met. A working group from the six cluster teams should be formed to convene stakeholders who have the authority and commitment to develop actionable items and chart next steps that will ensure that Texas meets its workforce needs.

4. Promote the Texas IT Cluster

An ongoing state-run communications campaign both outside and within Texas is needed to establish the perception that the IT Cluster is core to the Texas economy. This affects Texas at many levels: attracting and keeping talented researchers and research dollars; leveraging intellectual property, communicating and preparing students for career opportunities in IT; building vibrant networks of entrepreneurs and their stakeholders and growing the IT Cluster itself.

Despite some strong regional positioning (e.g., DFW for telecom, Austin for software and computers, San Antonio for Cybersecurity, Houston for aerospace, energy and healthcare) IT in Texas is still fragmented and its strengths are not fully known or appreciated. Perception will become reality.

5. Statewide Broadband Infrastructure

The IT Cluster received widespread support for ensuring Texas' infrastructure becomes more globally competitive. Therefore, all appropriate state regulatory and tax policies should be reviewed to determine how well they create or inhibit deployment incentives – and ease of market entry – for the widespread expansion of the advanced broadband and wireless infrastructure in the state.

1.3 – Technology Targets of Opportunity for Texas

The IT Cluster assessment revealed several areas that represent real opportunity for Texas. Significant effort is already underway, resources are committed and a large multiplier effect is possible because many of these technologies span multiple clusters and industry sectors. Further investigation is needed to determine whether these truly represent Texas' "best technology bets" and to determine if and where supporting investments of all kinds are needed.

- Logistics/supply chain solutions
- Cybersecurity
- Homeland security
- Digital media arts
- Border security
- RFID/smart cards
- Supercomputing
- Wireless

1.4 – IT Cluster Working Groups: Setting a Competitive Plan for Texas

It is the intention of the IT Cluster team to move forward with IT Cluster working groups to review the recommendations and ideas generated by this assessment process and to address key issues for evaluation, prioritization and action. The priority is to establish a competitive plan for the IT Cluster and Texas. Priorities will depend on the direction of the governor and leaders of Texas. For now, building on efforts that are already underway, items for consideration are outlined in Section 7 of this report.

1.5 – Summary of Findings

The IT Cluster assessment focused on regions in Texas with the greatest concentration of IT employment. This map shows the IT Cluster in Texas, with each dot representing an employer with five or more employees who operate in the core IT businesses. Core business is defined as those employers who manufacture goods, provide services or applied research in the Information and Computer Technology industry.

Figure 1. Core Business Employment in the IT Cluster [1]
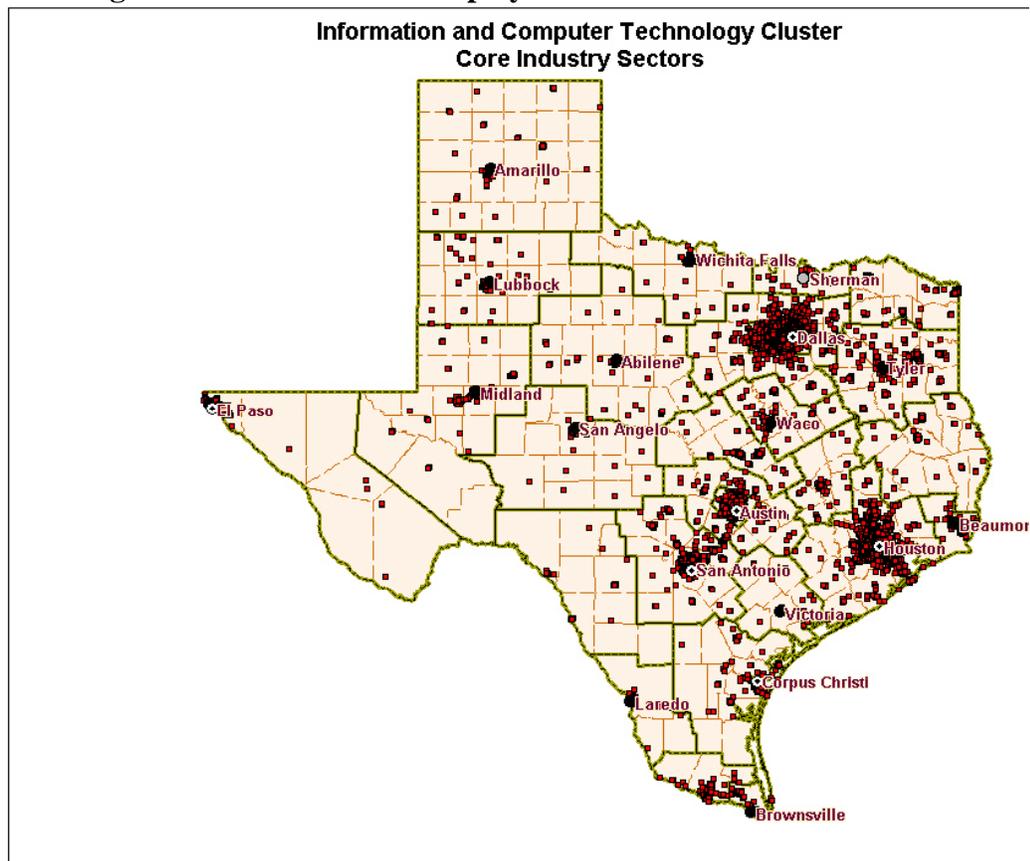
Mapping those employment concentrations reveals some distinct regional attributes (see Appendix C) and resources that offer opportunities to connect regions across Texas, as presented in the table below: specifically in supercomputing, logistics, RFID, wireless, Cybersecurity, homeland security and digital media arts. This information resulted from regional forums, interviews, surveys and other research and does not reflect the entirety of the IT Cluster inventory, as it reaches into so many sectors, but it is representative.

Figure 2. IT Cluster Regional Attributes and Resources [2]

Region	Industry Cluster Concentration	Resources
DFW North Texas	Telecom, electronics, software, design, logistics, wireless, smart chip R&D production, supercomputing; Cybersecurity; data management; business process outsourcing	Metroplex Technology Business Council (MTBC); AeA, University of Texas at Dallas, STARTech, Texas Logistics Capability Council; Texas A&M Supercomputing Facility; Cybersecurity & Emergency Preparedness Institute; Cybersecurity Research Center; Integrative Center for Homeland Security
El Paso Upper Rio Grande	Maquiladora OEMs, electronics, systems design, data processing, Internet, defense, border security	University of Texas El Paso hosting August 2005 event; Border Security; Critical Technologies for Security & Trade; "soft-quiladora" efforts
Austin Central Texas	Computers, Internet, compression technologies, supercomputing, wireless; Cybersecurity; semiconductors	Texas Advanced Computer Center; Dell Partnership; Center for Information Assurance & Security; Wireless Alliance; Wireless Networking & Communications Group; Austin Technology Council, AeA, World Congress on Information Technology 2006
San Antonio South Texas	Communications equipment, system design, software, data processing, hosting, digital media, logistics, homeland security, Cybersecurity	National Security Agency Cryptology Branch expansion; Digital Convergence Initiative; Technology Advocates of San Antonio, Media Convergence Lab; Smart City Project, San Antonio Technology Accelerator Initiative
Houston Gulf Coast	NASA, computers, global communications networks, Internet, medical, energy	Computer Information Technology Institute (CITI), Rice Alliance; RFID student badge project (28K); Houston Technology Center

2 – The Competitive Landscape

In the 1990's, "high tech" was the broad term used to describe any business or research initiative involving computers, communications and online content. As this industry has grown and technology has become pervasive, new descriptors are needed. AeA, in its *Cyberstates 2005* report, defined "high tech" using 49 North American Industry Classification System (NAICS) codes, although the report concluded that there is no universally accepted definition of the so called high tech industry. The ambiguity around this evolving cluster definition presents issues for many regions and sectors.

With globalization and advances in technology and communications, new employment models are emerging and the supply chain is being transformed, presenting both challenges and opportunities to the IT Cluster.

- Outsourcing – Services (e-commerce, business process, software development and testing, maintenance, professional services) can be moved outside the US (India, Ireland) because of large, low cost, skilled technical labor pool, bandwidth, advantages of time zone differences and collaboration tools.

- Offshoring – Manufacturing processes (textiles, consumer electronics, furniture, auto parts, machinery & equipment) can be moved outside the US (China, Japan, Mexico, Brazil) due to lower cost labor, high quality and productivity, new manufacturing technologies and high speed communications.

- Homesourcing – Services (travel reservations, customer service, e-commerce and commerce) previously conducted in call centers can be managed virtually with home-based agents, enabled by bandwidth, online learning and collaboration tools, and at reduced costs (facilities, benefits, equipment).

- Rural Sourcing – Services provide typical outsourced IT services and use highly skilled and often underemployed IT Workforce in lower cost rural areas of the United States. Rural Sourcing centers may be located in or near college or university towns that have the infrastructure and are sufficiently wired to meet the requirements of IT outsourced assignments. The centers provide jobs and opportunities to local college graduates who were previously forced to move away to find IT employment.

- Free Agents – Downsizing, layoffs, lifestyle choices, niche expertise and industry desire to use contract labor have all contributed to the growing number of experienced individuals who have small businesses and work as independent consultants with companies in the IT Cluster.

2.1 − Key IT Cluster Trends

Key IT industry trends that affect the IT Cluster were identified in five areas and are shown on the chart below:

IT Industry Trends [3]	
Business	• Outsourcing, offshoring, homesourcing are real • New state and regional models are emerging for economic development and for driving innovation • Mobile and wireless technologies are transforming business process • Broadband deployment enables competitive advantage • Traditional supply chain and logistics processes are changing • New technologies and applications are proliferating and appearing at a rapid pace, blurring traditional definitions and "rules" in IT
Technology	• Software as service, manufacturing processes • Radio Frequency Identification (RFID) in multiple industries. • Nanotechnology • Wireless • Homeland security/defense • Cybersecurity
Workforce & Education	• Shortage of qualified IT professionals nationwide • Difficulty in maintaining a pipeline of workers trained to meet industry's changing needs • Decline in science, technology & math training in K-12 and future impact on innovation and competitive position • Aging/retiring workforce with technical and management skills • Mobile/shifting workforce needs relevant, timely and accessible retraining • Creating, funding and sustaining successful public/private collaborations and partnerships drive regional growth • Downsizing due to outsourcing and offshoring has short and long term regional implications
Starting & Growing Companies	• Increasing access to seed and early stage capital is essential • Regional cultures and environments that foster innovation and entrepreneurship are necessary • Optimizing opportunities for commercialization and leveraging intellectual property will make a difference
Globalization	• Offshoring is pervasive and seen as a threat • Changing demographics in the US reflecting immigrant populations already exists in Texas • Management of intellectual property data and confidential records is a growing challenge • Changing treatment and perception of international borders represent both challenges and opportunities to countries and regions with expansive borders

Figure 3. IT Cluster Trends

2.2 – Trends and Opportunities

There are a number of global IT industry trends that have particular significance and, perhaps, opportunity for Texas, including the following**:**

- Outsourcing of services and offshoring manufacturing to lower cost regions is becoming pervasive in the IT industry. Texas has assets, including low cost labor and infrastructure that could make it an outsourcing/offshoring destination for companies anywhere in the world.

- Technology tools and telecommunications are transforming supply chain and logistics worldwide. Texas is in a position to leverage its deep expertise in these areas and position itself as a global leader.

- Sharing an expansive border with Mexico places Texas in a unique position to be a driver in developing and fielding innovative policies, processes and technologies.

- Widespread broadband deployment is an enabling technology for many regions worldwide. Texas would benefit greatly from a commitment to broadband and wireless, backed up by strategic implementation plans.

- Within the IT sector globally, security is a growing area of focus: cybersecurity, homeland and border security, and information security. Texas could leverage what is already in place in these domains and create a National Center for Security, building on the recently announced NSA center in San Antonio.

- Texas' public education system is a significant factor in the potential growth and health of the IT Cluster. The IT Cluster team recognizes the need for urgent action that can best be accomplished through collaboration and action by industry, government and education for every level of education. A focused effort to develop challenging IT training and educational courses along with recruiting students and underemployed or those making mid-career transitions could fill the IT workforce pipeline and lead to success for many Texans.

3 – Cluster Definition

At the outset of the assessment, the cluster perspective was a traditional view, with multiple "silos" representing industry sectors as depicted below in the snapshot of the industries and stakeholders in the IT Cluster. Early on, it became evident that many of the technologies represented by the industry were also embedded in and core to other clusters and industries.
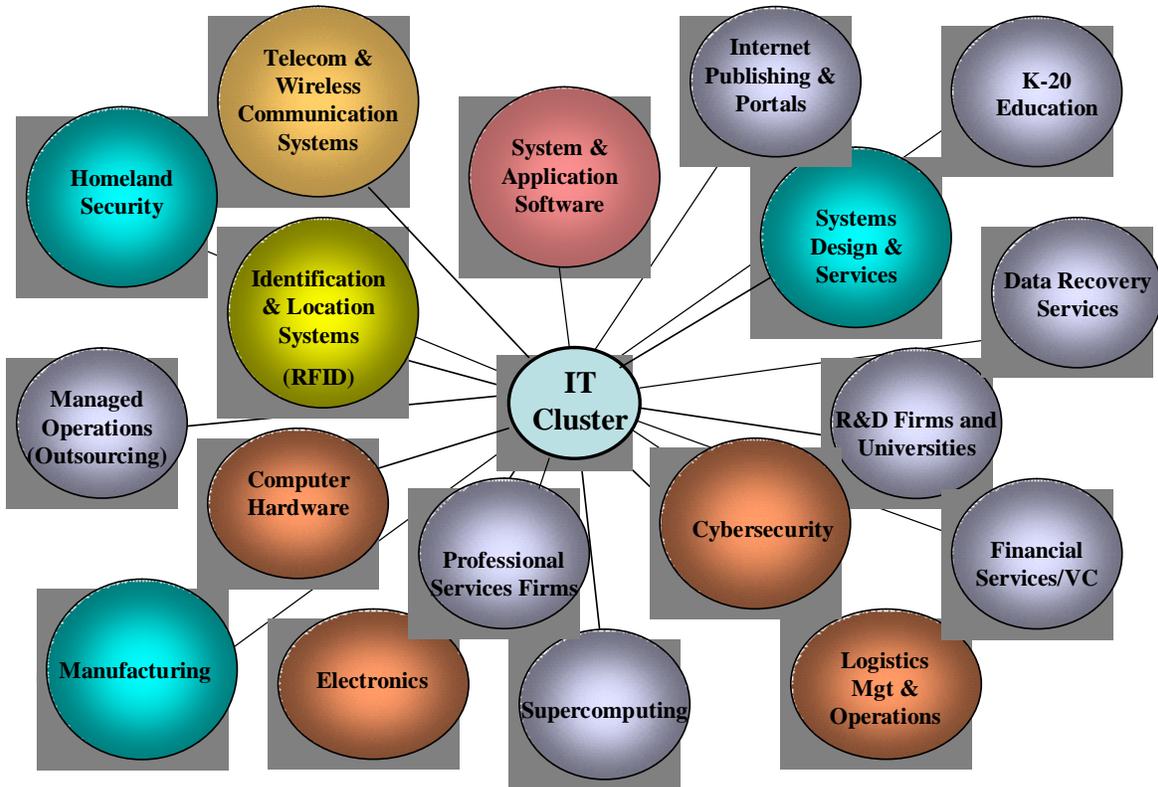
Figure 4. Industries and Stakeholders in the Texas IT Cluster [4]

During the course of the Cluster team's work and extensive research, a deeper, more multi-dimensional picture of IT in Texas emerged. This model looks at the traditional vertical sectors in IT and also reflects a new horizontal view of convergent technologies that are embedded across not only the IT Cluster, but are core to other industry clusters. These convergent technologies are at various stages of development – some nascent, some more mature – and many are expected to be transformative as they are applied. Finally, there are enablers, which are key to the health and growth of the cluster.

IT&T Segments

- Computer Equipment Mfg
- Communications Eqpt
- Telecom & Wireless
- Sys & App'n Software
- Sys Design & Services
- Electronics
- Manufacturing
- Internet Content, Portals
- Managed Operations
- Supercomputing

Cross Cluster Overlays

Advanced Technologies & Manufacturing
Aerospace & Defense
Energy
Biotech & Life Sciences
Petroleum Refining & Chemical Products

Convergent Technologies

RFID
Ultrawideband
Network infrastructure
Information/CyberSecurity
Homeland Security
Film/Gaming
Simulation/Training
Up/Down stream energy
GIS/GPS
Sensors
MEMS

Superconductivity
Chip technology
Nanotechnology
Manufacturing support
Bioinformatics
Supply Chain
Logistics support
Automotive manufacturing
Medical devices
Fuel cells

Enablers

Skills/Competencies
Infrastructure
Investment & Capital
Commercialization
Implementation

Figure 5. A Multidimensional View of the IT Cluster [5]

4 – Assessment Methodology and Approach

In order to engage a broad set of stakeholders and to capture their ideas about creating an IT Cluster strategy, both high-level and grassroots activities were used, including:

- an electronic survey of state and regional innovation mindset
- interviews with key stakeholders
- regional forums held in five cities
- ongoing legislative and policy discussion with the Cluster team

The intent of this qualitative approach was to gain valuable insights, commentary and guidance from over 300 practitioners, industry leaders and vendor-suppliers supporting the growth of the cluster.

Through this approach, a series of recommendations were created for the cluster assessment and appendices of related supporting documentation.

5 – Qualitative and Quantitative Data

5.1 – Qualitative Data - Survey of the State and Regional Mindset

An online survey was taken by 135 respondents, from all sectors of the IT Cluster and highlights are presented below, with full survey data included in Appendix E. Survey results generally supported findings in regional forums and one on one interviews, but there were several interesting findings.

- Over 90% of respondents indicated that it is very important/important to attract and retain entrepreneurial managers and talented scientists and engineers.

- Over 85% felt that access to venture and early stage seed capital, product innovation and access to new markets are very important/important.

- And 48% felt that there has been progress in the commitment of state and regional leaders to improving the environment for starting and growing a business, while 15% felt ground was being lost and 33% felt it was holding steady.

- In the area of public investment to further the success of technology/science clusters in Texas, respondents felt the university research, workforce training for skilled workers, business recruitment and retention, commercialization infrastructure and tax incentives were important or very important. Responses varied by question when rating state and local government impact in these investment areas, reflecting lack of consensus on progress in these areas.

Survey 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
- Great place to raise a family
- Climate
- Lower cost of living and doing business
- Tax structure and lack of government regulations – "Texas is Open for Business"
- Can do/entrepreneurial spirit
- Mobility around the state
- Uniqueness of Texas cities and regions
- Texas institutions of higher education

Respondents were asked for their thoughts on what could be done to make Texas more innovative and competitive. These responses are similar to the comments received in the forums and interviews.

- Foster a stronger "Texans doing business with Texas first," particularly Texas entrepreneurial companies
- Prioritize resource areas where Texas has the strongest skill sets
- Offer more incentives for business: tax, matching investment funds, reform franchise tax, workers comp and unemployment costs; tort and litigation reform
- Focus on education to improve K-12 –expand math, science and technology programs;
- Continue to fund the Texas Enterprise Fund and Texas Emerging Technology Fund to attract industry, research and venture capital
- Publish and maintain a roadmap of resources for innovation
- Facilitate greater engagement of the business community – statewide and locally – with education and government
- Eliminate service delivery area restrictions on community and technical colleges
- Attract incubators or VCs willing to invest in very early stage companies/ideas; Identify new funding sources for early stage companies.

5.2 – Qualitative Data - Stakeholder Interview and Regional Forum Perspectives

Strengths-Weaknesses-Opportunities-Threats (SWOT) Analysis

A SWOT analysis of the IT Cluster in Texas was developed from interactions with the IT Cluster team and then presented to participants at the IT Regional Forums held in five communities across the state. Forum participants provided regional perspectives on the strengths, weaknesses, opportunities and threats they recognized locally.

A summary of the SWOT by region is shown in the following chart. Further details, including the initial SWOT as presented at the regional forums and a region by region breakdown, are included in Appendix F.

An Overview of Regional Strengths, Weaknesses, Opportunities and Threats in the Texas IT Cluster				
Austin Central Texas	DFW North Texas	El Paso Upper Rio Grande	Houston Gulf Coast	San Antonio South Texas
Strength Recognized by the world as a center for IT/emerging technologies	**Strength** Global strengths in telecom, software and information services with supply chain solutions and logistics capacity seen as world class	**Strength** Bi-national and bilingual expertise expands trade with multinational markets	**Strength** Core industries strong and intersect with IT – energy, biotech life science, aerospace defense	**Strength** DoD Info operations and info security, military R&D, bioinformatics, GIS/GPS
Weakness Licensing and commercialization process still not effective	**Weakness** Lack of collaboration between large and small companies; no vertical integration	**Weakness** Broadband connectivity lacking	**Weakness** Lack of high speed access outside of Houston	**Weakness** Not enough private equity capital at early stages
Opportunity Leverage current supercomputing capacity as well as digital media convergence (wireless, entertainment, talent)	**Opportunity** Technically savvy underemployed workforce can be retrained in RFID and logistics solutions	**Opportunity** Connect and leverage Aerospace/DoD/ Homeland Security as the major sectors in this border region	**Opportunity** Connect available investment capital available with opportunities throughout the State	**Opportunity** Leverage Cybersecurity, homeland security, system/software design and the Convergent Technology Initiative statewide
Threat Flow between business and universities must be improved or opportunities will go elsewhere	**Threat** Importing engineering talent from abroad when talent must be available locally	**Threat** One of the largest exporters of engineering talent which affects the overall strength of the area	**Threat** Offshoring, outsourcing and the loss of skilled workers with the collapse of some companies may limit growth	**Threat** Highly skilled technical workforce is missing so companies may not expand or locate here.

Figure 6. Summary of Regional SWOT Analysis [6]

5.3 – Cross Cluster Themes from the Statewide Assessment

During the cluster assessment process, four core areas were common to all clusters and represent logical points around which to focus and organize ongoing Cluster team work: workforce and education, collaboration, capital and commercialization and business climate.

Workforce & Education	Collaboration
- Need for timely, specific and consistent data on workforce forecasts for all clusters - Availability of workforce pipeline with relevant skills for IT industry today or in the future is vital - Concern with declining focus on math, science and technology in K-12 education - Major shifts in technology result in substantial and constant need for ongoing worker training and retraining - Need for innovative programs and strong messaging to promote quality and value of Texas higher education	- Texas' IT Cluster is highly diversified with many overlapping technology sectors offering multiple opportunities to focus resources and distinguish Texas - Many technologies are embedded across clusters and there are opportunities to leverage them and showcase innovation and collaboration – e.g., RFID, homeland security, Cybersecurity, logistics - The Governor's Cluster Initiative brought together a diverse group of stakeholders interested in growing and strengthening the IT Cluster and its companies
Business Climate	**Commercialization and Capital**
- A ubiquitous broadband and wireless network infrastructure is key to competition and to accelerating growth and innovation in Texas - University culture and rewards system must promote the flow of ideas and people between academia and industry - Business incubation and acceleration activities can stimulate entrepreneurship and economic development - Economic development can be enhanced by supporting new business creation and growing existing companies as well as attracting and retaining large companies - Consistent agreement that TX needs to take action to attract and retain talent, innovation, funding; to be collaborative; to offer quality education and an open business climate	- Commercialization opportunities must be optimized by eliminating cultural, procedural, competitive, communications and infrastructure barriers - Increase seed and early stage venture capital funding - Increase the availability and effectiveness of R&D (federal and state), private R&D and SBIR - A statewide focus on commercialization would unify the business, government and academic communities - State leadership/support is needed to create new funding models and incentives for entrepreneurial ventures and for commercialization of Intellectual Property (IP)

Figure 7. Cross-Cluster Themes [7]

5.4 – Quantitative Data Overview

A broad range of quantitative data was gathered, compiled and analyzed to accompany the anecdotal data collected through forums, interviews and surveys. Appendices A and B contain data referenced and discussed in this section.

Sources for funding innovation include federal funding for Research and Development (R&D), Small Business Innovation Research (SBIR) grants, private sector R&D and venture capital. This section of the assessment reviews each of these areas. Funding data is obtained from a variety of sources and not all data is available for the same periods, every effort has been made to accurately reflect and interpret the data.

5.4.1 Federal R&D

Over the ten-year period, 1993-2003, Texas received $41.46 billion in unclassified federal R&D funding. After a drop in 1999-2000/2001 to $3.8 billion, federal R&D funding has been increasing, to $4.3 billion in 2003. Of this, 97% was related to DoD, NASA, Health & Human Services and the National Science Foundation. Over the 10-year period, these agencies have consistently been the largest recipients of unclassified federal R&D funding in Texas. DoD funding has remained at approximately $1.9 billion annually, with a drop in 2000-2001; NASA funding has declined slightly since 2000 to $1.1 billion in 2003; HHS has increased from $521 million in 1997 to $858 million in 2003, and NSF has stayed in the $103-118 million range from 2001-2003.

There are greater fluctuations in other agency funding, with DVA, DED and DOE showing significant increases since 2000.

By technology sector, aerospace, life sciences and biotech and defense represent almost 91% of the $41.46 billion total. Telecommunications and advanced computing represent less than one half of one percent ($204 million). However, it is difficult to attribute a precise dollar value to R&D for the IT Cluster because of the embedded nature of IT ─ in advanced manufacturing, advanced materials, energy, computers and communications, other science & technology, aerospace, defense and life sciences & biotech. Yet, clearly, investment in IT-related efforts have a multiplier effect because of the breadth and depth of the IT Cluster.

During this period, Dallas County has been the largest recipient of unclassified federal R&D, averaging over $1.8 billion annually, followed by Harris County which received $1.5 billion annually. These two counties account for almost 81% of unclassified federal R&D in the period 1993-2003, and this has not varied year over year.

5.4.2 Small Business Innovation Research

SBIR grants have been a steady source of funding for Texas and the state has consistently ranked 8th or 9th nationally in total SBIR funding. The SBA reports aggregate SBIR funding and no detail is available for classified/DoD grants. Funding for unclassified SBIR grants in Texas has increased slightly over the last four years, yielding $29.1 million in 2003, $26.5 million in 2002, $22.5 million in 2001 and $19.5 million in 2000.

States receiving grants in this category ahead of Texas include California, Massachusetts, Virginia, Maryland and Colorado in the top five for 2001 and 2002.

There is a concentration of SBIR grants, with 10 companies accounting for almost $100 million in grants over a 10-year period. IT is clearly embedded in the operations of many of these: Proportional Technologies, Ambion, Biomedical Development are in the biotech field; Microfab, Systems & Processing Engineering, Metrica and Ionwerks have activities in advanced manufacturing. Several of these companies produce products in multiple clusters, notably Lynntech.

Company Name	Location	County	No. of SBIR Awards	SBIR Funding ($M)
Lynntech, Inc.	College Station	Brazos	415	39.86
American Hi Quality	Houston	Harris	118	12.76
Proportional Technologies Inc.	Houston	Harris	54	9.09
Ambion, Inc.	Austin	Travis	57	7.33
Microfab Technologies, Inc.	Plano	Collin	67	6.70
Biomedical Development Corp.	San Antonio	Bexar	64	6.53
Systems & Processing Engineering	Austin	Travis	67	4.26
Metrica, Inc.	San Antonio	Bexar	32	3.94
Ionwerks, Inc.	Houston	Harris	36	3.68
Knowledge Based System, Inc.	College Station	Brazos	52	3.53
Total			962	97.68

DOD SBIR data is restricted

**Figure 8. Top 10 Performers
1993-2003 Unclassified SBIR Funding in Texas [8]**

5.4.3   Private Sector R& D

Private sector R&D data are available for the last three years and is based on information in public company reporting documents. From 2002-2004, almost $10 billion has been invested in communications, computer programming & design, computer equipment & communications and radio & TV equipment. Investors include SBC, Verizon, Allegiance, EDS, Alliance Data Systems, Dell, Crossroads Systems, Cirrus Logic, Data Race, Alamosa Holdings and Digital Recorders.

Opportunities
Technology transfer and commercialization opportunities for leveraging all R&D investments – private and public, unclassified and classified – represent tremendous opportunity for growth in Texas. For the IT Cluster, a baseline perspective of all funding sources should be established. As the cluster initiative moves forward, additional research can be conducted into the outcomes and effectiveness of R&D investments in terms of economic impact for Texas.

Key metrics would include the number of technology licenses and revenue derived as a percentage of research dollars. In addition, more detailed analysis by research type, industry sector, technology type and region, as well as university rankings based on these statistics should be used. Finally, all of these metrics should be tabulated across all Texas clusters.

5.4.4   Patents

Overall, Texas ranks high in terms of sheer number of patents issued in the US, behind California and New York, and patenting in high tech areas has been consistently ahead of the U.S. national average since 1998.

In the period 1990 to 2003, IT/Telecom patents represented 24% of all Texas patenting activity (17,608 of 73,200 patents), as reflected in the chart below.

Computer hardware and computer software are two of the largest and fastest growing areas of patenting in Texas, growing at 213% and 306%, respectively, over the last seven years. Growth in computer software patents nationally is approximately the same as that for Texas, but Texas computer hardware patents has grown significantly more than the national average (151%).

Telecommunications patenting has increased at 185% in Texas during this period, versus 98% nationally. Texas has a relatively large number of patents in the Electrical Components area, with patenting almost doubling in recent years. Texas' patents in this technology are also above average in terms of their impact and links to scientific research. Many of Texas' patents in this area are assigned to Lucent.

Navigation/Global Positioning Systems (GPS) is a very small area of patenting within Texas (only 50 patents issued between 1997 and 2003), however, Texas' patents in this technology are very highly cited and are closely linked to scientific research. Several large, Texas based companies have patents in this area, including Raytheon, Texas Instruments, IBM and Lockheed Martin.

Reflected in patenting, the technology focus of different areas of Texas varies greatly. Austin, Dallas-Fort Worth and, to a lesser extent, San Antonio, focus mainly on high tech industries such as computers, telecommunications, semiconductors and pharmaceuticals. Meanwhile, Amarillo, Beaumont-Port Arthur, Houston-Galveston, Midland-Odessa, South Texas and Tyler concentrate on more traditional industries such as oil exploration and drilling, industrial machinery and chemicals. El Paso, College Station and Lubbock combine both high tech and traditional industries.

IT/Telecommunications Patents in Texas by Region, 1990 - 2003[9]				
Region	**Total Patents in Region**	**Number of IT/Telecom Patents in Region**	**IT/Telecom Patents in Region as % of Total Patents in Region**	**IT/Telecom Patents in Region as % of IT/Telecom Patents in Texas**
Austin	17,018	8,083	47.5%	45.91%
Amarillo	237	14	5.9%	0.08%
Beaumont-Port Arthur	624	5	0.8%	0.03%
College Station	707	35	5.0%	0.20%
Dallas-Fort Worth	25,883	6,645	25.7%	37.74%
El Paso	456	31	6.8%	0.18%
Houston-Galveston	22,213	2,207	9.9%	12.53%
Lubbock	423	24	5.7%	0.14%
Midland-Odessa	404	4	1.0%	0.02%
San Antonio	2,822	245	8.7%	1.39%
South Texas	762	7	0.9%	0.04%
Tyler	258	5	1.9%	0.03%
Other Regions	1,393	303	21.8%	1.72%
Total	**73,200**	**17,608**	**24.1%**	**100%**

Figure 9. IT/Telecommunications Patents in Texas, by Region, 1990-2003

As reflected in the chart above, Austin, Dallas-Fort Worth and Houston-Galveston are the leading Texas regions for patents. Austin leads in terms of IT/Telecom: almost half of Austin patents are in IT/Telecom which represents almost half of all the Texas patents in that sector, making Austin the most IT-centric region in Texas.

As part of the IT Cluster assessment, benchmarks and metrics for Texas patent activity and the resulting contribution to the Texas economy can be developed to include patents per capita, patent issuances by companies or institutions and major regional patent producers. As mentioned above, it is important to tie patents to licensing and royalties to assess tangible value.

5.4.5 Venture Capital Investment in Texas

Venture capital information is based on data from the MoneyTree Survey, a quarterly study of venture capital investment activity in the United States produced through a collaboration between PricewaterhouseCoopers, Thomson Venture Economics and the National Venture Capital Association.

Between 1995 and 2004, $18.13 billion in venture capital was invested in Texas companies. Texas consistently ranks 5th or 6th in venture investing, behind Silicon Valley, Boston, Southern California, the Southeast and the Mid-Atlantic.

The MoneyTree Survey classifies and defines industries in a way, which does not correspond directly to the cluster definition provided in the Texas Industry Cluster Initiative legislation, so the results shown here are not exact. For instance, while the data for the telecommunications sector was available in a single category, it was necessary to combine the data from four separate industries (referred to by the MoneyTree Survey as IT services, networking and equipment, semiconductors and software) in order to best represent the information technology sector (See Appendix E). Despite its limitations, however, the overall accuracy of the data is sufficient to provide a reliable and compelling snapshot of venture capital activity in Texas.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
IT	65.9	132.6	240.7	304.8	923.7	291.2	1475.3	620.5	588.8	520.0
Telecom	68.1	140.1	134.3	221.9	532.1	1144.9	608.0	292.6	264.5	185.7
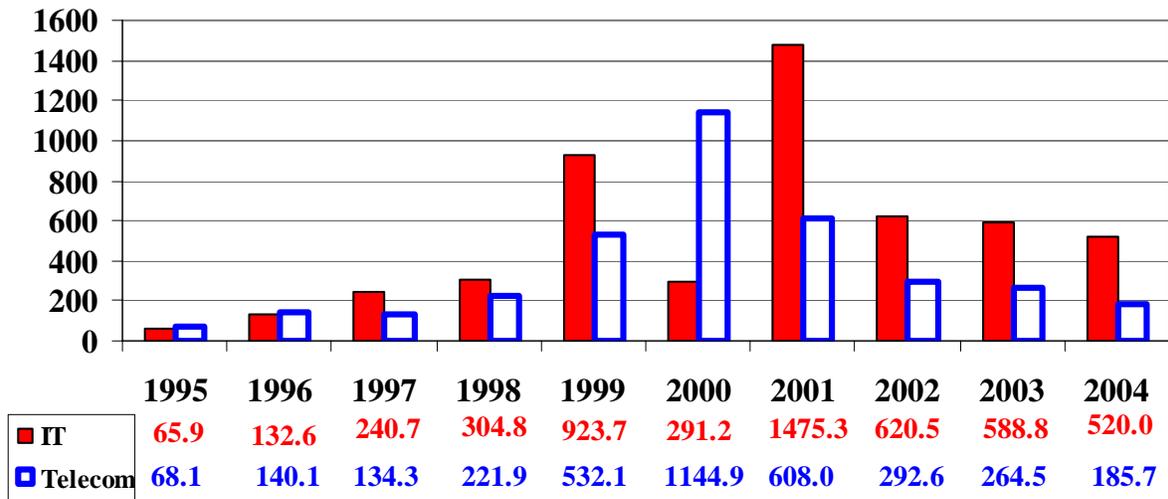
Figure 10. VC Activity in Texas IT and Telecom Sectors, 1995 – 2004 (millions of $) [10]

The chart below depicts how venture capital has been invested in Texas, showing that almost 50% of it is in telecom and IT, over the period 1995 – 2004.

Telecom 19.8%

Other 35.0%

IT* 28.5%

Industrial/Energy 9.3%

Adv. Manufacturing* 4.7%

2.8% Biotech

*These clusters are composites of multiple industries
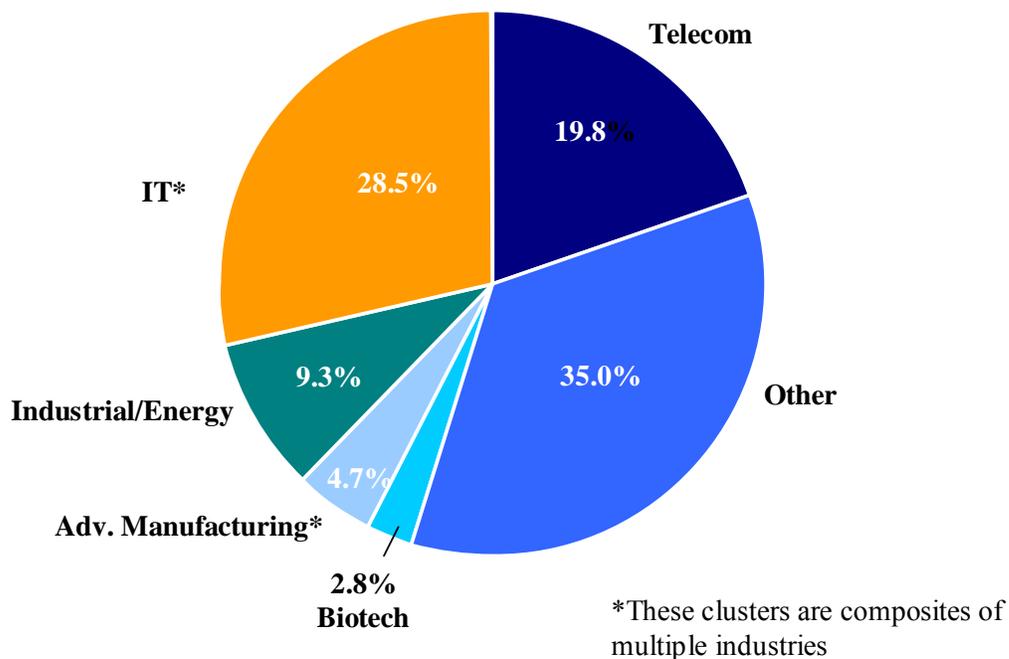
Figure 11. Texas Venture Capital Investment by Industry Cluster, 1995 – 2004 Totals [11]

Additional information on private equity – venture capital and angel investments – must be developed to more accurately reflect this funding source and its impact on the growth of Texas companies in the IT Cluster. It should be put in context to show comparisons of Texas with other regions and states, of regions within Texas and across all clusters in the Governor's Initiative.

5.5 – Regional Cluster Economic and Industry Asset-Base

During the IT Cluster assessment, it was evident that there is a lack of information – or central place to locate it – about all of the activities, programs, initiatives, resources, organizations, institutions, research and education that supports Texas' IT Cluster. Details, including content, purpose, sponsors, people, logistics and expected outcomes, are vital to all stakeholders who operate within the cluster. These networks represent the infrastructure that connects and unifies the IT Cluster.

There was consistent interest to identify these assets within the IT Cluster regions and to then aggregate the regional information across the state. This is included in the list of tactics for the IT Cluster working groups to address.

6 – Further Recommendations and Next Steps

The Executive Summary, Section 2 of this report, includes the IT Cluster team strategic recommendations. Supporting this direction, working groups can be convened to review the recommendations and ideas generated by this assessment process and to establish a competitive, strategic plan for the IT Cluster and Texas. Priorities will be set and depend on the direction of the governor and leaders of Texas.

The Cluster team and the working groups will include key constituencies – a mix of large, medium and entrepreneurial companies, venture capital and the education community and will establish operating and communications processes to ensure effective and efficient use of participants' time and resources. The Cluster team needs the resources of a dedicated coordinator to facilitate, support and steward this process. High level objectives include:

- Identify short term/high impact activities to sustain momentum.

- Develop, measure and communicate key trends, milestones and metrics for the IT Cluster.

- Establish aggressive schedules and eliminate barriers to demonstrate commitment to this ongoing statewide cluster process.

- Leverage the IT Cluster team to analyze, debate and promote the cluster and connect and communicate with regions in the cluster.

- Identify and foster partnerships with industry, government and education that benefit the IT Cluster.

- Build enduring communications programs and tools (newsletters, website) to connect and inform participants across the state.

6.1 – Further Recommendations

The IT Cluster team grouped issues into four overarching areas, and ideas and tactics were identified and aggregated for further evaluation, prioritization and action by the IT working groups:

Capital and Commercialization
- Remain active in the design, development and deployment of an effective statewide commercialization plan.
- Identify individuals, organizations and institutions working in technology transfer and commercialization and connect them to establish critical mass and identify gaps.
- Set targets, measure effectiveness, educate on value of commercialization to Texas, sustain high levels of engagement and promote successes.
- Create and sustain a state fund for seed stage companies; leverage Texas Emerging Technology Fund.

- Proactively promote venture-investing opportunities in Texas, inside and outside the state through a variety of channels, including statewide forums.
- Develop statewide cluster and regional programs to educate entrepreneurs about grants and to showcase successful endeavors.

Workforce/Education

- Facilitate ongoing dialogue with designated constituencies in industry and education regarding future trends and specific needs, focused on specific IT Cluster segments.
- Develop a broad and intensive campaign to communicate information on IT professional opportunities, career choices and paths for students early in the education experience.
- Support the ongoing creation of dynamic curriculum to better meet workforce needs now and for the future.
- Set, publish and measure specific goals to produce graduates in core technology, science, engineering and math and align education goals with business imperatives to address future needs.
- Define the economic model and identify funding sources for worker retraining.
- Benchmark Texas colleges and universities against top technical schools, identify gaps and address them.
- Explore the use and potential outcomes of directing resources to keep students in Texas after graduation.
- Develop a recruiting portal for Texas technology professionals and Texas-based businesses to aggregate talent and opportunities.

Collaboration

- Focus the IT Cluster to leverage and connect the best technology bets across clusters, regions, the state and globally, strengthening the cluster itself and the companies in it.
- Single out and leverage cross-cluster and convergent technologies – (e.g., homeland security, Cybersecurity, RFID, logistics, advanced manufacturing).
- Compile and communicate an inclusive inventory of Texas resources for IT businesses, entrepreneurs and their stakeholders.

Business Climate

- Engage education and business leadership and gauge success of efforts in promoting and facilitating economic development interactions with industry creating and growing Texas companies, as well as attracting and retaining businesses in Texas.
- Encourage top universities and faculty to demonstrate tangible research to benefit the IT industry in Texas.
- Connect and communicate existing Texas incubation/acceleration efforts in a broad, industry and statewide collaborative.
- Identify, connect and communicate resources that are in place today for entrepreneurs and for small and medium enterprises.
- Periodically examine all appropriate state regulatory and tax policies to ensure that they create and support the expansion of the IT Cluster in Texas.
- Educate and promote the importance of a statewide vision, funding and comprehensive plan for broadband and wireless deployment across Texas.

6.2 – Next Steps

The IT Cluster team supports the establishment of cluster working groups both for the IT Cluster along with cross cluster working groups for those issues that affect all of the clusters. We await the direction of the governor and Texas leadership. We have not formalized a strategic plan in this report but will use the direction of the governor, the results from the assessment and establish metrics and a working plan to accomplish the objectives we are given.

7 – Information and Computer Technology Cluster Team/Contributors

The Texas Information and Computer Technology Industry Cluster team is chaired by Lonnie Martin, Founder and CEO of White Rock Networks. Cluster team members, contributors and assessment participants include:

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[5] NES
[6] NES and IT Cluster Assessment participants
[7] NES and IT Cluster Assessment participants
[8] Rand RaDiUS with additional data in Appendix A
[9] 1790 Analytics, LLC
[10] PriceWaterhouseCoopers, Thomson Venture Economics and the National Venture Capital Association
[11] PricewaterhouseCoopers, Thomson Venture Economics and the National Venture Capital Association