Advanced Manufacturing in Texas

About the Advanced Manufacturing Sector

The Advanced Manufacturing sector includes businesses and industries that use innovative technologies and processes to create products of all kinds. The sector encompasses a broad range of manufacturing activities and outputs and is unified by the incorporation of automation, sensing, and other cutting-edge technologies in production. Within the Advanced Manufacturing sector, the state has identified four target clusters: Aerospace Vehicles, Aircraft, and Defense; Automotive; Computers, Electronics, and Semiconductors; and Production Technology and Heavy Machinery. Texas is a state of doers and makers, and this spirit is reflected in the strength of its Advanced Manufacturing sector. Fueled by its access to domestic and global markets, business-friendly climate, and world-class education programs, Texas is poised to design and build the products of the future.

Advanced Manufacturing Target Clusters

- Aerospace Vehicles, Aircraft, and Defense
- Automotive
- Computers, Electronics, and Semiconductors
- Production Technology and Heavy Machinery

Target Clusters Fast Facts

	Workforce	GDP	Exports
Magnitude	**243K** *Total Employment (2021)*	**$64B** *GDP Contribution (2021)*	**$27B** *Foreign Exports (2021)*
Share	**7%** *Share of U.S. Cluster Total Employment (2021)*	**9%** *Share of U.S. Cluster GDP (2021)*	**8%** *Share of U.S. Cluster Foreign Exports (2021)*
Growth	**5%** *Total Employment Growth (2011 – 21)*	**13%** *GDP Growth (2011 – 21)*	**14%** *Foreign Export Growth (2011 – 21)*

Data Sources: IMPLAN, Regions Industry Data, Texas and United States, (2011-21); Guidehouse Analysis

Sector Opportunities

Strengths

Texas has a large, diverse advanced manufacturing industrial base. The state has existing and emerging competitive advantages in a broad range of Advanced Manufacturing industries, spanning from aircraft engines, to automobiles, to semiconductors, to rocket engines.

Texas' manufacturing sector spans all stages of the value chain. From research and product design, to the production of goods of all types, to high-value manufacturing supportive services, Texas' Advanced Manufacturing value chain is mature and inter-connected.

Texas is a destination for high-value, high-tech manufacturing. In recent years, Texas' Advanced Manufacturing target clusters have shown significant growth in GDP despite slower growth in employment, indicating that the sector is moving toward higher-value products.

Opportunities

The state is well positioned to attract, retain, and grow a wide range of advanced manufacturing businesses. Texas' strong supply chains and concentration of manufacturing businesses can continue to spur growth in the sector.

Complex manufacturing is expected to grow in Texas. Texas is expected to become an international hotbed of complex, tech-enabled manufacturing, including aerospace, automotive, semiconductor, and electronic computer manufacturing.

The state can continue to invest in the people, businesses, and technology that drive innovation in manufacturing. By advancing R&D and workforce programming, Texas can build on recent productivity gains and define the cutting edge.

Quantitative and qualitative research was performed May 2023 through May 2024; data cited reflects the then-most current and/or granular information for the time periods noted.

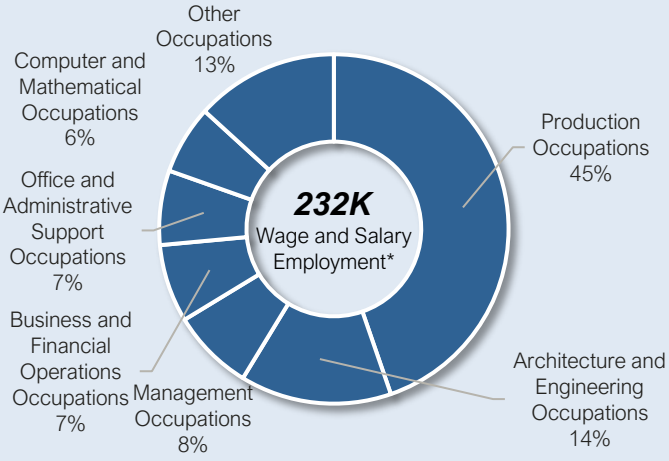
Advanced Manufacturing in Texas

Target Sector Workforce Landscape

The workforce supporting Texas' Advanced Manufacturing target clusters is relatively specialized. As demonstrated in the chart at right, production occupations represent nearly half of total wage and salary employment in the target clusters, and architecture and engineering occupations represent another 15% of total cluster jobs. These clusters are also supported by operations staff, including management, business, and administrative occupations.

Texas' Advanced Manufacturing target clusters require a skilled workforce with a strong understanding of mathematics, computers, electronics, mechanics, and production. In recent years, technological knowledge and skill areas, such as computers, electronics, and programming, have grown in importance to Advanced Manufacturing target clusters. Top occupations and competencies for the target clusters are identified in the tables below.

Workforce Distribution by Occupation Type (2021)



Key Detailed Occupations

Top Detailed Occupations by Employment (2021)	Emp. (2021)
Assemblers and Fabricators	47,140
Metal Workers and Plastic Workers	28,490
Engineers	25,210
Other Production Occupations	20,390
Computer Occupations	14,300

Top Detailed Occupations by Jobs Added (2018-21)	Jobs Added (2018-21)
Other Production Occupations	4,490
Business Operations Specialists	1,930
Material Moving Workers	1,640
Assemblers and Fabricators	1,420
Operations Specialties Managers	540

Key Competencies

Top In-Demand Competency Areas (2021)		
Rank	**Knowledge Area**	**Skill Area**
1	English Language	Critical Thinking
2	Mathematics	Active Listening
3	Computers and Electronics	Reading Comprehension
4	Production and Processing	Speaking
5	Mechanical	Monitoring

High Growth Competency Areas (2018-21)		
Rank	**Knowledge Area**	**Skill Area**
1	Administration and Management	Quality Control Analysis
2	Mechanical	Social Perceptiveness
3	Computers and Electronics	Complex Problem Solving
4	Public Safety and Security	Negotiation
5	Sales and Marketing	Programming

Data Sources: IMPLAN, Data Library, Texas, (2018-21); Guidehouse Analysis

Workforce Themes

Specialized Workforce

Nearly half of all Advanced Manufacturing employees are in production occupations.

Technical Skillsets

Advanced Manufacturing businesses require a highly technical workforce.

Growth in Technology

Computers, electronics, and programming skills are growing in importance to the sector.

Note: Wage and Salary Employment is a headcount of salaried or wage-earning employees. This figure does not include Proprietor Employment, which represents proprietors, partners, and tax-exempt cooperative members.

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Aerospace Vehicles, Aircraft, and Defense

Texas has a long history of leadership and innovation in the Aerospace Vehicles, Aircraft, and Defense cluster. From one-person planes to military helicopters to the world's most powerful launch vehicle — aerospace products of all types are manufactured in Texas. The state's growing aerospace supply chain, diverse workforce, and billions in research and development spending make it an ideal place to start and grow an aerospace and defense business.

The Aerospace Vehicles, Aircraft, and Defense cluster includes six industries and encompasses a variety of manufacturing-focused activities, including the production of airplanes, space vehicles, navigation instruments, and other aerospace equipment. Notably, the cluster does not include the air transportation industry, which is located within the Transportation and Aviation Services cluster.

The Northwest Texas and Metroplex regions are hubs of aerospace manufacturing in Texas. Northwest Texas — home to companies such as Pratt & Whitney and Howmet Aerospace — has a strong concentration of aircraft engine and engine parts businesses and employment. The Metroplex also has a well-established aircraft manufacturing industry, supported by businesses such as Textron, DRS Technologies, and Lockheed Martin.

Other regions have emerging competitive advantages within the cluster, such as the space manufacturing hub growing around SpaceX's Starbase launch site and production facility in Boca Chica. Additionally, the Gulf Coast and South Texas regions have strength in complementary industries that bolster the growth of the Aerospace Vehicles, Aircraft, and Defense cluster, including aerospace maintenance, repair, and overhaul (MRO) operations and government aviation and defense.

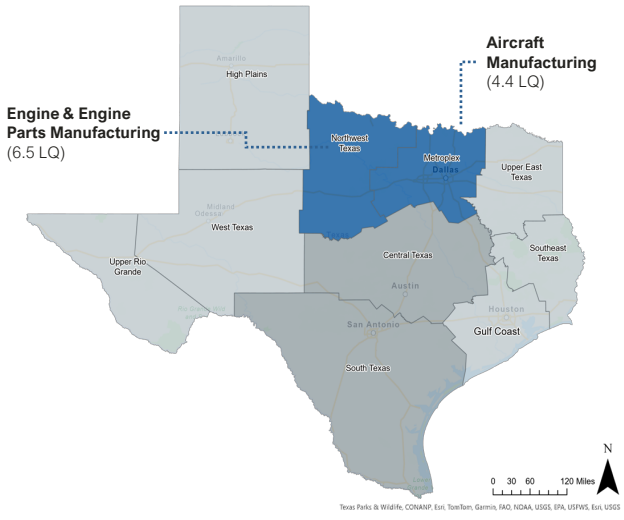
Texas is on the cutting edge of the technological and industry trends that are shaping the future of the cluster. Universities across the state are investing in research and development on advancements in new space, hypersonics, and advanced air mobility, among others. Texas is also home to multiple state-of-the-art aerospace labs and testing facilities, such as the National Aerothermochemistry and Hypersonics Laboratory at Texas A&M University.

Though cluster employment declined in the period from 2011 to 2021, employment is on the rise in recent years, growing approximately 7% from 2015 to 2021. The cluster is also expected to experience moderate growth in the next 10 years, with cluster GDP estimated to expand by 57% from 2022-32.

Cluster Fast Facts

	Workforce	GDP	Exports
Magnitude	**51K** *Total Employment (2021)*	**$16B** *GDP Contribution (2021)*	**$10B** *Foreign Exports (2021)*
Share	**9%** *Share of U.S. Cluster Total Emp. (2021)*	**11%** *Share of U.S. Cluster GDP (2021)*	**15%** *Share of U.S. Cluster Foreign Exports (2021)*
Growth	**-3%** *Total Employment Growth (2011 – 21)*	**37%** *GDP Growth (2011 – 21)*	**285%** *Foreign Export Growth (2011 – 21)*

Cluster Employment Concentration (2021)



Less Concentrated (0.00 to 0.50)	(0.51 to 0.90)	National Average (0.91 to 1.10)	(1.11 to 1.50)	Highly Concentrated (1.51+)

Data Sources: IMPLAN, Regions Industry Data, Texas and United States, (2011-21); Guidehouse Analysis

Advanced Manufacturing in Texas

Automotive

For decades, Texas has been an essential player in the U.S. and global Automotive cluster. A strong manufacturing workforce, robust supply chain, and central location make Texas an attractive destination for manufacturers of products ranging from passenger vehicles to heavy-duty trucks. Private investment in research and development and a strong STEM workforce also keep Texas' auto manufacturers at the forefront of cluster trends and innovation.

The Automotive cluster includes 16 industries that cover a variety of auto manufacturing activities, including upstream activities such as metal foundries and custom roll forming; motor vehicle component manufacturing such as body manufacturing and engine manufacturing; and auto and truck manufacturing and assembly. Notably, the cluster does not include the sale of motor vehicles or ground transportation activities, both of which are located within the Transportation and Logistics sector.

South Texas has the highest automotive manufacturing concentration in the state, driven by a major Toyota manufacturing plant in San Antonio and bolstered by interconnectivity with automotive manufacturing activities in northern Mexico. Texas' automotive manufacturers are supported by a diverse network of suppliers; automotive parts suppliers like Toshiba, Aisin, Vitesco, Navistar, and Continental build the strength and sustainability of Texas' automotive cluster.

Other regions across the state are also building bustling concentrations of automotive manufacturing businesses. The Metroplex region has highly concentrated automobile manufacturing and automobile electronics industries and is home to major factories for General Motors and Peterbilt. In 2021, Tesla opened its Gigafactory in Central Texas, making the region a hub for next-generation automotive engineering and manufacturing.

Texas is driving the future of the Automotive cluster. University centers such as The University of Texas at Austin Center for Transportation Research and Texas A&M Transportation Institute are leading the conversation on cluster trends, including autonomous and electric vehicles. Companies across Texas are also pioneering self-driving technologies — operating driverless vehicles for transport and delivery.

Employment in the Automotive cluster in Texas grew 21% from 2011 to 2021. Productivity increased notably over the same period, with an 80% growth in GDP, likely due to the increased prevalence of automation and other advanced technology in automotive production processes. The cluster is expected to continue to grow, with a projected GDP growth of 59% from 2022 to 2032.

Cluster Fast Facts

	Workforce	GDP	Exports
Magnitude	**38K** *Total Employment (2021)*	**$14B** *GDP Contribution (2021)*	**$3B** *Foreign Exports (2021)*
Share	**4%** *Share of U.S. Cluster Total Emp. (2021)*	**8%** *Share of U.S. Cluster GDP (2021)*	**4%** *Share of U.S. Cluster Foreign Exports (2021)*
Growth	**21%** *Total Employment Growth (2011 – 21)*	**80%** *GDP Growth (2011 – 21)*	**-30%** *Foreign Export Growth (2011 – 21)*

Cluster Employment Concentration (2021)

Less Concentrated (0.00 to 0.50)	(0.51 to 0.90)	National Average (0.91 to 1.10)	(1.11 to 1.50)	Highly Concentrated (1.51+)

Data Sources: IMPLAN, Regions Industry Data, Texas and United States, (2011-21); Guidehouse Analysis

Advanced Manufacturing in Texas

Computers, Electronics, and Semiconductors

The Texas Computers, Electronics, and Semiconductors cluster has a storied past and bright future. Texas is known for excellence in electronics; when asked to picture a calculator, many would think of the Texas Instruments TI series, an essential tool for generations of math students. Today, the Computers, Electronics, and Semiconductors cluster continues to flourish in Texas, due to the presence of major industry players, a strong pool of engineering talent, and strategic investments by the state.

The cluster includes 29 industries which span the computer, electronic, and semiconductor supply chain. Activities in this cluster include the production and assembly of electronics, computers, and semiconductors as well as the manufacturing of components such as wiring devices, fiber optic cables, carbon and graphite products, and other equipment.

Central Texas and the Metroplex are major hubs of the Computers, Electronics, and Semiconductors cluster in Texas. Central Texas is home to Dell, which was founded in a dorm room at The University of Texas at Austin, as well as other computer and semiconductor manufacturers including Samsung, National Instruments, Silicon Labs, and NXP. The Metroplex region also has a robust computer manufacturing industry and is home to a number of large businesses such as Texas Instruments.

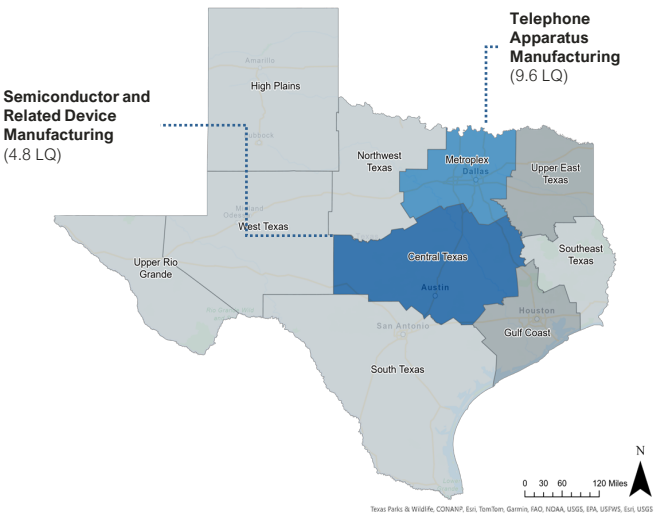
The semiconductor industry is a bright spot of growth within an already strong cluster. Texas has led the nation in semiconductor exports for 13 years. New and expanding companies are driving growth at the regional level, including Samsung, which is currently constructing a major manufacturing facility in Taylor. Sherman is also poised to become a chip manufacturing hub, with major investments in the region by Texas Instruments and GlobiTech. Significant federal and state investments will further accelerate semiconductor industry growth. In June 2023, Governor Abbott signed the Texas CHIPS Act to encourage semiconductor-related companies to expand in the state, further develop the expertise and capacity at Texas higher education institutions, and maintain the state's leadership in semiconductor manufacturing. The Texas CHIPS Act also established the Texas Semiconductor Innovation Consortium and the Texas Semiconductor Innovation Fund, to be administered by the Texas CHIPS Office — a newly formed division within the Texas Economic Development & Tourism Office.

Though cluster employment was largely flat from 2011 to 2021, the cluster is primed for future growth. The cluster is expected to grow steadily in the coming decade, with a projected GDP growth of 46% between 2022 and 2032.

Cluster Fast Facts

	Workforce	GDP	Exports
Magnitude	**85K** *Total Employment (2021)*	**$23B** *GDP Contribution (2021)*	**$8B** *Foreign Exports (2021)*
Share	**9%** *Share of U.S. Cluster Total Emp. (2021)*	**9%** *Share of U.S. Cluster GDP (2021)*	**9%** *Share of U.S. Cluster Foreign Exports (2021)*
Growth	**0%** *Total Employment Growth (2011 – 21)*	**-17%** *GDP Growth (2011 – 21)*	**-27%** *Foreign Export Growth (2011 – 21)*

Cluster Employment Concentration (2021)



Data Sources: IMPLAN, Regions Industry Data, Texas and United States, (2011-21); Guidehouse Analysis

Advanced Manufacturing in Texas

Production Technology and Heavy Machinery

The Production Technology and Heavy Machinery cluster is critical to the state, national, and global economy. Industries of all types rely on the products manufactured in the cluster, which range from the cranes that construct Texas' iconic skylines to the farm machinery that keeps food on our tables. The state's robust supply chain and large workforce make Texas an ideal location for Production Technology and Heavy Machinery businesses to locate and grow.

The Production Technology and Heavy Machinery cluster consists of 34 industries encompassing a broad range of technology and machinery types. Cluster industries include equipment production, such as farm machinery, mining machinery, and other industrial machinery, as well as upstream activities such as ball and roller bearing manufacturing, valve and fitting manufacturing, and fabricated metal manufacturing.

East Texas, particularly the Upper East, Southeast, and Gulf Coast regions, are hubs of production technology and heavy machinery manufacturing, with strength in the Air and Gas Compressor Manufacturing and Mining Machinery Manufacturing industries. South Texas is home to several Caterpillar manufacturing facilities in San Antonio, Schertz, Seguin, and Victoria. Other production technology and heavy machinery companies, including Komatsu, Parker Hannifin, JCB, and Johnson Controls, also maintain significant presences across the state.

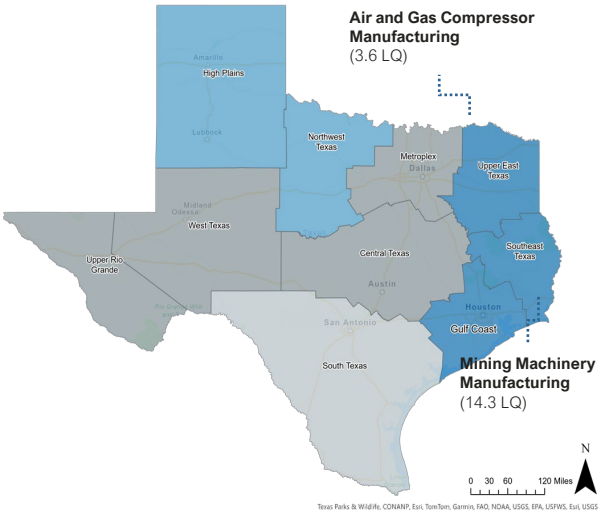
Production Technology and Heavy Machinery companies are driving innovation in Texas' Advanced Manufacturing sector. John Deere recently launched an innovation hub in Austin that will bring advanced technological solutions such as automation and autonomy to the agriculture industry. Innovative companies within the cluster come to Texas to pioneer state-of-the-art technologies that improve the efficiency of production and the effectiveness of heavy machinery, drawn in by Texas' pool of tech and engineering talent, startup community, leading universities, and software and data analytics expertise.

Between 2011 and 2021, the Texas Production Technology and Heavy Machinery cluster grew steadily in both employment and GDP. The cluster is also poised for future growth, with a projected 21% in GDP growth from 2022 to 2032. Industry players are continuing to make investments in the state, and Texas' growing population will drive demand for the production technology and heavy machinery required to expand and fortify the state's infrastructure.

Cluster Fast Facts

	Workforce	GDP	Exports
Magnitude	**70K** *Total Employment (2021)*	**$11B** *GDP Contribution (2021)*	**$6B** *Foreign Exports (2021)*
Share	**7%** *Share of U.S. Cluster Total Emp. (2021)*	**7%** *Share of U.S. Cluster GDP (2021)*	**7%** *Share of U.S. Cluster Foreign Exports (2021)*
Growth	**10%** *Total Employment Growth (2011 – 21)*	**8%** *GDP Growth (2011 – 21)*	**1%** *Foreign Export Growth (2011 – 21)*

Cluster Employment Concentration (2021)



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