



Fort Worth & Tarrant County Opportunity and Needs Assessment



Presented to Texas A&M for the
A&M Innovation Campus in Fort Worth

Prepared August 29, 2022

Presented by Tarrant County and the City of Fort Worth

Commissioned by Downtown Fort Worth, Inc

U3ADVISORS.COM

Acknowledgements

We would like to thank the following organizations for their generous support for this needs assessment study:

City of Fort Worth

Tarrant County

North Texas Community Foundation

Jetta Operating Company

Sheraton Hotel

Omni Hotel

Greater Fort Worth Real Estate Council

Fort Worth Now

Bank of America

Trinity Metro

Kelly Hart & Hallman

Visit Fort Worth

Cover page photograph by Joseph Haubert

Table of Contents

Executive Summary	07
Section 1: Project Background	11
Section 2: Regional Economic Strengths, Weaknesses, and Opportunities	16
Section 3: Industry and Economic Development Needs	20
Section 4: A&M Innovation Hub Programmatic Ideas	25
Appendix	32

Executive Summary



Executive Summary

As a land, sea, & space grant institution, Texas A&M has a core mission of serving the people and future of Texas. Key among those served are the communities of Fort Worth and Tarrant County, which the Texas A&M School of Law - now the second-highest ranked law school in Texas - has called home since 2013, and which has hosted Tarleton State University's newest campus since 2019.

More recently, Texas A&M has looked to expand its presence around the School of Law by bringing new cutting-edge research and experiential learning opportunities to Fort Worth and consequently bringing students and former students from across a wide range of industries to the area. Paired with the region's key industries, A&M's new campus in Fort Worth represents an opportunity to dramatically expand the innovation landscape in the city and broader region.

1. Project Background

In the 2021 Texas A&M Fort Worth Innovation Hub program strategy study commissioned by Downtown Fort Worth, Inc., U3 Advisors identified four main goals for the Innovation Hub:

1. Connect A&M's research with local industry needs and local economic development goals.
2. Support A&M's research and commercialization objectives across the System and the University.
3. Anchor A&M's presence in the growing North Texas region.
4. Spur new opportunities for A&M and industry in the Fort Worth & Tarrant County area, through Tier 1 university programming.

To ensure Texas A&M's resources are best positioned to meet these goals, the City of Fort Worth, Tarrant County, and Downtown Fort Worth, Inc., together with John Goff, Elaine Agather, and other key business community leaders, jointly launched this needs assessment study in 2022. This effort focuses on opportunities envisioned by industry leaders to arise out of A&M's new campus.

U3 Advisors was engaged to gather input from key industry and community leaders across the region's priority economic sectors:

- **Mobility, Logistics & Transportation**
- **Aerospace & Defense**
- **Energy**
- **Health & Life Sciences**
- **Agribusiness & Food**
- **Other merging sectors**

Texas A&M's investment in the Fort Worth innovation campus is a once-in-a-generation opportunity to transform both the local and regional economies and dramatically expand A&M's institutional impact in North Texas. To ensure the campus maximizes this potential, Texas A&M, Fort Worth, and Tarrant County must deliberately and collaboratively engage business community stakeholders, to develop a campus that responds to local needs and, ultimately, accelerates the region's innovation leadership.

2. Regional Economic Strengths, Weaknesses, and Opportunities

Fort Worth and Tarrant County feature important assets that lay the groundwork for a strong innovation economy, including successful industry and community partnerships with Texas A&M. These assets include high quality of life, growth in start-up job creation, a strong base of investment capital, and a strategic geographic location.

Stakeholders across Fort Worth and Tarrant County are eager for A&M to bring its academic, research, and workforce training strengths and scale to catalyze visionary growth, particularly related to entrepreneurship, research, and workforce development. The Fort Worth campus also offers A&M the opportunity to leverage the region's growing, diverse population and industry strengths for initiatives unique to North Texas and an urban, downtown setting.

3. Industry & Economic Development Needs

Industry leaders noted specific industry needs that the A&M Innovation Campus could support, including in the following areas:

- Improved innovation ecosystem connections.
- Expanded research & development.
- Robust infrastructure & resources for start-ups.
- New workforce/graduates with specialized, applied experience and skills. Highlighted fields include computer science, engineering, supply chain management, and life science and biotechnology.
- Support in addressing industry-specific regulatory contexts & impacts.
- Broader access to training & workforce development.
- Specialized facilities for research, training, and program implementation.

4. A&M Innovation Hub Programmatic Ideas

Based on these assets, opportunities, and industry-specific needs, a wide range of exciting programmatic approaches are available to Texas A&M. This report provides initial, specific ideas for A&M to consider exploring. These are meant to spur creative thinking about leveraging A&M's academic mission and unique resources, as well as the region's core competencies, to maximize impact. Ideas are summarized as follows:

- **Research programs, industry partnerships, and tech transfer**
 - Brand the campus with "tech" at the center.
 - Recruit a range of Texas A&M research institutes.
 - Act as a convener for industry research.
 - Maintain an on-site technology commercialization and partnerships office.
 - Support healthcare trials and implementation.
 - Support specialized research for aerospace & defense, ground & air mobility.
 - Advise on industry-specific regulations.

- **Entrepreneurship & commercialization resources**
 - Act as a convening site for innovation-centered organizations.
 - Identify Texas A&M-related opportunities with early-stage ventures, and encourage entrepreneurship across A&M.
 - Launch a one-stop entrepreneurship center.
 - Provide an innovation-centered convening space and relevant programs, a high-quality makerspace, and shared wet lab space.
 - Increase access to simulation technology.
- **Workforce & talent**
 - Expose Texas A&M students to area industries through experiential learning opportunities.
 - Run training programs for new technologies and emerging research.
 - Offer continuing education for industry, such as field-specific legal training.
 - Collaborate with nearby higher education institutions to review industry alignment.
 - Create pathways for local students to A&M and ultimately to job opportunities.
 - Support education ecosystem more broadly.
- **Physical space & district planning**
 - Provide dedicated spaces such as flexible wet labs, testing labs suitable for urban research, and flexible training spaces.
 - Serve as a “front door” for North Texas - and even West Texas and Texas Panhandle - families to Texas A&M.
 - Leverage downtown district infrastructure.
 - Provide attractive amenities and design.
 - Prepare for A&M-associated housing demand.

Section 1

Project Background

An Urban, North Texas A&M Campus

Today, the Texas A&M University System encompasses 11 universities and eight state agencies located across the State of Texas. Despite this extensive footprint, Texas A&M does not yet have a significant downtown, multidisciplinary campus in any large city, even as the rapid growth of the state's cities and metropolitan regions – including Fort Worth – has reshaped the Texas economy. Moreover, Fort Worth is among the fastest growing cities not just in the state but in the country, helping drive North Texas's explosive growth. It is no surprise that more of A&M's former students live in the Metroplex than any other region after Houston.

By anchoring a visionary Innovation Hub and leveraging an urban setting in North Texas, Texas A&M will launch new industry and academic collaborations across the System universities and agencies. Fort Worth's civic and business communities are ready and eager to partner with

A&M and accelerate bold new opportunities for the city.

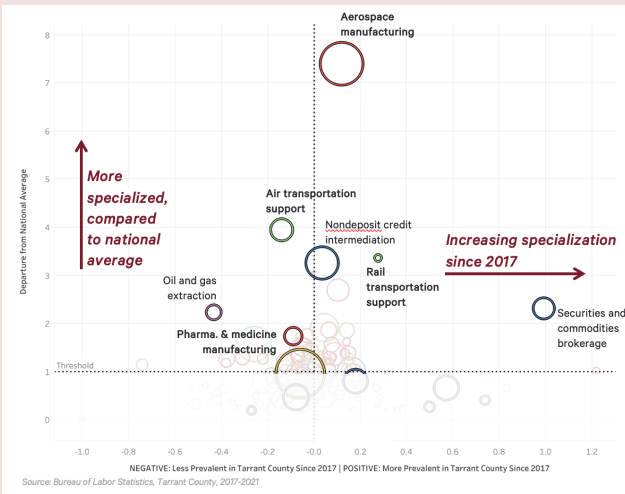
Impact on Tarrant County and Fort Worth

Tarrant County consists of 41 incorporated areas, of which Fort Worth is the largest and most urban. Fort Worth's rapid population growth – which has outpaced employment growth – has highlighted critical needs in the regional economy, including more affordable housing, improved public education, and jobs that pay a living wage. While Tarrant County has high levels of expertise in particular industry clusters – namely energy, transportation & logistics, healthcare, manufacturing, and aerospace & defense – recent job growth has skewed towards lower-wage fields in service industries. Meanwhile, many of the County's traditionally strong sectors are rapidly evolving. They require new technologies, skills, and capacities at all levels to compete in the global market. Texas A&M is perfectly positioned to capitalize on these needs.

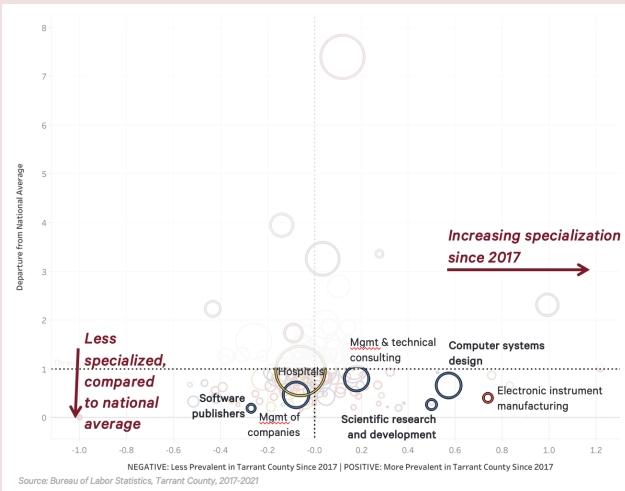
Conceptual Rendering of A&M-Anchored Innovation District Development



Tarrant County Industry Employment Trends, Selected sectors with *greater* specialization compared to national averages (location quotient), and change in specialization from 2017-2021



Tarrant County Industry Employment Trends, Selected sectors with *less* specialization compared to national averages (location quotient), and change in specialization from 2017-2021



Dallas-Fort Worth-MSA Selected Occupations Sample sectors with a high degree of specialization compared to the national average (location quotient) and weaker sectors with lower specialization

Dallas-Fort Worth MSA 2020 Selected Occupations	Number of employees	Employment LQ
Aircraft Cargo Handling Supervisors	920	3.55
Petroleum Engineers	2,370	3.29
Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	3,120	3.14
Aerospace Engineering and Operations Technologists and Technicians	750	2.48
Airfield Operations Specialists	650	2.39
Ophthalmic Laboratory Technicians	1,580	2.34
Geological and Hydrologic Technicians	900	2.24
Semiconductor Processing Technicians	1,770	2.20
Aerospace Engineers	3,190	2.04
Credit Analysts	3,360	1.81
Computer Programmers	8,300	1.81
Computer Network Architects	7,260	1.77
Transportation Inspectors	1,160	1.64
Electronics Engineers, Except Computer	5,020	1.59
Software Developers and Software Quality Assurance Analysts and Testers	52,490	1.38
Computer Hardware Engineers	2,130	1.28
Bioengineers and Biomedical Engineers	460	0.95
Mechanical Engineers	6,600	0.87
Computer and Information Research Scientists	540	0.69
Medical Scientists, Except Epidemiologists	1,770	0.54

Source: Bureau of Labor Statistics 2020. Beginning in 2018, the BLS no longer publishes data specific to metropolitan divisions such as Fort Worth. Data is only available at the metropolitan statistical area (MSA) level, and so Dallas and Fort Worth are combined. LQ: Location Quotient. The ratio of an occupation's share of employment in a given area relative to that of the U.S. as a whole.

The City of Fort Worth’s Economic Development Strategic Plan recognizes these challenges, and lays out specific goals and outcomes:

Goals:

1. Establish Fort Worth’s competitive edge.
2. Become a hub for creative business.
3. Ensure community vitality.

Outcomes:

1. High-wage job growth.
2. A more sustainable tax base.
3. An economy that capitalizes on high-growth businesses and the creative individuals who fuel them.
4. A commitment to quality of place throughout the community.

A university-anchored innovation hub is uniquely suited to serve the City’s plan and regional goals. Universities catalyze economic growth and opportunity, through their roles as education providers as well as research and knowledge generators. While the Dallas/Fort Worth Metroplex hosts over 50 institutions of higher learning, three of which are comprehensive Carnegie Tier 1 research institutions, none reach Texas A&M’s caliber and scale. Research expenditures, for example, at other Tier 1 Institutions ranged from \$84M to \$134M in 2020, compared to \$1.13B at Texas A&M College Station in 2020.¹

A&M’s investments, programming, and industry partnerships should build upon Fort Worth’s entrepreneurial spirit and foster a robust innovation ecosystem that propels whole industries forward. Programmatically, the Innovation Hub should focus on strengths in Fort Worth and Tarrant County, connecting A&M’s research enterprise with real-world assets and needs.

1. Other Tier 1 Institutions in the Metroplex include University of Texas at Arlington (\$133.8M in research spending in 2020), University of Texas at Dallas (\$132.2M), and University of North Texas (\$84.2M)






Key Sectors

- Mobility, transportation, and logistics, including passenger and freight transportation, airline transportation, e-commerce, the application of robotics and automation to generate new efficiencies, and transformation of infrastructure for sustainability.
- Aerospace and defense, including aviation technology, manufacturing, material sciences, design and engineering, and IT and analytical instrumentation.
- Energy, including energy production, geotechnical engineering, expansion of renewables and alternative energy, and energy distribution. Applications also include emergency response management.

- Health & life sciences, including several major hospitals clustered in the Near Southside Medical Innovation District, as well as biotech and life sciences, with an emphasis on optical manufacturing and research.
- Agribusiness and food, including agricultural tech, animal sciences and veterinary medicine, food production systems, and food consumption.
- Other emerging sectors such as in batteries, electrification, computer sciences, and other sectors with significant growth potential for the region and complementary benefits to existing industries.

These sectors are also reflected in the City of Fort Worth’s Economic Development Strategic Plan’s recent 2022 Update.

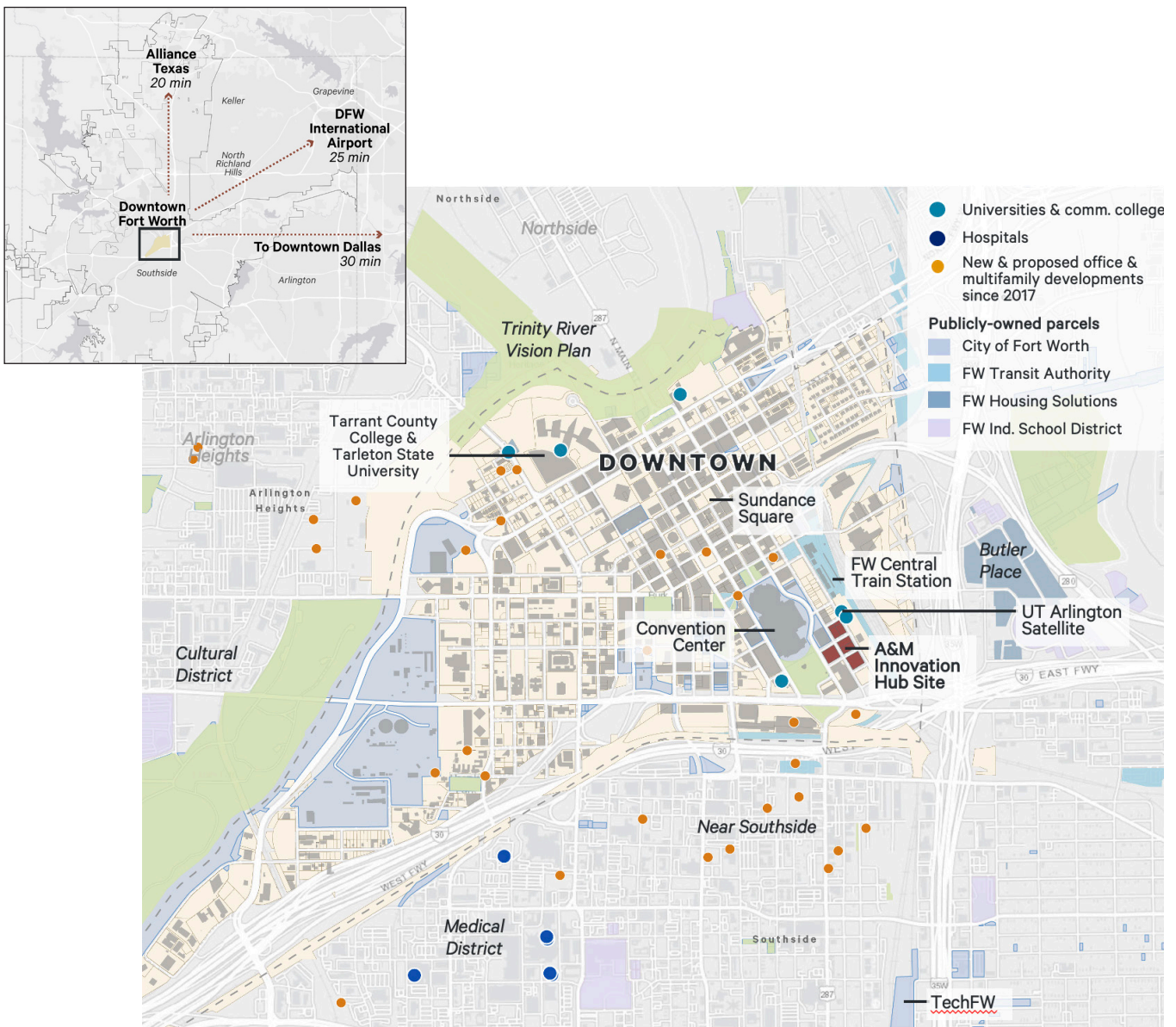
City of Fort Worth Economic Development Strategic Plan 2022 Update Target Sectors

 MOBILITY	 AEROSPACE & DEFENSE	 ENERGY	 CULTURE	 ANCHORS & INNOVATORS
<ul style="list-style-type: none"> • Automotive • Distribution & E-Commerce • Transportation & Logistics 	<ul style="list-style-type: none"> • Aerospace Vehicles & Defense • Federal Government (Military) • Information Technology (IT) & Analytical Instruments 	<ul style="list-style-type: none"> • Alternative Electric Power • Electric Power Distribution • Drilling Wells • Oil & Gas Machinery • Support Activities for Oil & Gas Operations 	<ul style="list-style-type: none"> • Hospitality & Tourism • Performing Arts • Local Community & Civic Organizations • Local Hospitality Establishments 	<ul style="list-style-type: none"> • Colleges, Universities, & Professional Schools • Hospitals • Research Organizations • Computer Services • Corporate Headquarters • Engineering Services • Biopharmaceutical Products

Creating the Innovation Hub

A broader district surrounding the core Texas A&M campus could hold potentially up to 5 million square feet of space, serving as a new hub of creative downtown activity. The district will draw upon its location within walking distance of two important multi-modal rail stations, with convenient connections to Dallas, the Mid-Cities, and DFW International Airport. Likewise, immediate access to major highways allows for easy

access to AllianceTexas, DFW Airport, downtown Dallas, College Station, and beyond. The district is also directly adjacent to major civic centers in Fort Worth, including the Convention Center, the office core, federal offices, numerous hotels, and Sundance Square. Finally, creative, lively urban design and placemaking will draw the entire district together, providing the civic, green space, and street-level experiences that will give the Innovation Hub a distinct identity and 24/7, year-round dynamic activity.



Section 2

Regional Innovation Strengths, Needs, and Opportunities

Innovation Strengths

Fort Worth and Tarrant County feature important assets that lay the groundwork for a strong innovation economy and successful industry and community partnerships with Texas A&M:

High quality of life

The region's key strengths that attract workers are a high quality of life and relative affordability. This contributes to a rapidly growing, diverse population, with the fastest growth among large U.S. cities.

Growth in start-up job creation

Fort Worth recognizes that start-ups are growing in the region and generating a significant number of local jobs. Start-up activity is particularly notable among life science, biotech, mobility, and tech-based companies supported by organizations like TechFW and Sparkyard.

Base of investment capital

Critical for a growing innovation economy, Fort Worth and the North Texas region have a strong base of potential investment capital from an existing pool of investors, funders, and philanthropies. This investment community must continue to accelerate connections to new innovation opportunities, and Texas A&M can play a critical role in this connectivity.

Strategic location

For logistics and mobility needs, Fort Worth and Tarrant County's geography serves important strategic functions. Industries benefit from locating at the center of the U.S., between the U.S. and Mexico, and near large-capacity airport, highway, and rail infrastructure.

Significant healthcare hub

Fort Worth's hospitals are the main medical hub for all of West Texas and have ample opportunity to expand in the Near Southside Medical District and beyond. The hospitals describe themselves as

uniquely collaborative compared to other medical hubs. Specific specialized strengths include ER, trauma, psychiatry, medical devices, neurology, oncology, physical therapy, and aging.

Base of manufacturing skills

With a relatively strong base in advanced manufacturing and mechanical engineering-based companies – many of which are small businesses providing machining and parts for large corporations – Tarrant County benefits from jobs that need to remain local and in-person, as opposed to jobs that are shifting to more remote work patterns. Additionally, the Texas Manufacturing Assistance Center (TMAC) has a significant presence in North Texas, including an existing partnership with University of Texas Arlington. TMAC works directly with manufacturers to improve products, processes, and technologies.

Future regional connections

Texas A&M should also recognize the long-term potential of connections between the Downtown Fort Worth campus and Downtown Dallas via the proposed high-speed rail. The Innovation Hub would then be linked with the innovation ecosystem throughout the Texas Triangle.

The Mobility Innovation Zone at Alliance, 20 minutes north of Downtown Fort Worth, is an internationally recognized center for mobility innovation and exemplifies catalytic investments. Companies ranging from Amazon to BNSF have access to advanced facilities to test groundbreaking technologies related to, among others, autonomous trucking, unmanned aerial systems, and logistics and distribution. The Mobility Innovation Zone offers a clear example of Fort Worth's leadership and broader innovation opportunities.

Innovation Needs

Strengthening the innovation ecosystem across Fort Worth and Tarrant County is imperative to sustaining future competitiveness within Texas, nationally, and globally. For example, the 2022 Economic Strategic Plan notes that although Fort Worth’s dominant sectors of mobility, aerospace & defense, and energy have grown in employment size, local growth has not kept pace with national average rates of growth in these sectors.² Thus, accelerating innovation and industry leadership in the following areas is more important than ever.

Entrepreneurship focus

The local economy and economic development efforts have tended to focus more on attracting external businesses, as opposed to strengthening the entrepreneurship base. As a result, some stakeholders described Fort Worth lacking a robust “early adopter” culture of investing in new types of technologies or models.

Entrepreneurship resources

The entrepreneurship and innovation resources that do exist are relatively small-scale but are growing into a more robust network. For example, Fort Worth has relatively few incubators and accelerators compared to cities of similar size. Growing the resources available for innovation would increase the region’s inherent capacity to generate new start-ups. Existing corporations would also benefit from collaborating with a rich network of early-stage venture companies.

While Fort Worth enjoys a large base of philanthropy and capital, financial investments in innovation activities are still modest. As a result, despite being the 12th largest city in the country, Fort Worth was ranked 40th for early-stage capital funding in 2020.³ The 2021 report “Building a

Startup Metropolis in Fort Worth” delves into further recommendations across the city and community for strengthening the ecosystem.

Academic-industry connections

Academic institutions and industry players can foster even more systemic, widespread, and sustained collaboration to accelerate the innovation ecosystem. Strong academic-industry connections are needed in both research partnerships and preparation of the workforce and talent pipeline. In healthcare, a particular weakness had been the lack of an M.D. medical school, until TCU opened its School of Medicine, joining the UNTHSC School of Osteopathic Medicine.

Coordination in workforce development initiatives

Many efforts are underway across individual higher education institutions, workforce development organizations, and individual companies to develop training and credentialing opportunities to expand the local skilled workforce. However, greater systematic, regional capacity is needed to align workforce training, credentials, and degree programs with local workforce opportunities and industry needs. Improved workforce training, access, and coordination in Fort Worth is critical to addressing socioeconomic disparities among diverse communities, a challenge common across many cities.

Broad, equitable access to high-quality education

Stakeholders across Fort Worth and Tarrant County are working to address long-standing inequities and weaknesses in the early childhood and K-12 education systems, but more resources and partnerships are needed. Fort Worth and Tarrant County’s youth need equitable access to high-quality education to participate in – and grow – the innovation ecosystem.

2. Source: City of Fort Worth Economic Development Plan Strategic Plan Update 2022. Based on decrease in Fort Worth’s location quotient from 2010-2020, and projections to 2025, in each sector of mobility, aerospace & defense, and energy. Location quotient is a measure of the intensity of employment locally relative to the U.S.

3. Source: Sparkyard, Texas Startup Indicators.

Opportunities for Texas A&M to Leverage

As Texas A&M develops its Innovation Hub programming, it should consider the opportunities that Fort Worth and Tarrant County offer to further A&M's education and research mission, including:

Openness to Texas A&M's size, scale, and influence

Industry and community leaders universally cited A&M's size and scale as its primary institutional advantage. As one industry leader described, they hope to see A&M be a "disruptor" for innovation in the local economy.

Applications for Texas A&M's academic and research strengths

Building closer relationships with the diverse industries in North Texas expands research, tech transfer, and commercialization opportunities across A&M. Several sectors, including biomedical/life sciences and energy, specified A&M's applied engineering disciplines as particular areas of strength, with greater collaboration potential.

Fort Worth's growing, diverse population

In addition to its sheer scale as the county's 12th largest city, the rapid population growth in Fort Worth and the DFW Metroplex allows Texas A&M to draw from a large pool of talent and ideas. Additionally, A&M can directly market itself to a growing and increasingly diverse student applicant pool across the region.

Student experiential learning

By establishing a campus adjacent to industry partners, Texas A&M can design creative experiential learning opportunities for students that connect their classroom experiences to real-world settings, whether through internships, job shadowing, service learning, research and project partnerships with companies, site visits, etc.

Urban location and assets

With urban amenities and exceptional accessibility, the downtown campus can attract a dense concentration of partners from around the region and world to collaborate with Texas A&M students, faculty, and researchers. Critical transportation infrastructure includes a leading global airport hub, public transit, and plans for a transformative high-speed rail station next to the campus.

Community & workforce development resources

Several on-the-ground organizations are ready to partner with Texas A&M to help ensure its investments reach local communities throughout the city and Tarrant County. The **City of Fort Worth** and **Tarrant County** have already begun significant efforts to assist A&M's expansion plans. **T3 (Tarrant To & Through) Partnership** is forming deep partnerships with universities, employers, and K-12 students to support higher education and career pathways. **Tarrant County College** has a long, successful track record of workforce development in the community. **Workforce Solutions for Tarrant County** helps identify credentialing and training opportunities for local businesses to offer to their employees. **Downtown Fort Worth, Inc.** is a critical leader in facilitating downtown planning and development. Other adjacent community development resources include **Near Southside, Inc.** and **Southeast Fort Worth, Inc.**



Innovation resources

Existing start-up resources, including **TechFW** and **Sparkyard at UNTHSC**, have a strong track record of growing and advocating for the start-up community. These organizations are eager to partner with Texas A&M and can help provide a conduit into the existing innovation ecosystem.

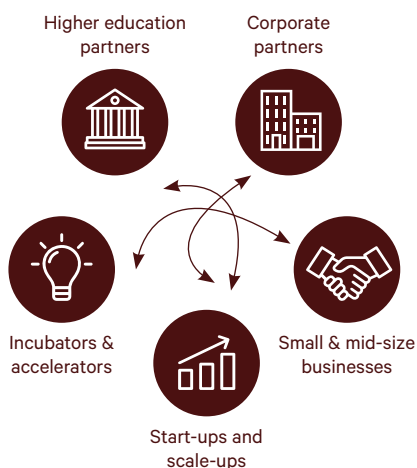
Section 3

Industry and Economic Development Needs

The Fort Worth and Tarrant County business community sees significant opportunity for Texas A&M to accelerate innovation locally, while generating new opportunities for A&M to advance its institutional mission. Common themes reiterated across stakeholders include:

1. Connecting the innovation ecosystem

Fort Worth and Tarrant County need institutional capacity and leadership to serve as the “connective tissue” organizing, connecting, promoting, and facilitating different components of the innovation ecosystem. This ecosystem includes higher education institutions, large corporations, corporate innovation centers, small businesses, start-ups, and start-up resources.



Capacity is needed for:

- Disseminating and connecting high-caliber academic research to local companies through collaboration and commercialization, and vice versa – communicating industry needs to academic researchers.
- Accelerating transitions from research and development, to commercialization, scaling up, and growth.
- Connecting start-ups with established companies and partners in the ecosystem,

such as corporate innovation offices and venture teams.

- Tracking and forecasting new jobs, skills, and trends needed as industries innovate and evolve.

2. Expanding research and development

Companies at all stages and across sectors often lack the capacity to dedicate resources to long-term R&D and ideation, between running day-to-day operations and navigating often volatile economic conditions. Texas A&M’s presence in Fort Worth can help foster new connections that strengthen the culture of academic-industry partnerships. Commercial airline companies, for example, often do not have robust, sustained academic collaborations outside of pilot training (in contrast with university partnerships with aerospace manufacturers, for example) and so present enormous opportunities for new kinds of research partnerships.

3. Infrastructure & resources for start-ups

The regional innovation ecosystem needs expanded infrastructure and resources to nurture, incubate, and accelerate start-up activity, through:

- Significantly expanding the size, scale, and diversity of the accelerator and incubator network, adding to the programs and support currently available from TechFW and Sparkyard. Relevant examples of successful entrepreneurship hubs include Pegasus Park in Dallas (with a focus on biotech) and Geekdom in San Antonio.
- Catalyzing new connections and momentum between entrepreneurs and sources of capital, such as philanthropy, venture capital, or angel investors.
- Identifying and marketing entrepreneurship training needs and opportunities.

- Encouraging and offering resources for new graduates to explore start-up opportunities, including launching start-ups and joining new ventures.

4. Specialized, applied experience and skills among recent graduates

For established corporations as well as start-ups, recruiting and training skilled talent is paramount, especially considering the significant shifts taking place across all industries (e.g., rise of automation, data analytics, advanced manufacturing, etc.) Employers seek students and recent graduates who are prepared with the skills needed to drive innovation and hope to bring these students to Fort Worth early in their studies, to expose them to industry applications in their fields.

Industry leaders expressed critical, urgent needs for workforce, professional, and technical skills. These are categorized below by field, with additional details raised by specific industry representatives:

Computer science-related

U3's prior industry studies, as well as other Fort Worth and Tarrant County economic studies, show that Fort Worth is relatively less specialized and has fewer occupations in computer science-related fields compared to other major cities nationally, as well as in Texas. Specific workforce needs include:

- Computer science & software development, raised by:
 - All sectors
 - Sector-specific, specialized applications with specific training needed, such as the intersection of software with unique hardware components (such as aerospace & defense, medical devices, electric motors, etc.). As specialized companies and industries scale up, they are increasingly limited in capacity to train new hires in-house.
- Cybersecurity, a critical challenge raised by:
 - All sectors, recognizing security challenges are a growing concern for any industry working with sensitive data.
- Data analytics, data systems, and optimization, raised by:
 - Mobility/transportation, for complex data inputs from vehicle sensors, network inputs, and electrification
 - Health sector for data management
 - Energy sector for monitoring and geographic data analysis
 - All sectors for supply chain and logistics monitoring
 - Ancillary uses across all sectors, for human resources, accounting, etc.
- Automation, raised by:
 - Energy, for remote monitoring, grid maintenance and emergency response, and field operations
 - Health, for remote patient monitoring, etc.
 - Aerospace and defense, for manufacturing and vehicle technology
 - Mobility, transportation, and logistics, for manufacturing, vehicle technology, and warehousing/shipping logistics. While the major players in shipping logistics (Wal-Mart, Amazon, FedEx, etc.) have developed highly advanced distribution systems, smaller companies have fewer resources available. There is a need to develop more sophisticated, automated, integrated automation and tracking throughout product and supply chains.
- Artificial intelligence (AI).
- Data storage.
- Data visualization.

Engineering-related

Texas A&M, Fort Worth, and Tarrant County all share strong foundations in engineering. The region's industries have a growing need for engineers adept at working across disciplines, in fields like:

- Robotics (related to automation), raised by:
 - Aerospace & defense, for accelerating manufacturing automation.
 - Mobility, transportation, and logistics, for accelerating manufacturing automation.
- Electrification, energy distribution, energy storage, raised by:
 - Aerospace and mobility/transportation, for advancing battery technology, energy storage, and electric boards and chips.
 - Increasing infrastructure capacity for electrification is a significant need, as transportation and other sectors transition to electricity.
- Electrical engineering, with specialized expertise applied to:
 - Energy.
 - Aerospace & defense.
 - Mobility/transportation.
- Biomedical engineers, raised by:
 - Life sciences and biotech, including medical devices.
- Chemistry and chemical engineering. Specialized expertise in chemical engineering is critical for the intensive environments applicable in the aerospace/defense and energy sectors. Specific needs include:
 - Materials sciences & metallurgy.
 - Alternative and sustainable fuels, most critically for the commercial aviation sector.

Supply chain and logistics management

Supply chain management capacity is needed across sectors. Companies rely on Fort Worth's location as a logistics hub for their competitive advantage, while also adapting to global changes to the supply chain system. New skills needed include:

- Technology integration and testing.
- Design of tracking/tracing and IoT (Internet of Things) systems.
- Supply chain resilience evaluations.

Life science and biotechnology

Growing skills and talent in life sciences and biotech is imperative to building the region's life science sector. Specific skills building on Fort Worth's strengths include:

- Biomedical engineering, drawing on Fort Worth's long-time engineering expertise as noted above.
- Medical devices.
- Gene therapy.
- Specialization in vision sciences.

5. Integrating regulatory contexts & impacts

Each of these key innovation sectors are closely tied to public regulatory processes and standards. Companies therefore need a deep understanding of current and changing regulations among their staff. For example, one aerospace-related company described spending 6-12 months training new engineering hires on Federal Aviation Authority (FAA) regulations, which is an unsustainable investment of time and effort as the company expands. Ideally, new hires in engineering would already bring a solid foundation in regulatory understanding. Similarly, smaller companies expressed a need for more experts in industry-specific legal issues, such as aerospace contracts, industry-specific regulations, and litigation issues.

At the same time, companies must simultaneously anticipate new regulatory requirements, which have been slow to evolve as to emerging aerospace and ground mobility technologies like unmanned aerial vehicles (UAVs) and electrification. Companies therefore are unable to predict and plan their investments for future standards. These companies are looking for ways to help regulatory

bodies anticipate the regulations needed and accelerate their decision-making. With a regional FAA office located in Fort Worth, Texas A&M has a significant opportunity to expand connections between regulators and industry and advance critical research needed by both.

6. Broadening access to training & workforce development

Several workforce development initiatives are active across Fort Worth. Additional capacity and support are needed to connect workforce development pathways coherently, ensure access to training and education for the populations that need them most, and ensure job placement success for students and workers who pursue credentials. Specific needs include:

- Ongoing workforce training and clear workforce pathways and career ladders, such as high school programs, certificates, community college degrees, and four-year degrees that align industry needs with academic offerings.
- Workforce pathways should include a focus on improving disparities and inequitable access to educational opportunities – the focus of organizations like the T3 Partnership.
- Sample existing workforce pathway opportunities include:
 - Healthcare, with partnerships between hospitals and the Independent School Districts (ISDs) to offer high school certificate programs.
 - Energy, through internships for high school students.
 - Aerospace & defense, through high school student programs and partnerships with local ISD's collegiate and P-Tech programs, which expose high school students to engineering, business, and operations.
 - Ancillary training across all fields in, for example, purchasing, logistics, HR, executive and leadership programs, etc.

- Targeted certificates and continuing education for ancillary workers, such as non-clinical professionals in healthcare or human resources professionals in aerospace/defense, in fields like data management.

7. Specialized facilities

Some industries mentioned the need for simulation labs or other kinds of shared research or training facilities:

- Hospitals describe a general need for simulation labs and clinical teaching facilities for nurses, doctors, and other practitioners. For example, Tarrant County College hosts a high-quality nursing simulation lab, and UNTHSC also recently opened a new Regional Simulation Center. More of these types of labs are needed.
- Aerospace/transportation manufacturing needs complex testing facilities. Several companies cited Wichita State University in Kansas as a valuable aerospace testing resource, and one of the few large-scale facilities available in the country. Many Fort Worth companies travel to WSU to use this test facility and work closely with their graduate students and faculty.
- New shared lab space for life science/biotech start-ups are also needed due to the limited supply available in Fort Worth, particularly for new companies in early research and development phases.
- High-performance computing analytics facilities could serve and help model advanced computing and new computing technologies to local partners.
- Specialized urban agriculture and agricultural technology facilities could help accelerate agribusiness innovation in Fort Worth and Tarrant County. A promising example is emerging in Denver, where Colorado State University (CSU) is opening CSU Spur, an innovation center focused on agriculture, water conservation and research, and community outreach and education.

Section 4

A&M

Innovation Hub

Programmatic

Ideas

The industry and civic leaders participating in this study are eager to engage with Texas A&M on translating these needs into programs and ideas for the A&M Innovation Hub. Listed below are ideas for A&M to consider exploring. These are meant to spur creative, broad thinking about leveraging A&M's academic mission and unique resources with the region's core competencies, to maximize impact for Texas A&M, Fort Worth, and Tarrant County.

A. Research Programs, Industry Partnerships, and Tech Transfer

Above all, Texas A&M should recognize the significant opportunity for researchers to engage and work side-by-side with local industry and emerging businesses on joint R&D projects.

Sample Fort Worth and Tarrant County-based companies with potential for A&M partnerships



To connect research and innovation to industry opportunities, Texas A&M should consider:

1. Brand and heavily connect the campus with “tech.” Communicate broadly that the campus is engaged with new technologies.
2. Connect College Station-based research institutes to the region's focus industries. By engaging A&M's high-profile, established research institutes, the Innovation Hub would enhance the profile of College Station within the DFW Metroplex. As examples, specific research centers cited by business leaders included:
 - Texas A&M Transportation Institute (TTI).
 - Texas A&M Engineering Experiment Station (TEES).

- Texas A&M Engineering Extension Service (TEEX).
- Texas Division of Emergency Management (TDEM).
- Bush School of Gov. Cybersecurity Program.

TTI's industry partnership initiatives offer an exemplary model. For example, its Supply Chain Technology Hub (SCT-Hub) is an ongoing initiative that provides applied research, consulting services, and coordination for technology providers, end users (including large and small businesses), and public sector entities to improve supply chain operations. Examples of issues studied include technology integration and testing in supply chain operations, design of tracking systems, risk assessments, and network design simulations. At the Fort Worth campus, initiatives like the SCT-Hub could offer critical services to industry partners, while coordinating across public and private sectors to test new concepts and advance innovation.

3. Regularly convene sector and subsector-specific representatives to advise on existing research and research gaps, and ensure representatives span companies across an industry, from manufacturers to end users. Leverage existing industry consortia where they already exist.
4. Define clear pathways for companies seeking to partner with A&M. A Texas A&M technology commercialization and partnerships office located on-site, with dedicated capacity for local partnerships and expertise in specific industries, would help provide an accessible “front door” to the A&M research enterprise.
 - This office could include co-located representatives from affiliated A&M commercialization offices across the A&M System and agencies.
 - Staff and liaisons should reach out to businesses at all scales. This capacity could significantly impact small businesses –

including those in advanced technical fields - who may not have the scale, connections, or understanding to engage with academic institutions that large corporations do.

5. Where possible, establish research facilities and base researchers in Fort Worth to advance critical priorities and regularly interface with industry partners. If a physical presence is not viable, ensure the on-site technology commercialization and partnerships office has the knowledge and capacity to facilitate College Station-based connections.
6. For physicians and the healthcare sector, suggested areas for research partnerships include:
 - Connecting researchers to support a wide array of clinical trials.
 - Research and track innovative healthcare delivery models, such as deployment of community health workers, telehealth and remote health, and other models focused on factors related to the social determinants of health.
7. For aerospace & defense and ground mobility, key research areas needed include:
 - Battery development, electrification, and standardizing charging systems and requirements.
 - Infrastructure capacity for electrification.
 - Advances in materials sciences for specific applications in advanced manufacturing at all scales, from component parts to primary users.
 - Integration and impact of automation on advanced manufacturing processes and the workforce.
8. A unique opportunity to partner with commercial airlines, such as Fort Worth-based American Airlines, to catalyze new research could also distinguish the A&M research program. Commercial airlines currently have relatively few academic research partnerships, compared to their design and manufacturing aerospace partners. Priority areas include:
 - Data analytics and logistics optimization.
 - Alternative fuels and propulsion systems to meet industry sustainability targets.
 - Airport design and infrastructure.
9. To address the regulatory needs of fast-changing industries, develop a central resource for recommendations on regulatory and standardization issues related to new technologies, particularly in aerospace and mobility/transportation. This type of leadership would advance critical challenges facing these sectors. The Law School could collaborate with engineering, sciences, and other policy researchers on issues such as:
 - Aerospace, which is seeking to encourage the FAA to issue national guidance on future certifications and standards for new technologies related to: power infrastructure and production, power sources (such as electric or hydrogen), and operations and flight paths of drones, among many others.
 - Surface mobility/transportation, which is dealing with questions surrounding systems interoperability challenges, electrification standardization, and charging infrastructure.
 - Energy, including regulations around emissions capture.
10. Some industry representatives – in aerospace/defense and oil/gas - shared that they may not pursue shared research and development with other companies and A&M, due to the proprietary nature of some research. Sponsored research, however, is a distinct opportunity for A&M.

B. Entrepreneurship & commercialization resources

1. Convene local innovation-centered organizations to build a stronger, cross-sector ecosystem of start-up and early-stage venture resources:
 - Work with Sparkyard, TechFW, and AllianceTexas as local conveners deeply familiar with the local ecosystem.
 - Together, recruit a national, high-profile innovation player (such as an incubator/accelerator like J Labs) that can act as an industry disruptor and attract more attention and support from local and national venture capital, talent, etc.
 - Engage the innovation offices of established corporations with the start-up ecosystem, recognizing the interest from large corporations in identifying promising new IP.
2. Dedicate resources and training for the Texas A&M commercialization and partnerships office to identify opportunities and supports needed for early-stage ventures – to bring promising technologies to the market.
3. Encourage entrepreneurship among A&M students, researchers, and faculty conducting promising research with commercialization potential and engage resources available to launch new start-ups in Fort Worth.
 - Specifically target entrepreneurship outreach for students and researchers in life science, energy, and advanced engineering fields who may not otherwise consider entrepreneurship opportunities.
4. Create and manage a one-stop entrepreneurship center that offers coworking and ongoing entrepreneurship education opportunities. This center could also be the gateway for entrepreneurship resources across A&M, such as:
 - Expanded start-up resources and engagement with A&M in College Station, such as A&M's annual new venture competition.
 - A&M's Mays Business School could provide resources to support new entrepreneurs and conduct research on how communities grow innovation.
 - A&M's Law School could expand their support for entrepreneurs around company formation, licensing, patenting, etc.
5. Manage and program convening space centered around innovation, including a robust programming calendar, events, pitch days, and networking to disseminate new research and opportunities, highlighting key industry sectors.
6. Provide a high-quality makerspace open to students, start-ups, and the broader local community; locate makerspace adjacent to flexible office space.
 - Include research and equipment to ideate, build, test, and showcase products and automation and robotics technology for local industry's advanced manufacturing applications and product development.
7. Provide shared wet lab space for life sciences & biotech start-ups struggling to find suitable space. This is a current facilities gap in Fort Worth that the new campus could immediately fill.
8. For start-ups in data-heavy fields, access to simulation equipment and technology could help lower barriers to entry and advance collaboration opportunities for promising new companies.

C. Workforce & Talent

Ideas here reflect opportunities for Texas A&M College Station-based students to engage with Fort Worth & Tarrant County industries. Equally important are potential strategies for A&M to support Fort Worth/Tarrant County community, workforce, and professional development needs. Already, the Law School has set an exemplary precedent of engaging with specific industry needs by developing creative, targeted cross-disciplinary degrees, certificates, and specializations.

1. Expose College Station-based undergraduate and graduate students to sectors and companies in Tarrant County and Fort Worth, and design opportunities for students to develop applied, experiential learning experiences in their academic fields. For example:
 - Run cohort-based summer internship and/or “Semester in Fort Worth” programs with classes and internships that are integrated with industry partners. Encourage students to explore how to apply their fields to specific industry sectors, companies, and applications. For example:
 - Computer modeling applied to the energy industry
 - Software and engineering applied specifically to flight controls and the aerospace interaction between hardware and software
 - Chemical engineering and material sciences applied to altitude and environments for flight
 - Intersection between regulations/standardization and engineering innovations
 - Intersection between business and technology, advanced manufacturing, life sciences, etc.
 - Design “Summer in Fort Worth” programming for student interns, and structure student cohorts by industry sector. Expose students to the region and its industries as early in their careers as possible
- by bringing students directly to Fort Worth. This is of particular interest to the energy/oil & gas sector and was mentioned by HR-related leaders across other sectors.
2. Where possible, offer graduate student-level programming based in Fort Worth, focused on applied experiences in engineering and computer/data sciences.
 3. Leverage A&M agencies and research institutes to run training programs in new technologies and services, designed for both students and professionals.
 4. Collaborate with nearby higher education institutions (including Tarrant County College, Texas Wesleyan, University of Texas Arlington, Texas Christian University, etc.) and industry sectors to continuously review and adapt educational programs, to ensure students learn skills and knowledge that are the most relevant and topical.
 - Curricula developed for innovation industries and needs – for example, materials sciences, data analytics, or cybersecurity - are often outdated by the time they are implemented in classrooms. A more coordinated, flexible system could quickly adapt educational offerings to changes at the industry level.
 - This coordination could be structured through industry advisory groups that would work closely with academic departments and faculty to identify priority skills and experiences; review curricula and syllabi on a regular basis; design modules that could be integrated into existing curricula or new courses; and develop guest lectures from industry leaders.
 - A&M and industry advisory groups, in collaboration with other higher education institutions and workforce development partners, can also review high-demand career pathways and available educational offerings at the regional level to identify strengths and gaps in program offerings.

5. For current students in Fort Worth and Tarrant County: Support access to higher education and career pathways through partnerships with the local Independent School Districts (ISD's) and Tarrant County College.
 - Join T3's (Tarrant To & Through) higher education partnership to strengthen higher education pathways for K-12 students.
 - Provide T3 with additional support and research capacity around its organizational goals and impact.
 - Help Tarrant County students envision and transition to Texas A&M by operating a center for undergraduate admissions to base regional outreach, where families, students, and educators can "visit" A&M remotely. Support broader college outreach initiatives from this center.
 - Support each Tarrant County & Fort Worth cohort of students matriculating at A&M with pre-college and ongoing programming, as well as support in summers.
 - Develop partnerships with Fort Worth ISD schools, including Young Women's Leadership Academy in Downtown Fort Worth, that engage students in research and opportunities at the A&M campus.
 - Work closely with Tarrant County College to design pathways for targeted fields and industries by aligning program requirements and credentials. Partnerships with TCC will enhance A&M's accessibility and benefits to the community.
- Texas A&M and Tarrant County College recently launched the Texas A&M Engineering Academy at Tarrant County College, starting fall 2022. The Engineering Academies have been a highly successful example of aligning education systems, allowing qualified students to start their coursework at community college and finish their engineering degrees at A&M in College Station, thereby expanding access to engineering to a wider, diverse pool of students.
6. Support the education ecosystem more broadly, to ensure high-quality education for all families and children. Fort Worth and Tarrant County are particularly focused on improving early childhood education. For example, in May 2022 Tarrant County Commissioners announced a \$45 million investment of federal funds to support and expand infant and toddler care.
 - Conduct ongoing research on the early childhood education landscape, alignment with K-12 education, and student outcomes over time.
 - Provide hands-on, high-quality training and resources for new and existing early childhood educators.
 7. For the current workforce: Work with industry partners to design structured continuing education, certification, and executive education programs for employees.
 - Design curricula for short continuing education and professional development courses tailored to targeted industries. A&M research centers and faculty can train employees on industry applications and the latest advances in:
 - Computer software and technology.
 - Data analytics.
 - Engineering.
 - Understanding regulatory frameworks for technical fields, such as engineering and life sciences.
 - Other targeted industries.
 - Employee continuing education programs could feature a single A&M point of contact for the company, regardless of the program employees have enrolled in. Target specific programs (rather than a broad portfolio of offerings) so that employees can enroll as cohorts within their companies.
 - Promote and align with other nearby universities' continuing education programs in ancillary fields.
 8. Expand on the School of Law's cross-disciplinary focus. Promote and expand

specialized programs with the School of Law to help new and mid-career lawyers and other professionals gain industry expertise in niche legal and regulatory issues, particularly relevant in aerospace & defense.

9. North Central Texas Council of Governments (NCTCOG) is piloting an Agile workforce training system for Aerospace & Defense industries. Partner with NCTCOG to help expand this approach into other industries.

D. Physical Space & District Planning

1. Facility ideas include:
 - Provide training and meeting space for collaborative workforce efforts, e.g., meeting space and simulation labs accessible to the entire healthcare sector.
 - Provide in-demand, flexible wet lab space for life science and biotech start-ups, and plan for “step-out” space as those companies grow.
 - Consider testing labs that benefit from an urban testing environment but require smaller-scale facilities than larger suburban facilities might offer. Examples might include smaller-scale materials or structural testing.
2. Leverage the extraordinary reliability of downtown district infrastructure, including energy reliability, to attract office tenants and corporate partners.
3. Across the campus and district, provide appealing spaces for amenities, such as restaurants, retail, public spaces, etc., that activate the public sphere, leverage the walkability of the downtown grid, and attract both high-skilled talent outside the region and the existing communities in and surrounding downtown.
4. Consider strategies for the district’s built environment to model innovation itself, such as through building technologies, district infrastructure, nearby transportation investments, energy storage and back-up, etc.
5. Prepare for A&M student, staff, and faculty housing demand as the A&M Fort Worth campus grows.



Appendix A

Stakeholder Interviews Conducted for Needs Assessment

List of Industry Stakeholder Representatives Interviewed

Name	Company/Org.	Title
Mobility, Transportation, Logistics & Aerospace, Defense		
Chris Ash	Hillwood Development Company	SVP – Aviation Business Development
Mike Berry	Hillwood Development Company	President
Russell Laughlin	Hillwood Development Company	EVP
Ian Kinne	Hillwood Development Company	Director of Logistics Innovation
Mobility, Transportation, Logistics & Energy		
Brad Hunstable	Linear Labs	CEO
Mobility, Transportation, Logistics		
Ginger Goodin	Texas A&M Transportation Institute	Senior Research Engineer
Dan Kessler	North Central Texas Council of Governments	Assistant Director of Transportation
Bill Stockton	Texas A&M Transportation Institute	Deputy Agency Director
Aerospace, Defense		
Scott Baum	Elbit Systems	VP of Growth & Strategy
Steve Johnson	American Airlines	EVP & Strategic Advisor to the CEO
Cara Lundquist	Bell Textron, Inc.	Director – Workforce Planning, Strategy & Development
Paul Paine	North Central Texas Council of Governments	Sr Program Manager
Bryan Perkins	Novaria Group	CEO & President
Sunitha Vegerla	Recaro Aircraft Seating	General Manager
Energy		
Greg Bird	Jetta Operating Company	CEO & President
Laura Bird	Jetta Operating Company	VP – Facilities Management

Name	Company/Org.	Title
Richard Casarez	Oncor	Vice President
Jim Finley	Finley Resources, Inc.	CEO
Blake Hill	Jetta Operating Company	VP – Reservoir Engineering
Greg Mendenhall	Texland Petroleum	VP – Operations
Jeff Miller	Vortus Investments	Managing Partner
Brian Moody	Point Energy Partners	CEO
Amy Patterson	Jetta Operating Company	VP – Geology
John Sabia	Point Energy Partners	CFO
James Tatum	Jetta Operating Company	COO & SVP
Brian Wallace	Jetta Operating Company	CFO & VP
Jim Wilkes	Texland Petroleum	President
Healthcare & Life Sciences		
Carolyn Cason	UTA School of Nursing	Professor Emerita, Associate Dean for Research
Ben Coogan	Medical City Fort Worth	CEO
Cameron Cushman	UNT Health Science Center	AVP – Innovation Ecosystems
Joseph DeLeon	Texas Health Resources – Fort Worth	President
Elyse Dickerson	Eosera	CEO
Kathleen Gibson	Southwestern Medical Foundation	President & CEO
Les Kreis	Bios Equity Partners	Managing Partner
Lauren Poe	JPS Health	Chief Strategy Officer
Stella Robertson	Bios Equity Partners	Partner

Additional Stakeholder Representatives Interviewed

Name	Company/Org.	Title
Bobby Ahdieh	Texas A&M School of Law	Dean
Elizabeth Beck	City Councilmember	City of Fort Worth
Hayden Blackburn	Executive Director	TechFW
Roy Brooks	Tarrant County	Commissioner, Precinct 1
Jay Chapa	City of Fort Worth	Fmr. Assistant City Manager (retired)
David Cooke	City of Fort Worth	City Manager
Brandom Gengelbach	Fort Worth Chamber of Commerce	CEO
John Goff	Crescent Real Estate	Chairman
Billy Hamilton	Texas A&M University System	Deputy Chancellor & CFO
GK Maenius	Tarrant County	County Administrator
Andre McEwing	(fmr.) Tarrant County College	
Mattie Parker	City of Fort Worth	Mayor of Fort Worth
Renee Parker	Workforce Solutions for Tarrant County	Director, Industry Services Unit
Nina Petty	Texas A&M University School of Law	Special Advisor to the Dean
Betsy Price	City of Fort Worth	Fmr. Mayor of Fort Worth
Andy Taft	Downtown Fort Worth, Inc.	President
Jarratt Watkins	Kelly Hart & Hallman, Fort Worth Now	Attorney
Natalie Young Williams	T3 – Tarrant To & Through	Executive Director



NEW YORK

215 Park Ave S, 11th Floor
New York, NY 10003
212.460.8601

PHILADELPHIA

22 S 40th Street
Philadelphia, PA 19104
215.279.8385

BOSTON

1167 Massachusetts Ave
Arlington, MA 02476
267.455.5762

U3ADVISORS.COM