

Assessing the Demand for Middle-Skill Jobs in Greater Houston

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Key Questions for the Study to Inform:

- What are Greater Houston's "high demand" established and emerging middle-skill jobs and skills for strong career opportunities and targeted interventions?
- What are the key occupations demanded by the region's industry clusters?
- Among the middle-skill jobs, which can be considered "good" entry-level jobs to target for programmatic focus and scale-up?
- What are specific pathways into more advanced, viable middle-skill jobs with improved pay and job prospects?
- What middle-skill jobs are expected to be impacted most by automation and digitization?

Executive Summary

Greater Houston’s economy has experienced rapid growth and strong gains in both the near- and longer-term, placing strains on the regional labor market particularly during a long economic expansion. In the midst of this exciting yet challenging growth, the Greater Houston Partnership established a unique initiative to address the consistent, urgent feedback from its corporate membership regarding the difficulty and challenges in sourcing, hiring, and retaining its “middle-skill” workforce—specifically, those individuals in jobs that require education and skills beyond a high school diploma but less than four years of college.¹

The regional initiative established to address these concerns, UpSkill Houston, has been working to narrow the worker and skills gaps across the middle-skill workforce utilizing a highly collaborative approach led by business executives and employers. UpSkill Houston has brought together these industry leaders with key partners—educators, leaders of community organizations, and government officials to advance the workforce and talent pipeline in targeted occupation and career areas.

With five years passed since its inception, UpSkill Houston requires updated intelligence to maintain its focus in the most appropriate career areas, with relevant programming for strategically targeted occupations and skill sets. Today the Partnership and UpSkill Houston initiative have key questions to answer based on forward-looking data and projected demand (see sidebar) and are in need of better understanding priority occupation and skill areas for targeted, strategic interventions.

Middle Skills Matter in Greater Houston’s Economy

The study begins by establishing the context for the middle-skill, and broader regional skills mix of the workforce in Greater Houston. The analysis finds that for this region middle-skill jobs clearly matter:

- ✓ They account for a larger share of regional jobs than the national average (30% vs. 28%);
- ✓ They have outpaced the nation in growth during the current expansion (16% vs. 12%); and
- ✓ They are expected to continue to grow faster over next 5 years (5% vs. 4%).

With this high-level skills framework and importance of middle skills established, the study pivots to understanding what are those occupational areas that represent high-priority targets for interventions by UpSkill Houston.

¹ UpSkill Houston understand the terminology of “middle skill” is challenging and will be working on how to improve the messaging for the careers and occupations that require education and skills beyond high school but less than four years of college. This report will use the term “middle skill” for purposes of clarity.

Identifying High-Priority Middle-Skill Occupations for Targeted, Strategic Interventions

The study considers several demand-focused attributes to determine not only those “high-demand” occupations for Greater Houston, but also to go further and identify those occupations that demonstrate the combined set of characteristics that characterize a “high-priority” occupational area for UpSkill Houston.

Determining high-demand occupations regionally: Considers several demand-side attributes for each occupation, including: its regional concentration/specialization signaling its relative importance to the region’s economy; its median wage relative to the overall regional median, signaling its attractiveness to workers or wage pressures due to demand; and its projected annual job openings due to both expected growth and replacement needs. An index that combines these three attributes was calculated for each occupation.

Greater Houston’s Industry Clusters and Utilization of Middle-Skill Workers

Middle-skill Workers supporting regional industry clusters or drivers are important, and the study examines the workforce makeup of these industries. The additional lens is useful for understanding the broader drivers of occupational demand as well as considering implications for the organizing structure for UpSkill Houston going forward. A set of ten key regional industries and their major subsectors were identified and analyzed for their occupational skills make-up and demand.

- **Biomedical** – includes healthcare and industrial life sciences;
- **Construction** – includes civil, commercial/industrial, and residential construction;
- **Corporate Headquarters** – includes headquarters operations, facilities support services, and office administrative services;
- **Digital Transformation** – a concept put forth as part of “Houston Next”, defined here to include advanced business services, IT and telecommunications;
- **Education** – includes elementary through postsecondary schools, spanning both public and private institutions, as well as educational support services;
- **Energy** – includes oil and gas production as well as machinery, energy-related distribution;
- **Manufacturing** – a broad concept including all those manufacturing segments not included in other clusters;
- **Petrochemicals** – includes petroleum and coal products; chemicals manufacturing;
- **Real Estate** – includes agents and brokers, lessors of real estate and related activities;
- **Transportation & Logistics** – includes warehousing and storage; e-commerce; freight transportation; and other logistics and transportation subsectors.

An eleventh area considered for investigation into its middle-skills demand, though certainly not a regional cluster is the “Employment Services” sector, which includes workers for temporary help agencies.

Seven regional industry clusters/drivers are found to have a particularly strong concentration of middle-skill employees—those with a concentration above the regional average of 30 percent, including: biomedical; construction; energy; manufacturing; petrochemicals; real estate; and transportation and logistics. An eighth cluster, digital transformation, meets the regional average.

Identifying high-priority occupations for strategic interventions: Among the high-demand occupations, two additional requirements were established to focus in on those occupations that stand out in two additional key characteristics—those that are expected to have a “high-volume” demand annually across the region, and those that represent a well-paying job opportunity, paying median wages at or above that for the overall region, \$39,832. Middle-skilled occupations that meet each of these characteristics are identified as high-quality jobs worthy of promoting across the UpSkill initiative.

Considering each of these requirements, the analysis finds 47 occupations that should be deemed “high-priority” occupations and skill sets for Greater Houston and middle-skill occupations going forward. These occupations are listed and profiled in the report as well as in the supporting Appendix and include a broad set that span many occupational groups. The largest high-priority occupational areas are based in construction trades; installation, maintenance, and repair; production; technicians and drafters; and in transportation and material moving occupations. The occupations singled out as high priority represent areas in which UpSkill Houston should direct individuals for career awareness, upskilling opportunities, and other initiatives.

Viable Upskilling Transition Pathways for Greater Houston’s Middle-Skill Occupations

To ensure the demand-driven analysis is “actionable” for UpSkill Houston, it is important to better understand and identify optimal “pathways” for individuals to transition up the skills continuum and into viable career opportunities. A recent study conducted by the World Economic Forum (WEF) and the Boston Consulting Group (BCG) set out a utility-based model and optimization framework for identifying viable upskilling transitions from the perspective of workers.² The study leverages an analysis of online job postings in conjunction with assumptions about how individuals make career decisions to identify “reskilling pathways” and opportunities for individuals to transition to new jobs with better prospects for future growth and income generation.

This methodology utilizes several criteria to identify “viable” upskilling transition pathways for workers given their current occupation and a set of assumptions about their preferences for future employment tailored specifically to Greater Houston’s regional economic projections data.

The criteria for “viable” pathways include:

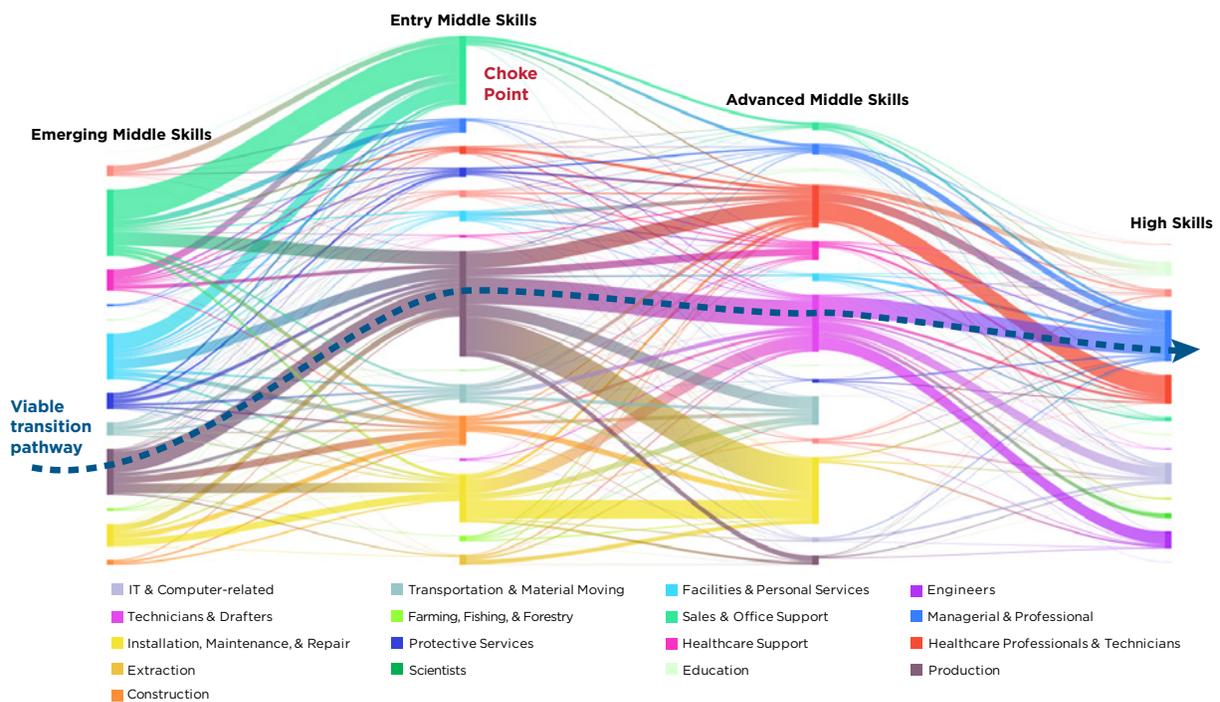
- Target upskill occupations that workers reskill into must be similar enough to their current occupation to be accessible, i.e. it must not require large leaps in education or experience requirements;
- The targeted upskill occupation must have a higher current salary than the current occupation to be a desirable transition endpoint for workers;
- The targeted upskill occupation must have both:

2 World Economic Forum in collaboration with The Boston Consulting Group, “Towards a Reskilling Revolution: A Future of Jobs for All,” January 2018.

- » Stable employment prospects, with no lower than a 5% decrease in the level of total projected employment through 2024; and
- » Capacity to grow, with a level of projected annual job openings that is no more than 50% less than the projected annual job openings for the current occupation.

Using the above criteria and constraints, Figure ES-1 is one way to visualize the set of viable transitions across the continuum of occupational segments defined by the typical education, work experience, and on the job training requirements. The graphic shows the “flows” of viable upskilling transitions by broad skill category and occupational segment, with the thickness of connecting segments indicating the volume of viable transitions.

Figure ES-1: Viable Upskilling Transitions for Greater Houston Occupations by Skills Level and Occupational Segment

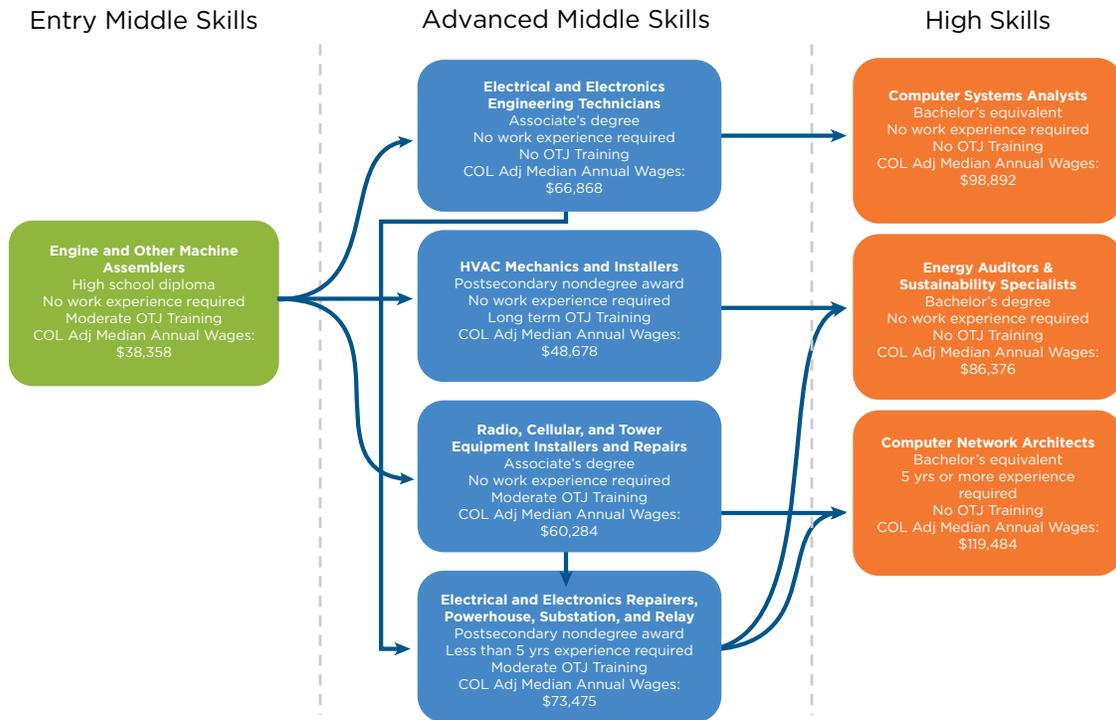


Source: TEconomy’s analysis utilizing WEF and BCG approaches to identifying optimized viable and desirable job transitions developed and reported in “Towards a Reskilling Revolution: A Future of Jobs for All,” January 2018.

This perspective shows that Greater Houston’s occupational segments sometimes reach certain “choke points” in viable upskilling pathways that could be targets for intervention. For example, there are a variety of different viable pathways into sales and office support occupations at the entry middle skills level, but a significantly lower volume of “exit” pathways into higher skill tiers from that segment. By contrast, production occupations in entry middle skills have a wide variety of potential viable upskilling pathways, even into healthcare and other service-related occupations.

Further utilizing this framework at the individual detailed occupational level provides insights into options for specific segments of the middle-skill labor force in Greater Houston. Figure ES-2 is just one illustrative example of a middle-skill occupation in the region and the detailed upskilling pathways available to individuals as they advance and upskill across occupational skills segments.

Figure ES-2: Illustrative Greater Houston Example of Viable Upskilling Pathways for Entry Level Assembler Occupations



Considering the Future of Work: The Effect of Automation and Digital Transformation on Greater Houston’s Middle-Skill Occupations

The study also considers effects of emerging global trends that are expected to affect the outlook for the middle-skilled segment of the labor force. Two in particular have the potential for significant near-term impact for middle-skills workforce alignment and preparation—the risk of job displacement due to adoption of automation technologies by businesses, and the increasing digitization of work requirements across all types of jobs as companies integrate digital operations models and demand new skills.

Analysis of the future employment and risks of computerization of jobs was conducted, based on an approach developed in a recent study³; and finds that Houston’s current middle-skill workforce makeup faces a “bimodal” automation risk outlook where these occupations in services and healthcare have a more secure outlook, while large employment footprints in segments such as

3 “The Future of Employment: How Susceptible Are Jobs to Computerisation?” Frey & Osborne, Oxford Martin School, 2013.

construction, production, repair, and transportation occupations face significant risks of displacement due to the emergence of new automation technologies.

Crafting interventions that meet short-term demand for high-demand occupations in high automation risk segments like construction and maintenance, installation, and repair may necessitate a diverse set of strategies to enable these workers to adapt if new technologies come online unexpectedly. Similarly, ensuring that there are significant investments made in lower automation risk jobs that diversify the occupational portfolio of the region will help mitigate the future impacts of technological change.

At the same time many of the same, or similar technologies coming online also require new skill sets for workers to utilize them most effectively. Digital skills are becoming an increasingly necessary requirement for workers regardless of industry or education level; and assessing gaps in digital skills preparedness can reveal places for targeted intervention to help workers remain competitive in a rapidly changing landscape.

Greater Houston's middle-skill jobs with higher concentrations of digital skills requirements are focused in healthcare, technician, professional, sales, and protective services segments with the largest middle-skill employment footprint requiring higher levels of digital skills estimated to be in sales and office support jobs. Conversely, construction and production segments with large employment footprints in Greater Houston have low digital skills profiles and represent a potential opportunity for workforce development stakeholders to increase applied digital skill sets to build resiliency as new dynamics and even new types of occupations emerge with the increasing integration of digital technologies into legacy industry sectors.

Key Recommendations and Implications

Several potential interventions by, and considerations for UpSkill Houston are highlighted throughout the report. These include recommendations for UpSkill Houston regarding the following:

- Convening its industry, education, and community stakeholders to share key findings from the study and to consider the supply side of the workforce equation;
- Re-visiting the participation in the initiative of specific industries with strong concentrations of middle-skill employees, including in the digital transformation space, and in real estate;
- Considering where seemingly varied industry employers have common ground in their respective workforce skills mix and aggregating the demand for strategic interventions and collaboration on solutions;
- Focusing individuals on career awareness, upskilling opportunities, and other initiatives related specifically to the 47 occupations identified as “high-priority”;
- Utilizing the approach to understanding and identifying optimal “pathways” for helping workers transition up the skills continuum and into more viable career opportunities; and
- Considering the expected impacts of automation in crafting interventions.

Going Forward and Meeting the Middle-Skill Challenge

Greater Houston has been experiencing tremendous regional growth and both the benefits and challenges it brings. The Partnership and regional employers are coming together in innovative ways to address a key challenge brought to the forefront—that of sourcing, hiring, and retaining workers in jobs that require more than a high school diploma but not a 4-year college degree. The UpSkill Houston initiative is working each day to illuminate and connect to the breadth of opportunities for workers in these careers. The demand-side analysis developed in this study is intended to refresh the landscape for UpSkill Houston’s work in this space; and has shined a spotlight on a number of high-priority areas in the middle skills upon which to focus and target its initiatives now and into the near future. In addition, the study has sought to highlight powerful analytical approaches available for identifying viable career upskilling pathways and transitions to inform its work into the future. But disruptive changes and forces abound, including waves of automation and digitization that will impact this workforce and must also be considered. UpSkill Houston is advancing an important and vital mission for both Houstonians and its dynamic employer base, and with the right intelligence in hand, can continue its impactful role in the regional ecosystem.

Introduction

Five years ago, the Greater Houston Partnership established a unique initiative to address consistent, urgent feedback from its corporate membership regarding the difficulty and challenges in sourcing, hiring, and retaining its “middle-skilled” workforce—specifically, those individuals in jobs that require education and skills beyond a high school diploma but less than four years of college.⁴ The Partnership, responding to these concerns, commissioned a workforce analysis and strategic plan to address this challenge. The regional initiative born out of the study, UpSkill Houston, has been working to address the worker and skills gaps across the middle-skill workforce utilizing a highly collaborative approach led by business executives and employers. UpSkill Houston has brought together these industry leaders with educators, leaders of key community organizations, and government officials to advance the workforce and talent pipeline in targeted occupation and career areas. In addition, the initiative is working to “increase awareness and shape accurate perceptions and attitudes about advanced and technical careers and occupations” that fall into the middle-skill requirements.⁵

Greater Houston has experienced rapid growth and strong economic gains in both the near-term and longer-term, placing strains on the regional labor market particularly during a long economic expansion. Since the current economic expansion took hold in 2010, Greater Houston’s private sector employment base has increased by 19 percent compared with 15 percent growth nationally. Meanwhile, since 2001, Greater Houston’s private sector employment levels have increased by 30 percent compared with just 12 percent for the U.S. Likewise, Gross Regional Product for Greater Houston has increased by 51 percent since 2001 compared with 32 percent for the nation. And while this growth is exciting and even enviable for many competitor regions, it is not without growing pains, not the least of which is the strain on the labor market and sourcing skilled talent to fill the many new jobs. These strains are exacerbated in an economic expansion where the unemployment rate has dipped to 3.7 percent for the region in June, which according to Workforce Solutions, is the lowest seasonally adjusted rate recorded going back to 1990.⁶

Of particular concern for Greater Houston (and the nation) is the growing numbers of unfilled middle-skill jobs, for which workforce and skills development and career exploration programs can be

4 UpSkill Houston understands the terminology of “middle-skill” is challenging and will be working on how to improve the messaging and framing for the careers and occupations that require education and skills beyond high school but less than four years of college. This report will use the term “middle-skill” for purposes of clarity.

5 UpSkill Houston, Request for Proposals: Houston Regional Workforce Study.

6 Workforce Solutions, Current Employment and Local Area Unemployment Statistics Houston-The Woodlands-Sugar Land, July 2019.

quite effective. Filling these jobs can be especially challenging with much emphasis placed on today's students to focus primarily on 4-year college degrees, outdated stigmas and perceptions attached to manufacturing and construction, lack of career awareness and counseling, and current labor market information to guide career choice and planning, and the aging of these incumbent workers relative to other skills segments. Deloitte and the Manufacturing Institute have provided a clear spotlight on the challenges of filling middle-skill jobs in their regular assessments of the skills gap in U.S. manufacturing. In their 2018 study, the fourth in a series, they find a widening gap between the jobs that need to be filled and the skilled workers able to fill them.⁷ The study projects that more than half of the open jobs in U.S. manufacturing by 2028 (2.4 million) could go unfilled due to shifts in skill sets with the advent of advanced technologies, "misperceptions" of the nature of manufacturing jobs, and the significant retirements of the baby boom generation. To be clear, not all middle-skill jobs are in manufacturing, nor are all manufacturing jobs middle-skilled, but the strain felt by this key segment of the U.S. (and Houston) economy is evident of larger challenges in meeting demands, particularly when the labor market is tight and retirements are increasing.

For all of these reasons, and the clear indication by Houston's regional employers regarding the very real challenges they face, the UpSkill Houston initiative and its employer-led design, is vital in addressing these challenges. UpSkill Houston has created an "all hands on deck" approach to meeting the skill needs of industry, and in doing so is creating win-win situations for both employers and those individuals seeking well-paid, high-quality jobs that can sustain a family. The initiative has been recognized for its work and design by the U.S. Chamber of Commerce Foundation's Talent Pipeline Management Initiative, the Communities that Work Partnership of the U.S. Department of Commerce, the Aspen Institute, the Global Cities Initiative of the Brookings Institution, JP Morgan Chase, and United Way Worldwide.

In order to maintain focus in the right areas, with relevant programming for strategically targeted occupations and skill sets, UpSkill Houston requires updating the intelligence required to guide the activities of the initiative. It has been five years since a prior study analyzed the situation for regional workforce demand for middle-skill jobs and UpSkill Houston is focused on refreshing its strategy for the future. Today the Partnership and UpSkill Houston initiative have key questions to answer based on forward-looking data and projected demand, including:

- What are Greater Houston's "high demand" established and emerging middle-skill jobs and skills for strong career opportunities and targeted interventions?
- What are the key occupations demanded by the region's industry clusters?
- Are there common middle-skill jobs and skill sets with strong demand found across multiple industry clusters for collaborative interventions?

⁷ Deloitte and The Manufacturing Institute, 2018 Deloitte and The Manufacturing Institute Skills Gap and Future of Work Study.

- Among the middle-skill jobs, which can be considered “good” entry-level jobs to target for programmatic focus and scale-up?
- What are specific pathways into more advanced, viable middle-skill jobs with improved pay and job prospects?
- What middle-skill jobs are expected to be impacted most by automation and digitization?

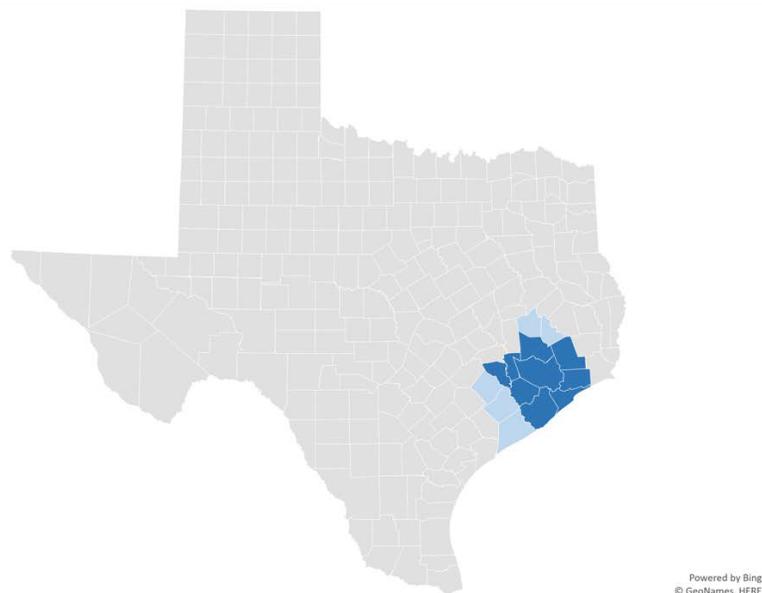
TEconomy Partners, LLC (TEconomy) has been engaged by UpSkill Houston to assist in answering these questions with a quantitative assessment of regional demand for middle-skill workforce and talent. The study team has utilized regional labor market data leveraging several approaches for answering the key questions raised by UpSkill Houston to inform its strategic focus both today and into the future. The study’s key findings have been presented and discussed with regional stakeholders for feedback. The study undertaken by TEconomy has not, however, included a qualitative component and therefore does not reflect direct discussions with industry, nor with educators or students.

Defining the Greater Houston Region for this Study

With guidance from the UpSkill Houston and Workforce Solutions Team, a regional framework was agreed upon using a 14-County Region for this study (see Figure 1), which includes:

- **9-County Core Houston Metropolitan Statistical Area (MSA):** Austin County, Brazoria County, Chambers County, Fort Bend County, Galveston County, Harris County, Liberty County, Montgomery County, Waller County
- **5 Adjacent Regional Counties:** Colorado, Walker, Wharton, Matagorda and San Jacinto

Figure 1: The 14-County Greater Houston Region Defined for the Study



Note: Counties shaded in dark blue represent the Metropolitan Statistical Area (MSA) as defined by the U.S. Census Bureau and Office of Management and Budget.

Regional Skill Mix: Setting the Context for a Skills-Based Framework

Economic researchers, policymakers, business leaders, and other stakeholders interested in profiling regional labor markets often leverage a basic framework for characterizing the workforce composition and skill mix of the economy at a high level in order to:

- Characterize the workforce generally, informing value-adding activities and the composition of industry demand for talent;
- Organize and target workforce development initiatives or other interventions to key segments of the workforce, using the framework for aggregating demand and identifying relevant interventions across industries.

Skill groups are most often delineated by the typical entry-level education, work experience, and on-the-job training required for a specific occupation. These characteristics are defined and delineated on an occupation-by-occupation basis within the Federal statistical system, specifically the U.S. Bureau of Labor Statistics (BLS).⁸ These skill groups are most typically segmented into “low-, middle-, and high-skilled” occupational categories and are defined as follows:

- **High-Skilled Occupations:** Generally requiring bachelor’s and higher degrees (and work experience such as residencies);
- **Middle-Skilled Occupations:** Requiring moderate education, experience, and/or training beyond high school but less than a bachelor’s degree, includes:
 - » High School Diploma plus Moderate to Long-Term On-the-job Training
 - » High School Diploma + Apprenticeship
 - » Postsecondary non-degree award
 - » Some College, no degree
 - » Associates Degree

The Challenge with “Middle Skills” Terminology

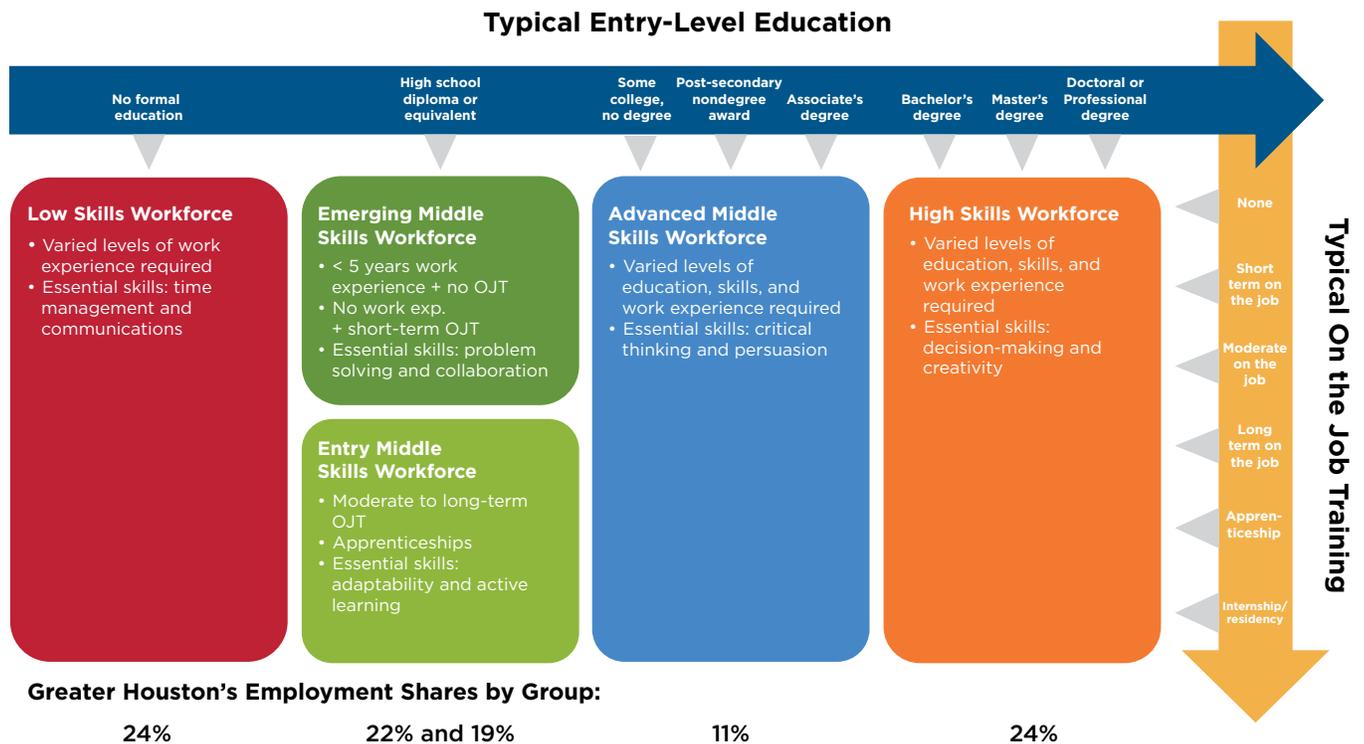
One challenge in promoting and making students and incumbent workers aware of the breadth of opportunities in jobs that require more than a high school diploma but less than a 4-year degree is terminology and how these jobs are described and perceived. In particular, the team at UpSkill Houston has found that using the term “middle skills” does not elicit the excitement and interest from students, educators, parents, or incumbent workers that it should given the strong opportunities associated with these jobs and associated career pathways. As part of its strategic planning process underway, UpSkill Houston is exploring new and better terminology; however, for this study the terminology is used.

⁸ See Bureau of Labor Statistics, Office of Employment Projections: <https://www.bls.gov/emp/documentation/education/tech.htm>.

- **Low-Skilled Occupations:** Generally requires less than a high school diploma or a diploma and only short-term training, includes:
 - » Less than a High School Diploma
 - » High School Diploma + Short-term On-the-job Training

This high-level skills framework is quite useful; however, it does not fully represent or portray the nuances or underlying steppingstones necessary for understanding the detailed pathways and career opportunities for a middle-skilled worker. For this reason, TEconomy has developed a more detailed depiction and classification of the middle-skills context for Greater Houston that applies the typical entry-level job context in a more nuanced manner. This framework, depicted in Figure 2, is then leveraged throughout the study to frame occupational demand for the region. The analysis conducted for Greater Houston has used this framework to code and classify the skill level for every occupation at the most detailed level—nearly 900 total occupations included under the Federal Government’s Standard Occupational Classification (SOC) system.

Figure 2: Defining a Skills Framework for Greater Houston Based on Typical Entry-Level Education, Training Requirements for Specific Occupations



Source: TEconomy Partners, LLC.

The focus of this study, based on discussions and refinement with UpSkill Houston, are the two areas viewed as the “core” segments of the middle-skill workforce—the “entry” and “advanced” groups depicted in Figure 2. These segments stand out as truly middle-skill job requirements in that they demand at least some moderate to longer-term on-the-job training (OJT) in addition to a high school diploma; whereas the “emerging” group can include jobs for which only a minimum level of short-term OJT is required.⁹ This is a significant difference and refinement from the original skills-based framework and concept for middle-skill workers set out in the previous study for the Partnership and has impacts in terms of measuring the size and scale of the core middle-skills group in Greater Houston.¹⁰ This focus should not downplay the importance for UpSkill Houston in engaging individuals in the emerging middle-skills category for interventions, as the name suggests, this group is on the cusp of upskilling and moving into entry or advanced middle-skill occupations.

Middle Skills Matter in Greater Houston’s Economy

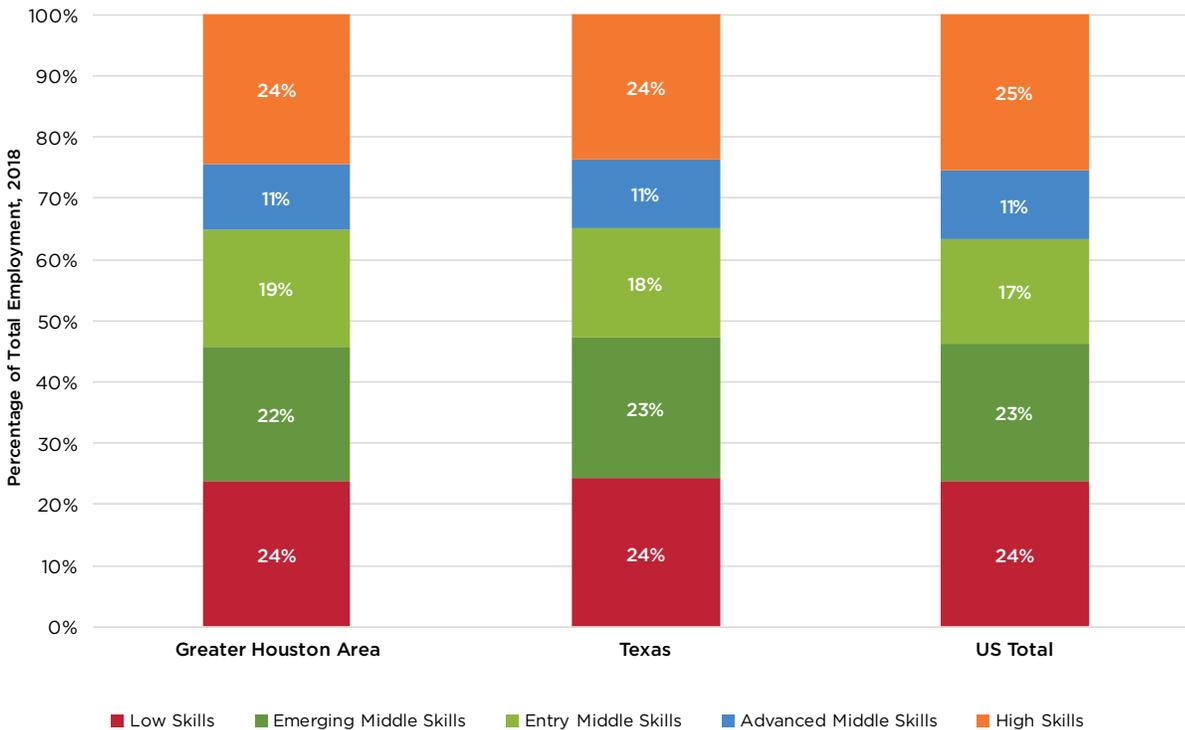
In 2018, there were 3.1 million employed in Greater Houston across both private and public sector employers. One might expect from the nation’s fifth largest metropolitan region a relatively similar skills composition compared with the national average, and that generally bears out for both Greater Houston and the State of Texas as shown in Figure 3. But a closer look, and consideration of the size difference a percentage point or two can make reveals the region stands out in its share and utilization of core middle-skill workforce (entry and advanced).

More than 921,000 local workers, or 30 percent of Greater Houston’s workforce is employed in core middle-skill occupations, compared with 28 percent for the nation (Figure 3). To provide a sense of the magnitude of this compositional difference, if Greater Houston mirrored the nation in its skills makeup, the regional middle-skill workforce would have 51,000 fewer workers.

9 BLS defines the typical OJT periods as follows: short-term OJT is 1 month or less; moderate OJT is more than 1 month and up to 12 months; long-term OJT is more than 12 months.

10 Greater Houston Partnership and TIP Strategies, “Addressing Houston’s Middle Skills Jobs Challenge: A Plan by the Greater Houston Partnership Regional Workforce Development Task Force,” April 2014.

Figure 3: The Skills Composition of Today’s Workforce, 2018



Source: TEconomy’s analysis of EMSI 2019.2 occupational employment data.

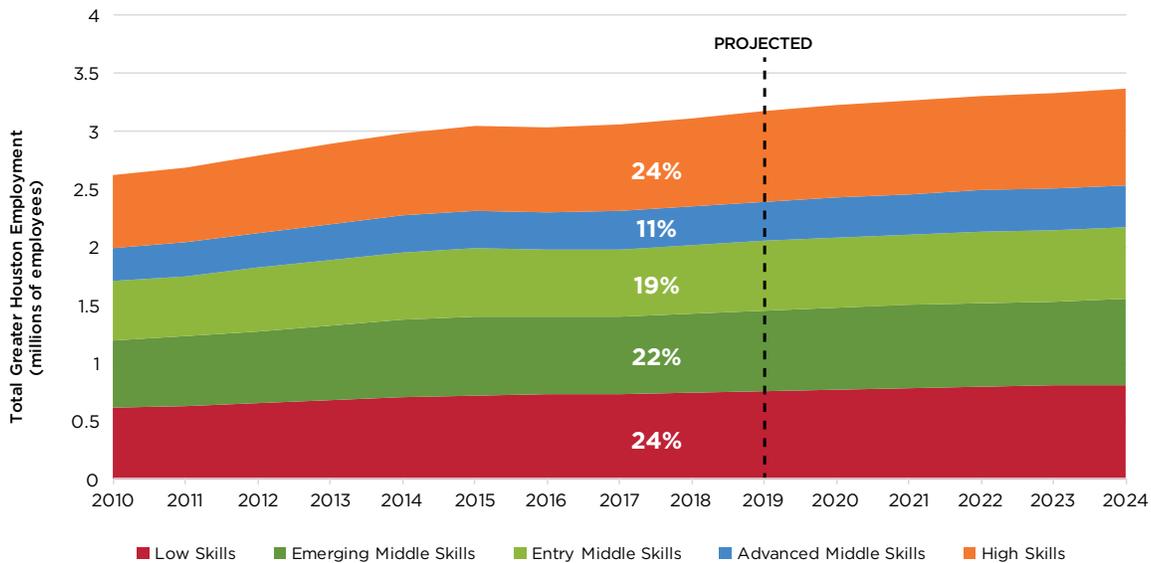
The region’s overall rapid job growth has included faster growth in middle-skill occupations; and these trends are expected to continue into the future (Figure 4). Employment trends during the current economic expansion for Greater Houston include:

- The region has outpaced the nation in overall job growth during the expansion (across all skill levels)—regional employment has increased by 19 percent compared with 13 percent for the nation since 2010.
- Middle-skill occupations (entry plus advanced) also have outpaced the nation since 2010 in terms of net job growth—16 percent versus 12 percent.
 - » Both the advanced and entry middle-skill segments have grown at similarly high rates

Looking ahead, employment projections reveal:

- The region as a whole is expected to continue to outpace national growth over the next 5 years with projected growth for Greater Houston at 6 percent, compared with 5 percent for the U.S.
- Projections show the region’s middle-skill jobs are expected to grow slightly faster than the nation over the next 5 years—with a net job gain of 5 percent projected versus 4 percent for the U.S.

Figure 4: Greater Houston Occupational Workforce Segments Employment, 2010-2018 Actual/2019-2024 Projected



Source: TEconomy’s analysis of EMSI 2019.2 occupational employment data.

To summarize these initial high-level findings, for Greater Houston middle-skill jobs clearly matter:

- ✓ They account for a larger share of regional jobs than the national average (30% vs. 28%);
- ✓ They have outpaced the nation in growth during the current expansion (16% vs. 12%); and
- ✓ They are expected to continue to grow faster over next 5 years (5% vs. 4%).

Recognizing that middle-skills matter to the regional economy, the analysis now turns to specifics—what are those skills and occupations in high-demand among Greater Houston employers among the middle-skill workforce?



Greater Houston's High-Demand Occupations Support Its Industrial Strengths

To be most effective in targeted initiatives and interventions it is important for UpSkill Houston to regularly update and refresh its identification of high-demand regional occupations. This is important on multiple fronts for the initiative—to be able to direct individuals, either students planning their careers or employed or displaced workers who are in need of a viable career opportunity or transition. In addition, it is important for UpSkill Houston to help connect these individuals across the regional economy toward high-priority areas of need for companies and local industry—as well as for the regional economy.

Identifying high-demand occupations and skill sets for a region requires understanding what stands out in terms of specialized need. What are the region's strengths in deploying human capital? These areas arise and are driven out of regional industrial strengths and concentrations or “clusters” in which a region stands out. In addition to regional specialization, relative wages can identify those jobs with particularly strong wage pressures driven by high demand, as well as those that attract workers due to wage opportunity. And finally, considering expected future demand, projections of job openings as a result of both overall growth as well as “replacement” needs for employees that are leaving the labor force or exiting a given occupation.

To assess high-demand occupations, these demand-side attributes were used to calculate indices which, when combined, yield an aggregate index that signals the relative strength of occupational demand:

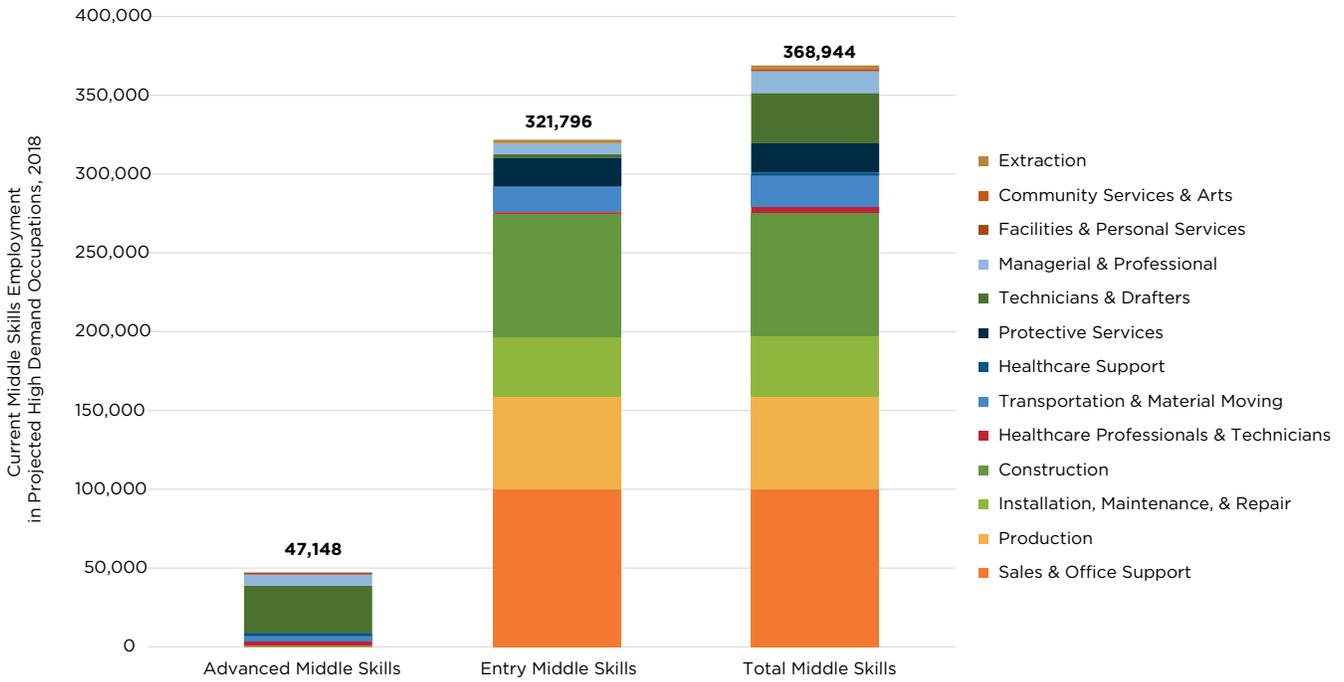
- *Regional concentration/specialization*: signals how important an occupation is to the region's economy (and thus how critical it is to fill jobs in that occupation) using occupational location quotients;
- *Relative wages*: signals jobs with attractive wages (for workers) or alternatively wage pressures (due to high demand) using an index that compares cost of living-adjusted occupational median wages to the average overall private sector median wage;
- *Projected job openings*: signals where demand will be needed to fill open jobs as a result of both growth and replacement of employees leaving the workforce or leaving a given occupation. An index is developed that compares the proportion of projected job openings within total projected occupational workforce levels relative to the region overall.

The three component indices are then normalized such that a combined high-demand index of 1.0 or greater indicates an occupation is likely to experience high demand from 2019-2024. The contribution of each component index's effect can also be analyzed or presented to indicate which attribute is driving demand. It is important to understand that this approach does not estimate any measures of labor supply required to fill demand, but instead focuses attention to occupations likely to be in high demand given current and projected future economic conditions and need. In an employer-led effort, UpSkill Houston should engage with employers to add their perspectives to this analysis. The projections for demand are based on historical trends and models and, therefore, may have limitations. Employers and industry can provide additional information related to the projections. In addition, UpSkill Houston should examine the key indicators related to supply, including graduation rates in key degree fields and educational attainment of the existing workforce.

369,000 middle-skill jobs across Greater Houston are in “high demand,” based upon applying the high-demand index and the index threshold (an observation of 1.0 or greater). This represents 40 percent of all regional middle-skill jobs and spans about 30 percent of all middle-skill occupational categories. Figure 5 shows the distribution of these jobs across the skills groupings and for major occupational groupings or clusters, with the vast majority of high-demand employment falling within the entry middle-skills group. This finding has significant implications for UpSkill Houston with respect to considering targeted interventions and the sizable opportunities for workers in the entry-level middle-skill group with employment requirements typically including a high school diploma and moderate- to longer-term OJT and/or an apprenticeship to move into these opportunities.

High-demand regional occupation stand outs for the entry middle-skill group include sales and office support; construction; production; and installation, maintenance, and repair jobs, with the highest sheer volume of employment today in Figure 5. Technicians and drafters form the largest segment of high-demand occupations in the advanced middle-skill category, typically requiring at least some college technical education or postsecondary credential.

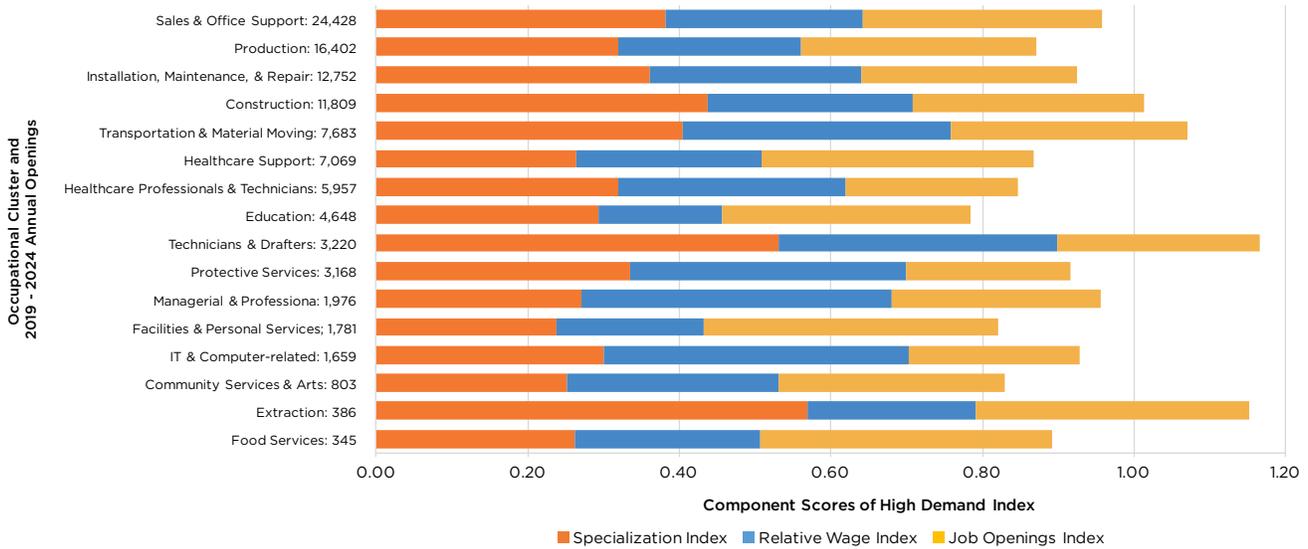
Figure 5: Current Employment Footprint of Houston Area High-Demand Middle-Skill Occupations by Segment



Source: TEconomy's analysis of EMSI 2019.2 occupational employment data.

Technicians and Drafters; Extraction; Transportation and Material Moving; and Construction stand out as particularly high demand overall in Greater Houston (see Figure 6). Each of these four occupational grouping or clusters exceeds the 1.0 high-demand threshold as an overall grouping, consisting of numerous underlying detailed occupations.

Figure 6: Greater Houston’s High-Demand Occupational Index Scores and Projected Annual Job Openings by Occupational Cluster, 2019-2024



Source: TEconomy’s analysis of EMSI 2019.2 occupational employment data.

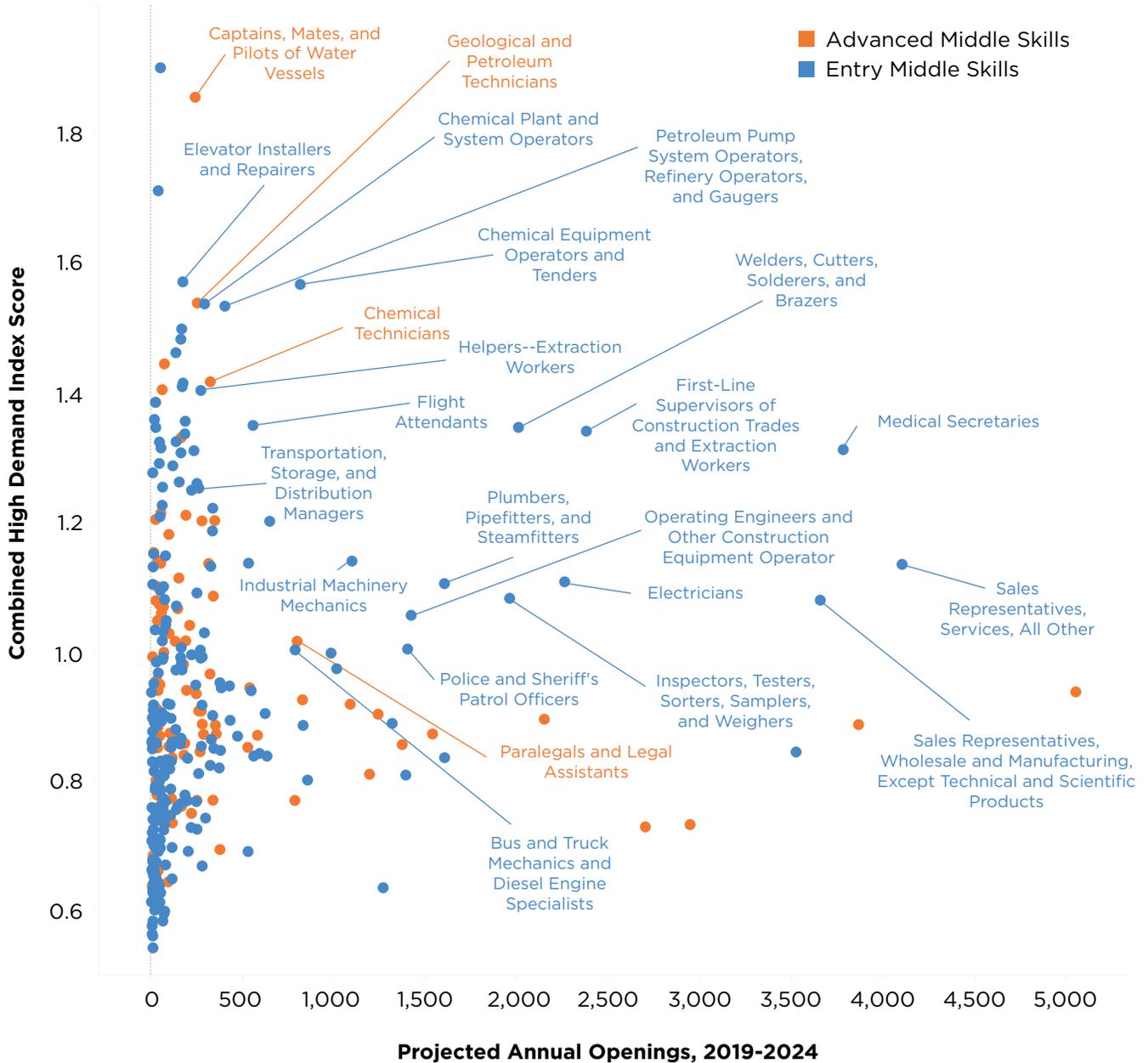
For actionable intelligence and specificity, one must delve a level below these occupational clusters for insights on detailed occupations. Therefore, the high-demand index was calculated for each detailed occupation across the region. A set of middle-skill occupations identified as high demand are plotted at and above an index value of 1.0 on the graphic in Figure 7 below. For further insights on detailed occupations for targeted interventions for UpSkill Houston, a second variable has been plotted for consideration and refinement, and that is the sheer number or volume of projected annual job openings across the region over the coming 5-year period. Using these projected job openings and establishing a threshold for occupations with 150 or more expected job openings annually for Greater Houston¹¹ — **these 52 detailed occupational areas can be considered both high-demand and “high-volume” need for Greater Houston employers into the near future.**

Specific examples help to interpret the figure. Elevator installers and repairers, for example, are in high demand regionally, but the actual annual projected need for these workers just exceeds the 150 per year threshold established for a high-volume need. Conversely, inspectors and testers have a relatively lower regional demand index given the size of the occupational employment in the region, but in terms of sheer volume they require a large number of workers each year to meet the overall projected need for replacing and/or adding workers. An occupational group such as construction

¹¹ The threshold of 150 or more openings per year was chosen to balance the need for a significant volume of annual openings to qualify an occupation as high volume while also acknowledging that an overly restrictive threshold can quickly limit the number of occupations that can be prioritized for effective policy intervention. This threshold was chosen as a slightly less conservative cutoff than the median of 171 projected annual openings through 2024 across all occupations in the Greater Houston region. Note that a more conservative cutoff value of 200 projected annual openings yields only 38 high-volume high-demand occupations and omits a number of occupation codes that are highly relevant to Houston’s advanced industries clusters.

supervisors is positioned in the figure with both a high demand characterization, as well as a large volume of workers required across the region each year.

Figure 7: Greater Houston Occupations Considered both High-Demand and with a High Volume of Projected Annual Job Openings from 2019-2024



Note: "High-volume" demand includes those occupations with 150 or more expected job openings annually for Greater Houston. Source: TEconomy's analysis of EMSI 2019.2 occupational employment data.

Middle-Skill Workers Supporting Regional Industry Clusters/Drivers Are Important

Identifying high-demand occupations is an important initial step for informing UpSkill Houston’s future targets and strategic interventions, but an additional lens is useful for understanding demand and organizing structure for the organization going forward—that of the industry-specific context and demand for these skilled workers. Like all regional economies, Greater Houston has a broad industry base, but also its own mix of industry clusters. According to *The Economist*, “clustering is the phenomenon whereby firms from the same industry gather together in close proximity.”¹² This simple explanation of a cluster is much more complex in reality, requiring a highly interconnected ecosystem for cluster firms to not only agglomerate, but to thrive and hold together. Industry firms most typically cluster geographically where an ecosystem is ripe with key ingredients, including access to and sharing of common markets and supply chains, shared workforce and talent access and needs, and proximity to research and innovation infrastructure and assets including research universities and labs.

A set of ten key regional industries and industry clusters were identified and analyzed for their occupational skills make-up and demand. The industries were identified and defined working in collaboration with the UpSkill Houston team and considering the following sources for targeted strategic regional focus areas: the Greater Houston Partnership’s “Houston Next” strategic plan¹³, Workforce Solutions, and the initial 2014 study for UpSkill Houston.¹⁴ And while not all of these industries are in traded sectors (those generating exports and wealth beyond the region, i.e. education, real estate), combined they represent key regional economic drivers and middle-skill employers. The ten industries and their major subsectors include:

- **Biomedical** – includes healthcare and industrial life sciences;
- **Construction** – includes civil, commercial/industrial, and residential construction;
- **Corporate Headquarters** – includes headquarters operations, facilities support services, and office administrative services;
- **Digital Transformation** – a concept put forth as part of “Houston Next”, defined here to include advanced business services, IT and telecommunications;

¹² *The Economist*. “Clustering.” August 24, 2009. Accessed online at: <http://www.economist.com/node/14292202>.

¹³ See: <https://www.houston.org/next>.

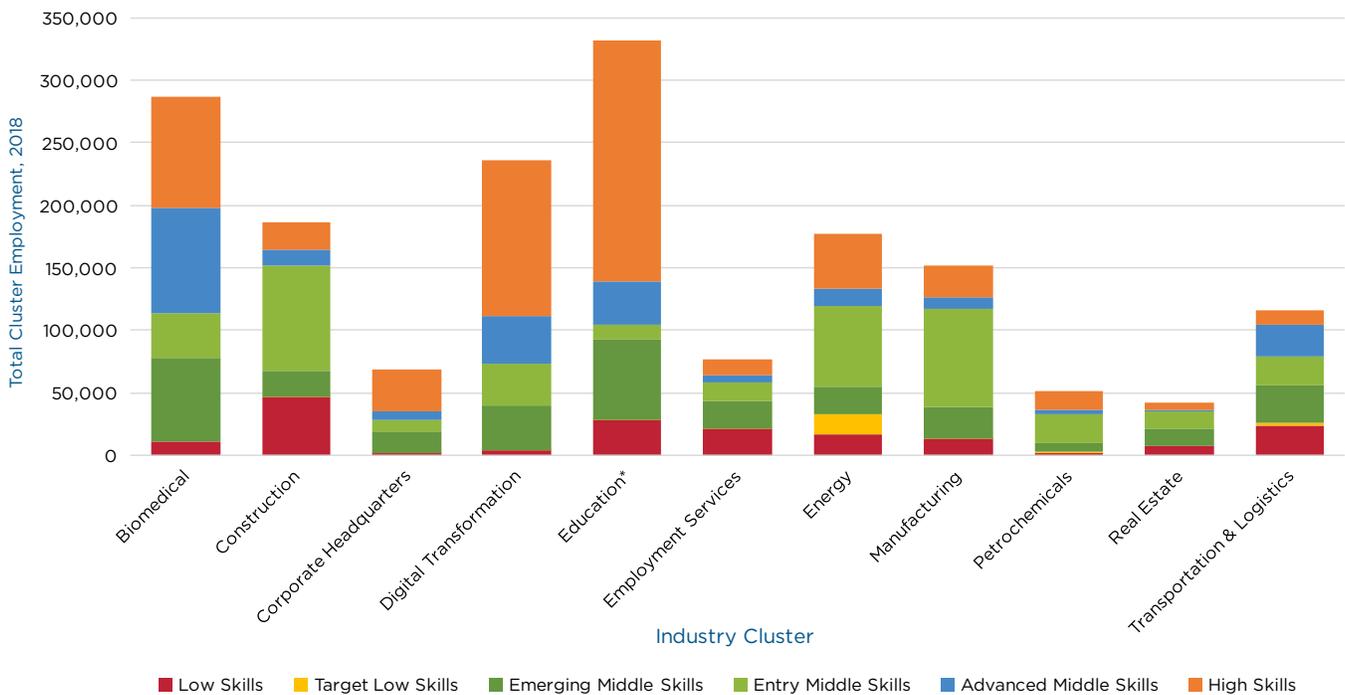
¹⁴ Greater Houston Partnership and TIP Strategies, “Addressing Houston’s Middle Skills Jobs Challenge: A Plan by the Greater Houston Partnership Regional Workforce Development Task Force,” April 2014.

- **Education** – includes elementary through postsecondary schools, spanning both public and private institutions, as well as educational support services;
- **Energy** – includes oil and gas extraction and production as well as machinery, energy-related distribution;
- **Manufacturing** – a broad concept including all those manufacturing segments not included in other clusters;
- **Petrochemicals** – includes chemical products obtained from petroleum and coal products;
- **Real Estate** – includes agents and brokers, lessors of real estate and related activities;
- **Transportation & Logistics** – includes warehousing and storage; e-commerce; freight transportation; and other logistics and transportation subsectors.

An eleventh area considered for investigation into its middle-skills demand, though certainly not a regional cluster is the “Employment Services” sector, which includes workers for temporary help agencies.

Seven regional industry clusters/drivers are found to have a particularly strong concentration of middle-skill employees—those with a concentration above the regional average of 30 percent (Figure 8). These include: biomedical; construction; energy; manufacturing; petrochemicals; real estate; and transportation and logistics. An eighth cluster, digital transformation, meets the regional average.

Figure 8: Occupational Skill Level Composition of Major Houston Industry Clusters/Drivers, 2018



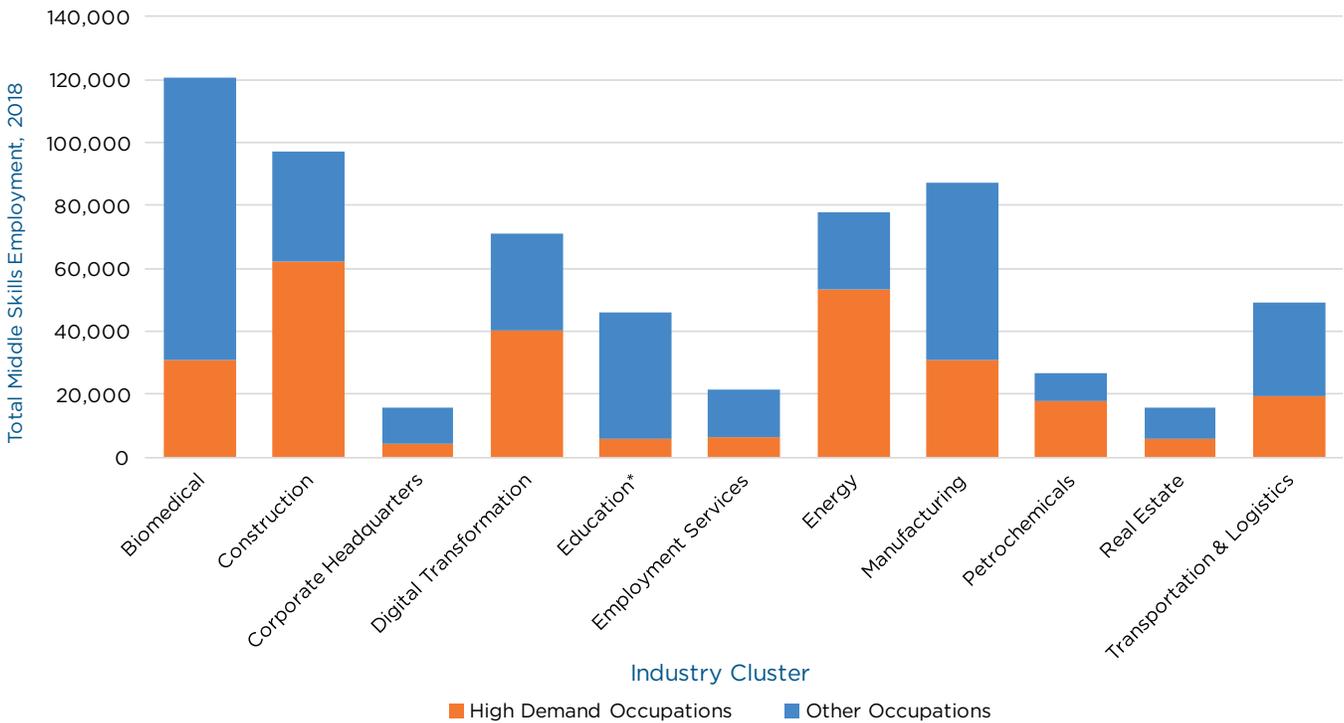
Source: TEconomy’s analysis of EMSI 2019.2 industry staffing patterns data.

*Note: Education cluster includes both private and public employees.

Note: Target low skills include a few low-skill occupations that represent targeted strategic needs for the region, particularly in the oil and gas industry.

Further, four regional industry clusters have an especially strong concentration and utilization of high-demand middle-skill occupations (Figure 9). These industries employ a greater share of middle-skill workers in high-demand occupation and skill areas compared with the regional average of 40 percent. They span several areas in which Greater Houston truly stands out nationally, including: construction; digital transformation; energy; and petrochemicals. A fifth cluster, transportation and logistics, meets the 40 percent threshold.

Figure 9: High-Demand Middle-Skills Occupational Employment Within Major Houston Industry Clusters, 2018



Source: TEconomy’s analysis of EMSI 2019.2 industry staffing patterns data.
 *Note: Education cluster includes both private and public employees.

A key question for UpSkill Houston in planning its strategic direction is whether its employer-led partnerships are focused in the right industrial areas to capture key middle-skills demand? Are the right companies and industry sectors represented at the table? The answer is largely “yes”.

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The answer is largely “yes”.

Table 1 summarizes the findings from the analysis of industry-occupational staffing patterns and finds that, in general, those industries with some combination of either a high share of these workers and/or a high concentration of high-demand skill

needs are participating in UpSkill Houston’s employer-led partnerships. Potential gaps, though, do include a more focused presence of employers in the digital transformation space, which could include IT and telecommunications firms as well as advanced business firms involved in consulting, legal and accounting services, etc. In addition, the region’s real estate sector is a major employer of middle-skill workers and should be considered for more formal participation in the initiative.

Table 1: Summary Deployment of Middle-Skill Workforce Across Key Industries and Regional Clusters and Presence of UpSkill Houston Employer-Led Partnership

Regional Industry Cluster	High Concentration of MS Workers (>30%)?	High Concentration of High-Demand MS Occupations (>40%)?	Organized Employer-Led Partnership?
Biomedical	✓		Yes (Healthcare)
Construction	✓	✓	Yes
Corporate HQs			
Digital Transformation	**	✓	
Education			Yes (Supply Side)
Energy	✓	✓	Yes (Petrochemical)
Manufacturing	✓		
Petrochemicals	✓	✓	Yes
Real Estate	✓		
Transportation & Logistics	✓	**	Yes
Employment Services			

Note: ** signifies cluster meets but does not exceed the percentage threshold.

Underlying the high-level deployment of these workers across regional industry is more nuanced to the skills composition and occupational demand for each cluster, depicted visually in Figure 10 for the major occupational clusters. The figure shows the differing context and variation for the size, breadth, and relative demand for middle-skills. Selected examples from the matrix illustrate the varied context by industry as well as how insights gleaned from this matrix can inform UpSkill Houston’s initiatives:

- From a pure occupational perspective (examining the rows in the graphic), skills in installation, maintenance and repair as well as sales and office support are deployed and in relatively high demand across virtually all key industrial areas in the region.

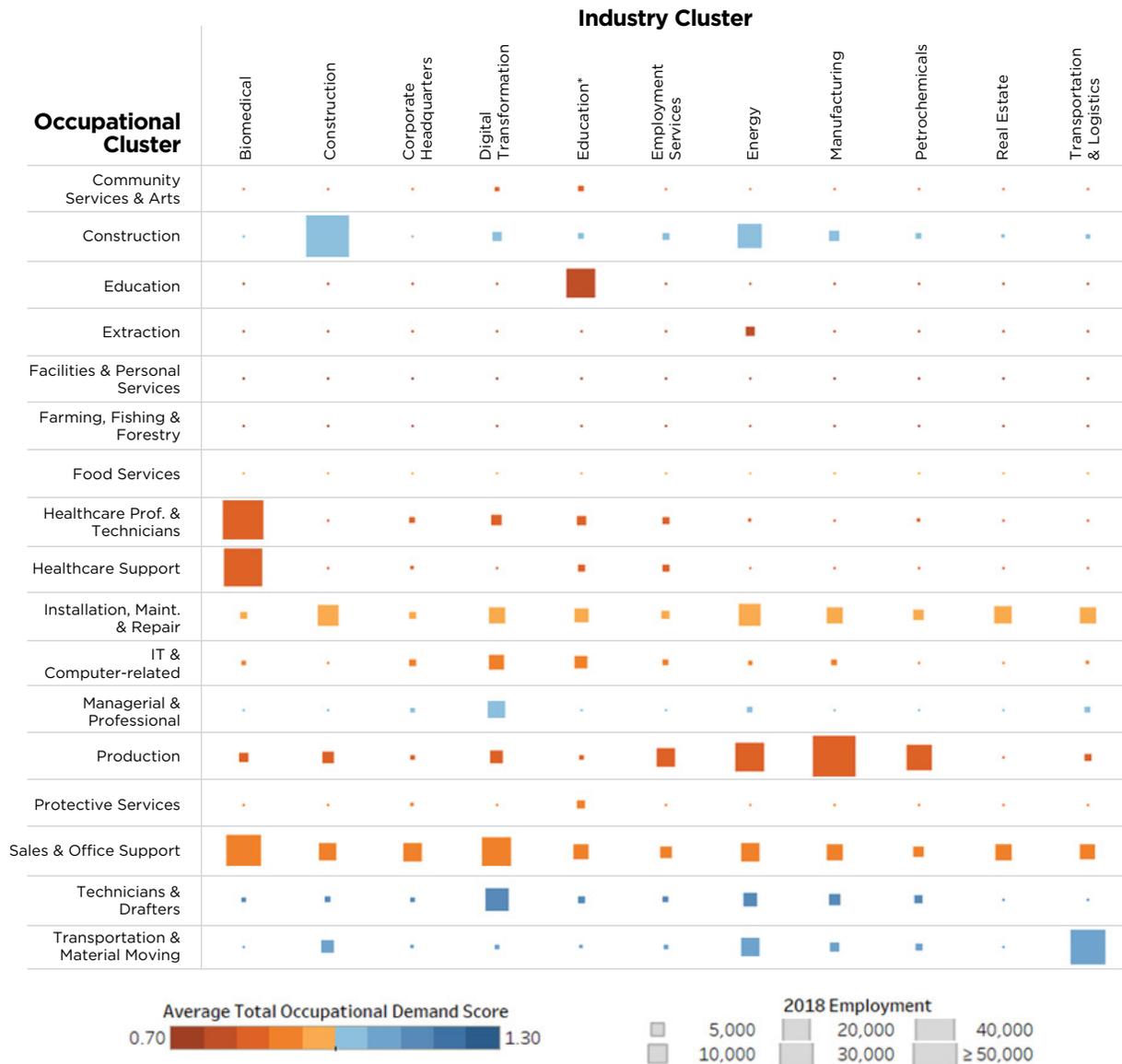
- » **Implication for UpSkill Houston initiatives:** these represent targeted skill areas for interventions that will have a strong aggregated demand context for a broad swath of employers, regardless of industry. Consider cross-sector initiatives to leverage the region's broad demand context.

- An advanced middle-skills level occupational cluster such as technicians and drafters has multiple industrial dimensions, but reflects a specialized nature and industrial context of these skill sets that almost uniformly require an Associates degree. This example differs from more broad-based maintenance or office support occupations that may be more easily transferred across industry. This group includes numerous high-demand regional jobs such as: geological and petroleum technicians; chemical technicians; mechanical engineering technicians; life, physical, and social science technicians, and more.
 - » **Implication for UpSkill Houston initiatives:** interventions and awareness around a range of 2-year degrees and high-demand career opportunities for technicians and drafting professionals has a high-degree of specialization and is deployed across a number of regional industries. In promoting awareness to stakeholders, important to illustrate the multi-industry specialized opportunities.

- Production occupations represent somewhat of a hybrid context, where the production-oriented focus is logically concentrated in manufacturing and other manufactured product-centric industries such as petrochemicals and energy. However, there are other key industry demands for production workers including in biomedical where the industrial life sciences component is manufacturing pharmaceuticals and medical devices.
 - » **Implication for UpSkill Houston initiatives:** Opportunities exist to leverage synergies across several manufacturing-intensive industry clusters; identify and explore common skill sets across industry clusters with aggregated regional demand for production workers.

- From an industry perspective (considering the columns in the graphic), clusters such as biomedical and construction have very specialized, concentrated skill needs in logical specializations such as healthcare occupations and construction-related skills.
 - » **Implication for UpSkill Houston initiatives:** While these industries can leverage cross-sector partnerships for broader demand areas noted above, their skill and occupational demands will be much more specialized and inward-focused.

Figure 10: Focus on Occupational Demand Drivers Within and Across Greater Houston’s Major Industry Clusters/Drivers



Source: TEconomy’s analysis of EMSI 2019.2 industry staffing patterns data.

Considering Wages and the Concept of Good Jobs in the Priority Assessment

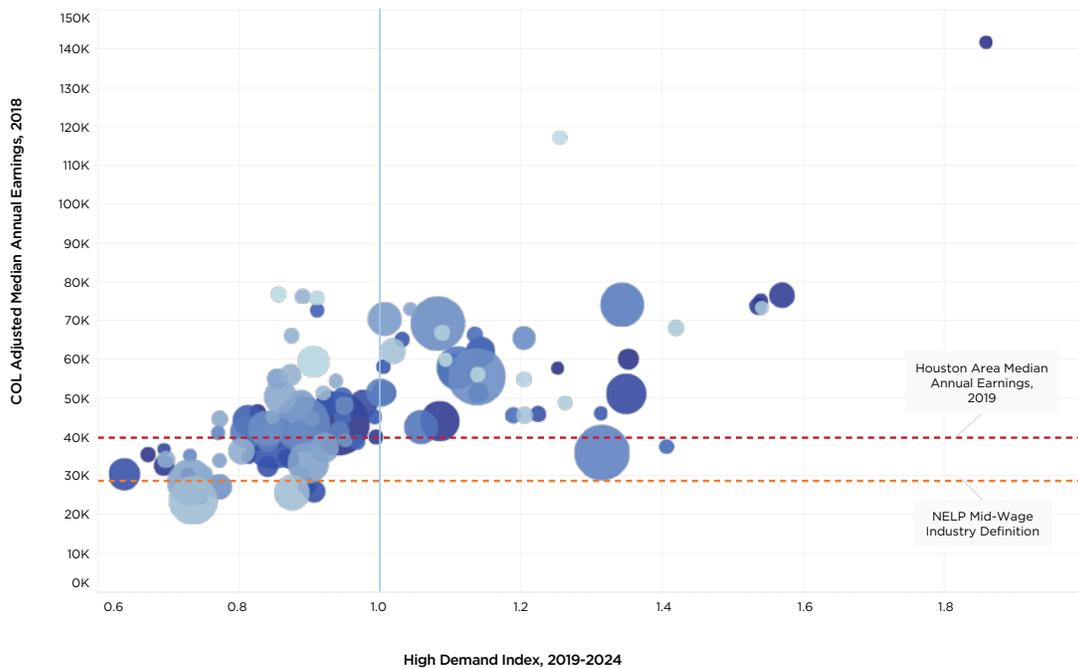
One additional consideration beyond the criteria already discussed for identifying high-priority occupations is that of the regional wage context for jobs. UpSkill Houston is concerned with directing individuals not only to those career opportunities with good prospects in the region into the future, but also with those that pay family-sustaining wages and can be considered “good jobs” that enable a healthy standard of living.

Concepts around identifying “good jobs” have been considered by a number of different institutions and researchers, with various approaches that consider regional cost of living and “living wages”, age and familial characteristics of the individual or household, wages relative to the average or median of the region more broadly, or other considerations. Several of these benchmarking approaches considered in this study include:

- The National Employment Law Project (NELP), which has developed wage segments used by many occupational studies to define “good jobs.” The wage level for the floor of the mid-wage industry segment’s range provides a good reference point for a lower threshold of considering jobs that may provide a good standard of living, but does not take into account local Houston area conditions in the definition;
- MIT’s living wage calculator, which utilizes Houston metro area data to show the level of livable wages that can support a family’s expenses given various family and children arrangements;
- United Way’s Asset Limited, Income Constrained, Employed (ALICE) threshold, which provides another alternative benchmark to the Federal Poverty Level in assessing survival wages for a basic household of two adults and two children;
- The overall Houston region median annual earnings, which provides a context for where middle-skills wages are positioned within the overall wage distribution.

Most middle-skill jobs in Houston are above both the lower range of the “good jobs” threshold used by NELP and the median annual earnings level for the Houston area (\$39,832). Using other definitions that include the context of additional family members shows that supporting increasing numbers of children rapidly makes living wage security unattainable for many middle-skills occupational segments that rely on a sole income earner.

Median Wages for Greater Houston Middle-Skill Jobs Relative to the Regional Median and NELP Mid-Wage Concept



Source: TEconomy’s analysis of EMSI 2019.2 occupational employment data

Quality, High-Demand Middle-Skill Jobs Should be UpSkill Houston’s Strategic Focus

Multiple demand facets have been considered in the analysis thus far; and overlaying each of these can help to identify “high-priority” occupational areas for targeted interventions and direction for UpSkill Houston’s strategic focus in the near-term. One additional consideration, though, should be added—that of the regional wage context for jobs. UpSkill Houston is concerned, and rightly so, with directing individuals not only to those career opportunities with good prospects in the region into the future, but also with those that pay high, family-sustaining wages and can be considered “good jobs” (see text box).

Figure 11: Key Factors for Identifying “High-Priority” Middle-Skill Occupations for Targeting Strategic Interventions



With the more refined analysis that considers the set of high-demand, high-volume occupations and then requires that occupations meet a “quality jobs” threshold where their median wages exceed the region’s overall median of \$39,832, 47 occupations should be considered “*high-priority*” occupations and skill sets for Greater Houston and middle-skill occupations going

forward. These occupations are listed and profiled in Table 2.¹⁵ The occupations singled out as high priority represent areas in which UpSkill Houston should direct individuals for career awareness, upskilling opportunities, and other initiatives.

An additional consideration of the deployment of each occupation across the regional industry clusters/drivers is important, but an overall threshold is not established nor required for the high-priority identification, but rather it is considered for context setting and approaches for UpSkill Houston’s programming. For an occupation that plays a key role across many industry clusters, such as industrial machinery mechanics, aggregating demand and tackling upskilling across several clusters and corporate partners is likely the best approach for UpSkill Houston. And for an occupation such as chemical technicians, where the demand is more industry siloed, it is appropriate for one cluster (petrochemicals) to focus on these activities. In table 2 below, occupations were given a check mark in the industry cluster employment column if their employment made up a significant share—at least 0.4 percent—of the industry’s total employment in the region.

Table 2: High-Priority Middle-Skilled Occupations for Strategic Interventions

Occupational Title	Middle-Skill Level	High-Demand Index	Projected Annual Openings, 2019-2024	Median Annual Earnings	High Avg. Share of Overall Industry Cluster Empl.
Construction					
Elevator Installers and Repairers	Entry	1.57	173	\$77,517	
Insulation Workers, Mechanical	Entry	1.41	170	\$43,174	
First-Line Supervisors of Construction Trades and Extraction Workers	Entry	1.34	2,378	\$69,598	✓
Structural Iron and Steel Workers	Entry	1.19	335	\$42,837	
Construction and Building Inspectors	Entry	1.13	326	\$62,297	
Electricians	Entry	1.11	2,259	\$54,424	✓
Plumbers, Pipefitters, and Steamfitters	Entry	1.11	1,602	\$53,513	✓
Operating Engineers and Other Construction Equipment Operators	Entry	1.06	1,421	\$40,072	✓
Healthcare Support					
Physical Therapist Assistants	Ad- vanced	1.04	211	\$68,510	

¹⁵ This represents a reduction from the set of 52 high-demand occupations identified earlier in the report—five detailed occupations were eliminated once the median wage threshold was applied. For more detailed information on each of the high-priority middle-skilled occupations, please see the Appendix to this report.

Occupational Title	Middle-Skill Level	High-Demand Index	Projected Annual Openings, 2019-2024	Median Annual Earnings	High Avg. Share of Overall Industry Cluster Empl.
Installation, Maintenance, & Repair					
Control and Valve Installers and Repairers, Except Mechanical Door	Entry	1.31	234	\$43,376	
Industrial Machinery Mechanics	Entry	1.14	1,097	\$58,277	✓
Mobile Heavy Equipment Mechanics, Except Engines	Entry	1.14	532	\$48,261	
Electrical Power-Line Installers and Repairers	Entry	1.03	291	\$61,198	
Bus and Truck Mechanics and Diesel Engine Specialists	Entry	1.00	787	\$48,281	
Telecommunications Line Installers and Repairers	Entry	1.00	269	\$54,645	
Managerial & Professional					
Title Examiners, Abstractors, and Searchers	Entry	1.31	163	\$80,232	
Transportation, Storage, and Distribution Managers	Entry	1.25	261	\$110,020	
Tax Preparers	Entry	1.09	250	\$56,284	
Paralegals and Legal Assistants	Ad- vanced	1.02	797	\$58,401	
Production					
Chemical Equipment Operators and Tenders	Entry	1.57	815	\$71,855	✓
Chemical Plant and System Operators	Entry	1.54	292	\$70,498	
Petroleum Pump System Operators, Refinery Operators, and Gaugers	Entry	1.54	403	\$69,302	
Gas Plant Operators	Entry	1.50	167	\$63,529	
Welders, Cutters, Solderers, and Brazers	Entry	1.35	2,007	\$48,043	✓
Structural Metal Fabricators and Fitters	Entry	1.22	337	\$43,153	
Inspectors, Testers, Sorters, Samplers, and Weighers	Entry	1.08	1,959	\$41,468	✓
Protective Services					
Police and Sheriff's Patrol Officers	Entry	1.01	1,401	\$66,116	

Occupational Title	Middle-Skill Level	High-Demand Index	Projected Annual Openings, 2019-2024	Median Annual Earnings	High Avg. Share of Overall Industry Cluster Empl.
Sales & Office Support					
Real Estate Sales Agents	Entry	1.20	648	\$61,556	✓
Sales Representatives, Services, All Other	Entry	1.14	4,102	\$52,223	✓
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	Entry	1.08	3,655	\$65,066	✓
Brokerage Clerks	Entry	1.01	164	\$55,900	
Technicians & Drafters					
Geological and Petroleum Technicians	Ad- vanced	1.54	252	\$68,893	
Chemical Technicians	Ad- vanced	1.42	323	\$63,975	
Mechanical Engineering Technicians	Ad- vanced	1.33	164	\$73,638	
Surveying and Mapping Technicians	Entry	1.26	250	\$45,878	
Mechanical Drafters	Ad- vanced	1.21	190	\$67,352	
Life, Physical, and Social Science Technicians, All Other	Ad- vanced	1.20	348	\$42,866	
Civil Engineering Technicians	Ad- vanced	1.20	278	\$51,573	
Architectural and Civil Drafters	Ad- vanced	1.14	314	\$52,726	
Environmental Science and Protection Technicians, Including Health	Ad- vanced	1.11	152	\$42,717	
Electrical and Electronics Engineering Technicians	Ad- vanced	1.09	340	\$62,856	
Engineering Technicians, Except Drafters, All Other	Ad- vanced	1.02	189	\$59,830	
Transportation & Material Moving					
Captains, Mates, and Pilots of Water Vessels	Ad- vanced	1.86	241	\$133,029	
Wellhead Pumpers	Entry	1.48	162	\$50,414	
Flight Attendants	Entry	1.35	557	\$56,478	

Occupational Title	Middle-Skill Level	High-Demand Index	Projected Annual Openings, 2019-2024	Median Annual Earnings	High Avg. Share of Overall Industry Cluster Empl.
Transportation Inspectors	Entry	1.26	154	\$56,853	
Crane and Tower Operators	Entry	1.25	221	\$54,265	

Note: A check mark means the occupation accounts for 0.4% or more of total industry cluster employment in Greater Houston
Source: TEconomy's analysis of EMSI 2019.2 occupation and industry staffing patterns data.

Viability Upskilling Transition Pathways for Greater Houston's Middle-Skill Occupations

With the regional occupational demand context and dynamics established, it is important for UpSkill Houston to better understand and identify optimal “pathways” for helping workers transition up the skills continuum and into more viable career opportunities. A recent study conducted by the World Economic Forum (WEF) and the Boston Consulting Group (BCG) set out a utility-based model and optimization framework for identifying viable upskilling transitions from the perspective of workers.¹⁶ The study leverages an analysis of online job postings in conjunction with assumptions about how individuals make career decisions to identify “reskilling pathways” and opportunities for individuals to transition to new jobs with better prospects for future growth and income generation.

For this study, the approach and methodology developed by WEF and BCG has been adapted for the Houston region using regional data from EMSI and occupational profile data from O*NET, a standardized database of occupational information maintained by the U.S. Department of Labor and the Employment and Training Administration. This methodology utilizes several criteria to identify “viable” upskilling transition pathways for workers given their current occupation and a set of assumptions about their preferences for future employment tailored specifically to Greater Houston’s regional economic projections data.

As WEF and BCG note in their study, the goal of desirable, or viable, pathways from the perspective of the worker is to most effectively invest themselves in pursuit of career paths with “stable long term prospects” and “wage continuity” in terms of compensation that “that does not fall below a level that would allow the individuals concerned to maintain their current standard of living.”¹⁷ The criteria for “viable” pathways that workers would find both accessible and desirable in pursuing reskilling efforts are adapted from the study’s methodology for the regional Houston context and include:

- Target occupations that workers reskill into must be similar enough to their current occupation to be accessible. To estimate this constraint, target occupations must meet a “similarity” threshold to the current occupation as estimated from detailed job descriptions and tasks set out in Federal O*Net occupational profiles;

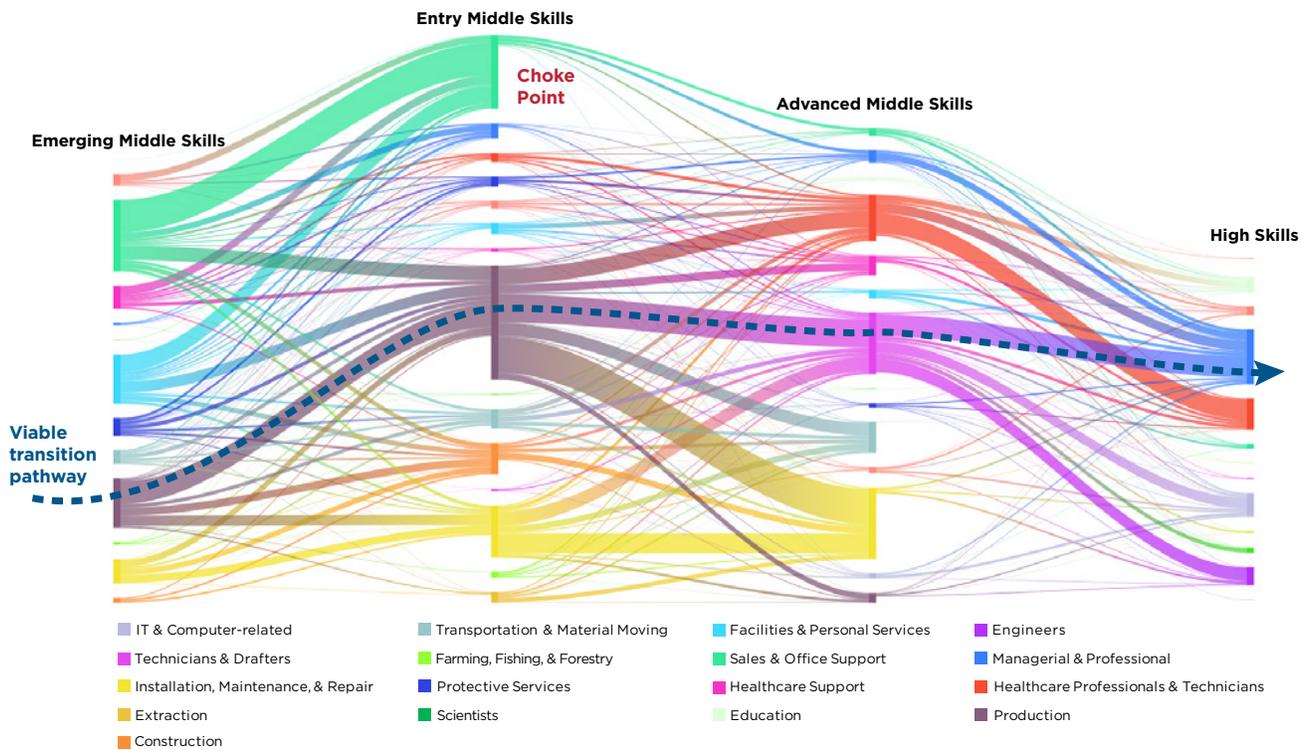
¹⁶ World Economic Forum in collaboration with The Boston Consulting Group, “Towards a Reskilling Revolution: A Future of Jobs for All,” January 2018.

¹⁷ Ibid.

- The targeted upskill occupation must have a higher current salary than the current occupation (with salary data adjusted for regional cost of living) to be a desirable transition endpoint for workers;
- As an estimate of worker assessment of the target occupation’s desirability in terms of future employment prospects, the targeted upskill occupation must have both:
 - » No lower than a 5% decrease in the level of total projected employment through 2024, to proxy for worker desire to move into target job segments with stable employment prospects; and
 - » A level of projected annual job openings that is no more than 50% less than the projected annual job openings for the current occupation, to proxy for worker desire to move into target occupations that are perceived to have capacity to grow and absorb new workers at rates that are not significantly worse than expected trends in their current occupations; and
- As a constraint on worker movement between occupations based on their current skill levels (and assuming no other outside intervention in reskilling or retraining), a targeted upskill occupation must not require large leaps in education or experience requirements based on O*Net job zones and defined occupational skills segments.

Using the above criteria and constraints, it is possible to define an optimal set of upskilling pathways across all occupations given their current and future projected trends in the Greater Houston area that models the utility-maximizing decision process faced by workers when transitioning to a new occupational field. Figure 12 is one way to visualize the set of viable transitions across the continuum of occupational segments defined by the typical education, work experience, and on the job training requirements. The graphic shows the “flows” of viable upskilling transitions by broad skill category and occupational segment, with the thickness of connecting segments indicating the volume of viable transitions.

Figure 12: Viable Upskilling Transitions for Greater Houston Occupations by Skills Level and Occupational Segment



Source: TEconomy’s analysis utilizing WEF and BCG approaches to identifying optimized viable and desirable job transitions developed and reported in “Towards a Reskilling Revolution: A Future of Jobs for All,” January 2018.

This perspective shows that Houston’s occupational segments sometimes reach certain “choke points” in viable upskilling pathways that could be targets for intervention. For example, there are a variety of different viable pathways into sales and office support occupations at the entry middle-skills level, but a significantly lower volume of “exit” pathways into higher skill tiers from that segment. By contrast, production occupations in entry middle-skills have a wide variety of potential viable upskilling pathways, even into healthcare and other service-related occupations.

Further utilizing this framework at the individual detailed occupational level provides insights into options for specific segments of the middle-skill labor force in Greater Houston. Figures 13 through 16 provide several illustrative examples of middle-skill occupations in the region that might serve as entry points to the labor force for individuals and the detailed upskilling pathways available to them as they advance and upskill across occupational skills segments.

Both the aggregate as well as the detailed views of upskilling pathways provide several broad conclusions for Greater Houston with respect to targeted interventions in middle-skill occupations. First, the region’s middle-skill jobs segment, particularly its advanced middle-skill component, provide a viable endpoint for upskilling. Many of the region’s advanced middle-skill occupations such as chemical equipment operators, medical technicians, and specialized mechanics represent career targets for

workers that have both some of the highest relative wages as well as some of the highest projected levels of job openings over the next 5 years. This confirms the benefits and viability of middle-skill opportunities and means that workers seeking to optimize their career paths may not need to upskill beyond these occupations to achieve both relatively high standards of living as well as job stability.

Second, for many of Houston’s middle-skill jobs there are some qualifications “choke points” that exist when considering the ability to transition into advanced middle-skill and even high-skill occupations. For example, for workers in entry-level occupations in sales and customer service, retraining and augmentation of skills may be necessary to transition to different occupational segments in technical and digital skills that have more job openings and pathways to advanced middle-skill jobs. Similarly, advanced skills segment jobs in technician and IT-related jobs often have the necessary experience and applied knowledge to advance to high skills occupations in IT, engineering, and other STEM occupations but face the barrier of earning a bachelor’s degree to be considered.

Exploring ways to enable these transitions throughout the middle-skills, particularly at points where workers face choke points or roadblocks in viable upskilling options or credentialing barriers, can help increase the desirability of a wider portfolio of career choices. The upskilling framework outlined here can also serve as a decision support tool for workers in the region in making informed decisions about the most effective ways to invest limited time and resources for the greatest value-add to their careers.

Figure 13: Illustrative Greater Houston Example of Viable Upskilling Pathways in IT-Related Occupations

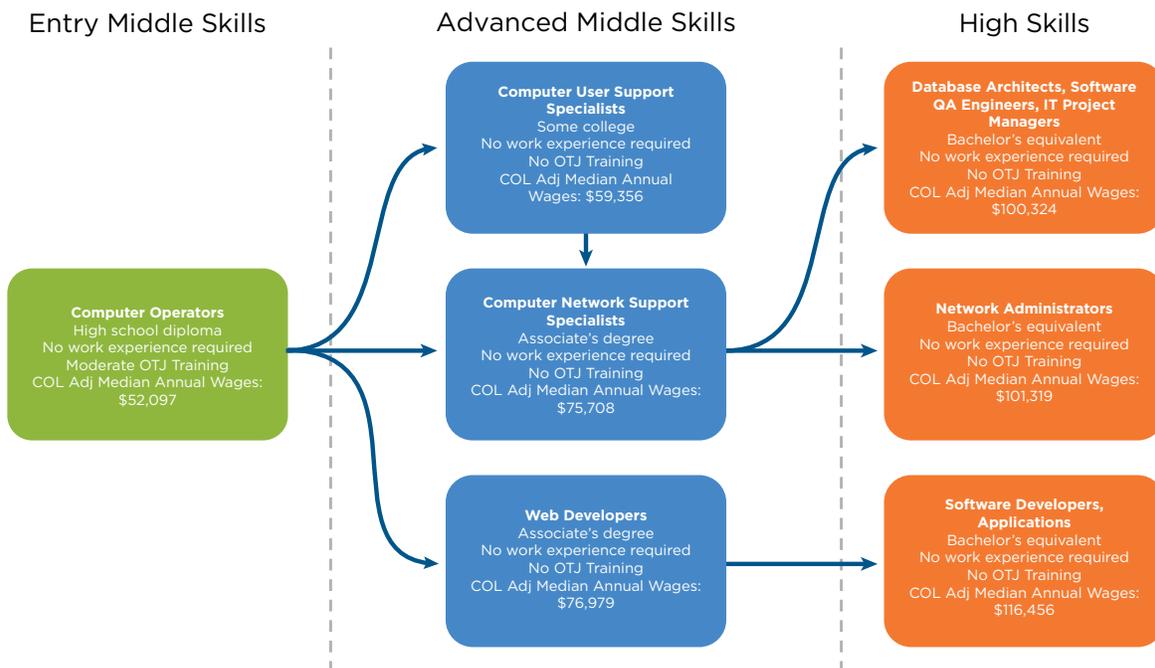


Figure 14: Illustrative Greater Houston Example of Viable Upskilling Pathways for Entry Level Assembler Occupations

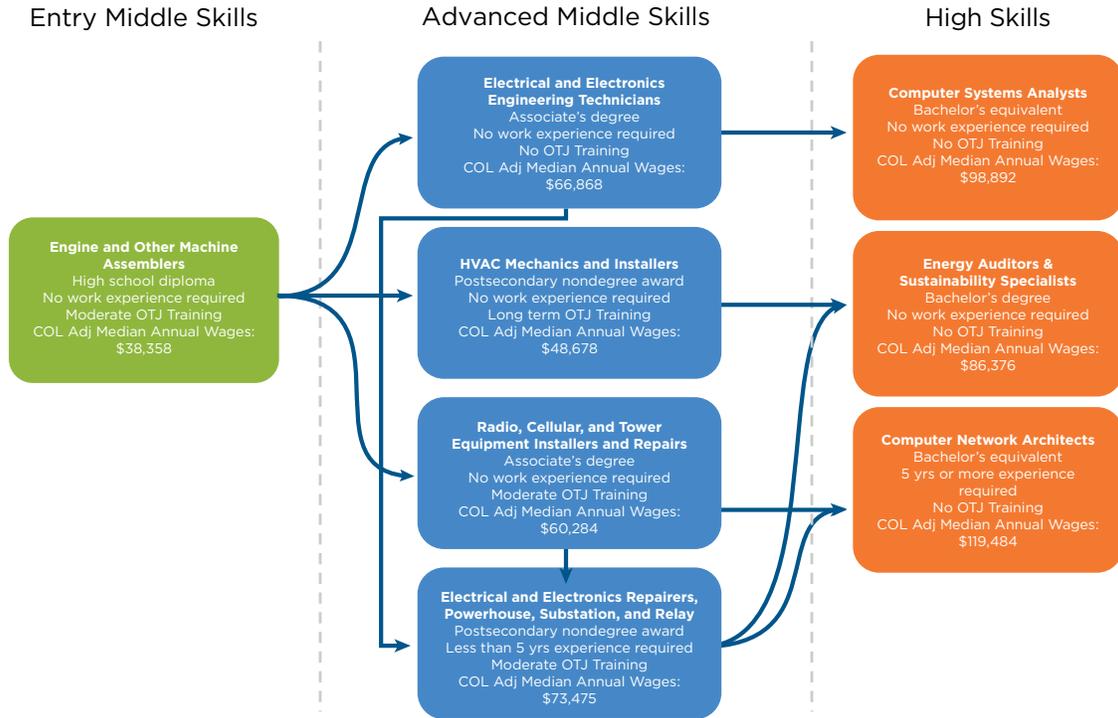


Figure 15: Illustrative Greater Houston Example of Viable Upskilling Pathways for Entry Level Repair and Installation Occupations

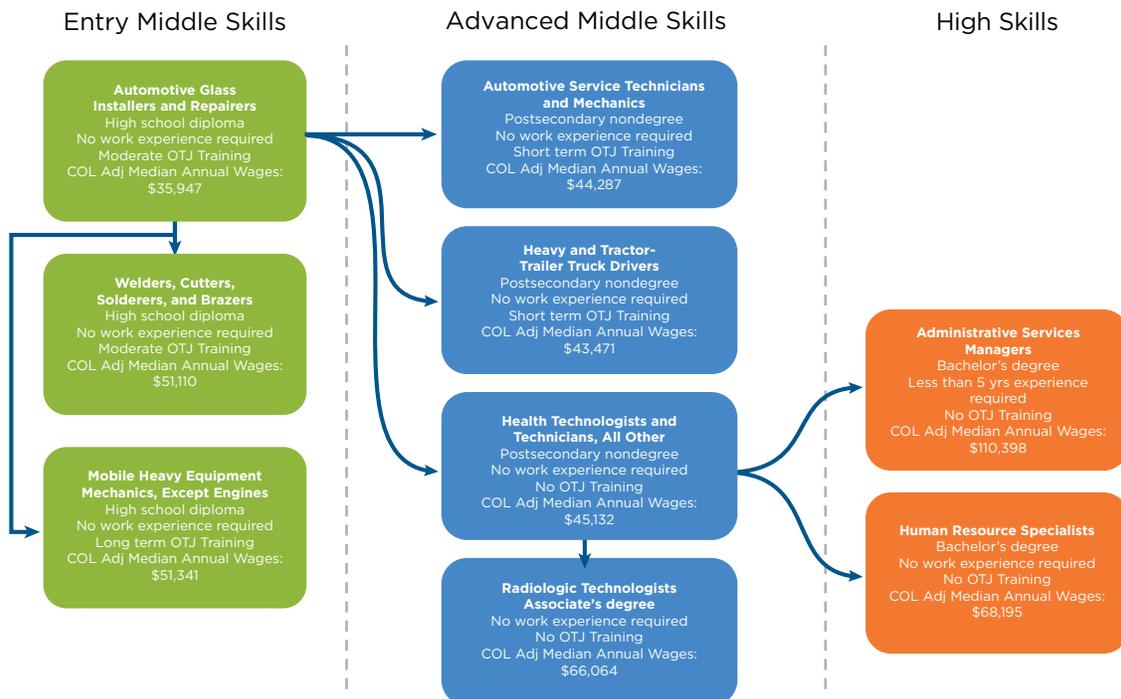
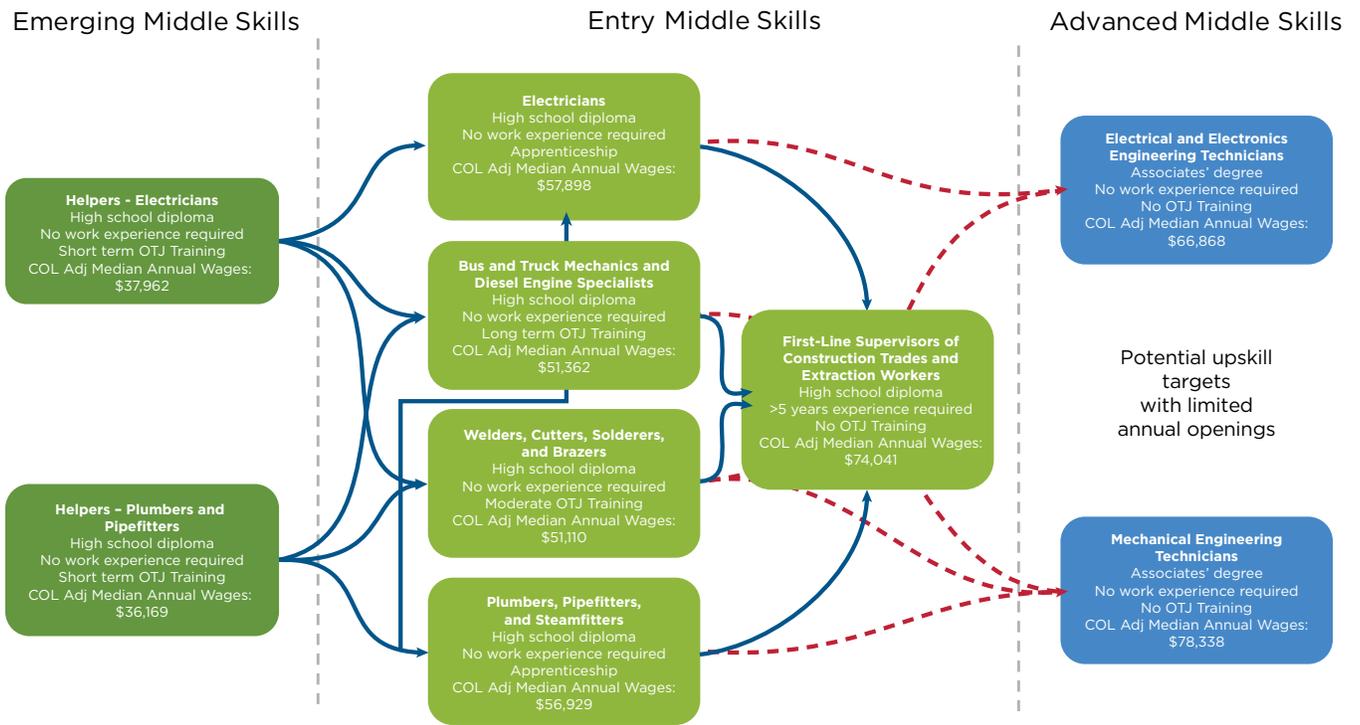


Figure 16: Illustrative Greater Houston Example of Viable Upskilling Pathway from Emerging Occupations to Entry-Level Occupations



Note: For Figure 13 only, red dotted lines indicate that these advanced middle-skill pathways do not satisfy the annual openings criteria described above due to limited levels of projected annual openings through 2024 for the Greater Houston area. They were included to show that viable transitions to advanced middle-skill occupations in these areas exist based on similarity and improved job prospects criteria; but may not be attainable when factoring in perceived desirability criteria or may represent choke points in terms of the availability of sufficient volumes of open positions in target occupations for workers seeking to upskill.

Considering the Future of Work: The Effect of Automation and Digital Transformation on Greater Houston’s Middle-Skill Occupations

In addition to the local market conditions that impact the career paths for middle-skill workers, there are also a variety of emerging global trends that are expected to affect the outlook for this segment of the labor force. Just a few of these high-level changes that are already driving significant shifts to hiring and training decisions include:

- Globally integrated markets and supply chains;
- Changing worker demographics and business operations models;
- Integration of new technologies into work environments;
- Rapidly changing skills requirements.

Two of these trends in particular have the potential for significant near-term impact for middle-skill workforce alignment and preparation—the risk of job displacement due to adoption of automation technologies by businesses and the increasing digitization of work requirements across all types of jobs as companies integrate digital operations models and demand new skills.

Houston’s current middle-skill workforce faces a “bimodal” automation risk outlook where these occupations in services and healthcare have a more secure outlook, while large employment footprints in segments such as construction, production, repair, and transportation occupations face significant risks of displacement due to the emergence of new automation technologies.

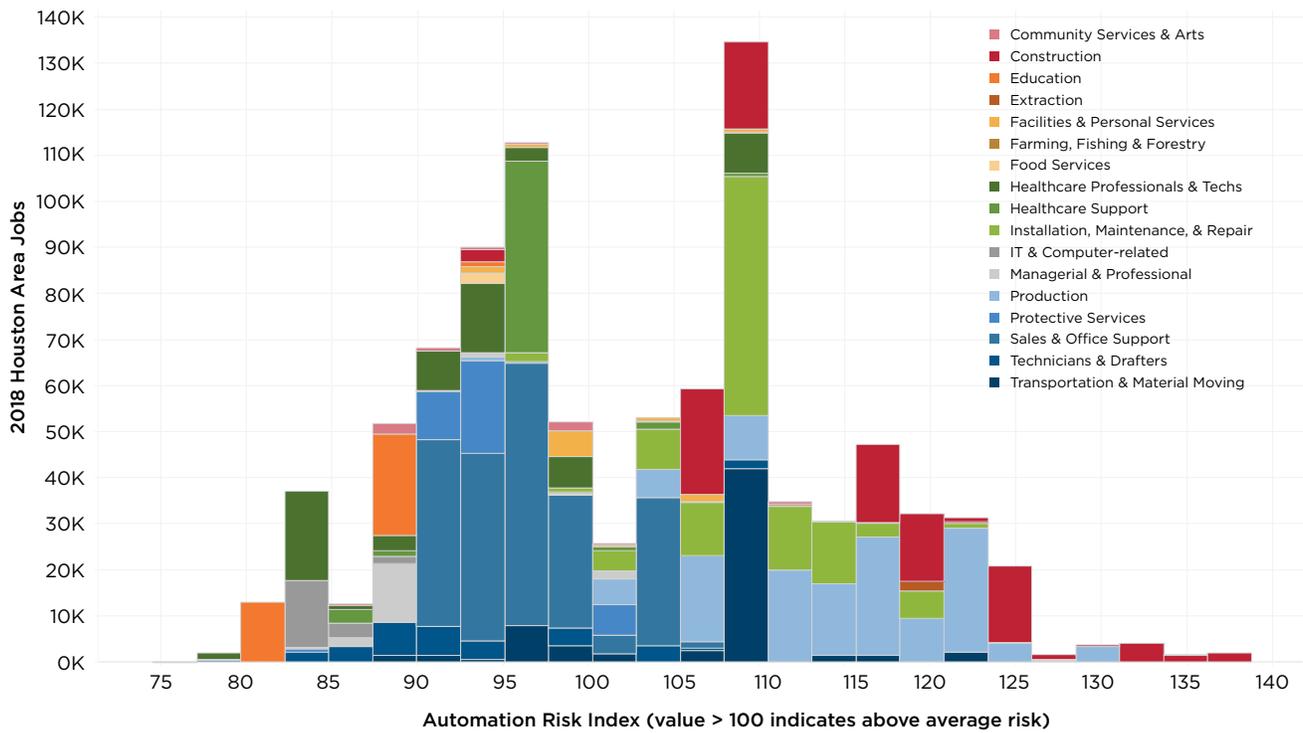
The risk of automation for Houston’s middle-skill workforce presents a near-term issue that workforce development stakeholders must be prepared to respond to. A study on the future of employment and risks of computerization of jobs estimated that 47 percent of all U.S. jobs are at risk of automation based on the fundamental tasks that they entail, particularly service, sales, and administrative support roles.¹⁸ Utilizing data from EMSI that calculates an automation risk index based on the methodology of this study, Houston’s risk profile for middle-skill occupational segments is shown in Figure 17. The figure plots Greater Houston employment for each occupational group on the

18 “The Future of Employment: How Susceptible Are Jobs to Computerisation?” Frey & Osborne, Oxford Martin School, 2013.

vertical axis against the automation risk index on the horizontal index. An index value greater than 100 indicates an above-average risk for that group.

Houston’s current middle-skill workforce makeup faces a bimodal automation risk outlook where these occupations in services and healthcare have a more secure outlook, while large employment footprints in segments such as construction, production, repair, and transportation occupations face significant risks of displacement due to the emergence of new automation technologies.

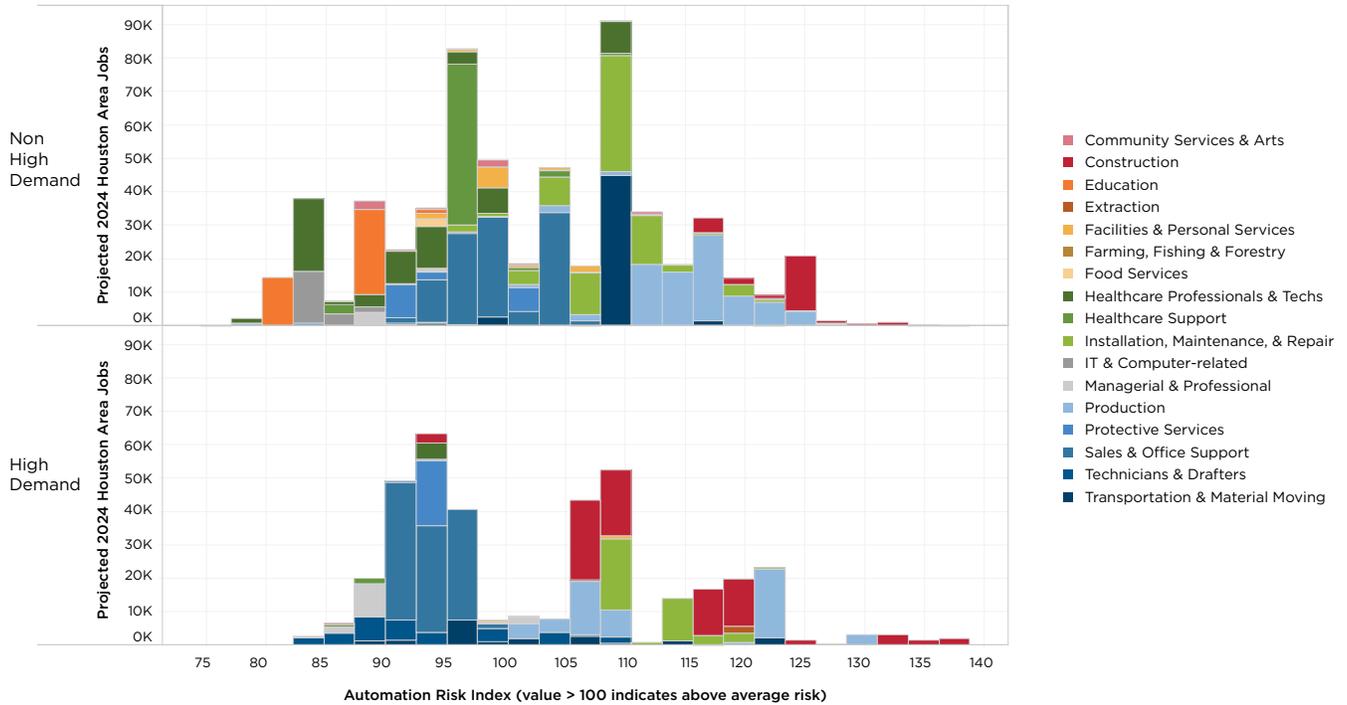
Figure 17: Automation Risk for Greater Houston Middle-Skill Jobs by Occupational Segment



Source: TEconomy’s analysis of EMSI 2019.2 automation index.

Further segmenting Houston’s occupational profile by high-demand occupations as shown in Figure 18 shows a more nuanced picture of this risk that has implications for workforce development in the region.

Figure 18: Automation Risk for Houston Middle-Skill Jobs by Demand Type and Occupational Segment



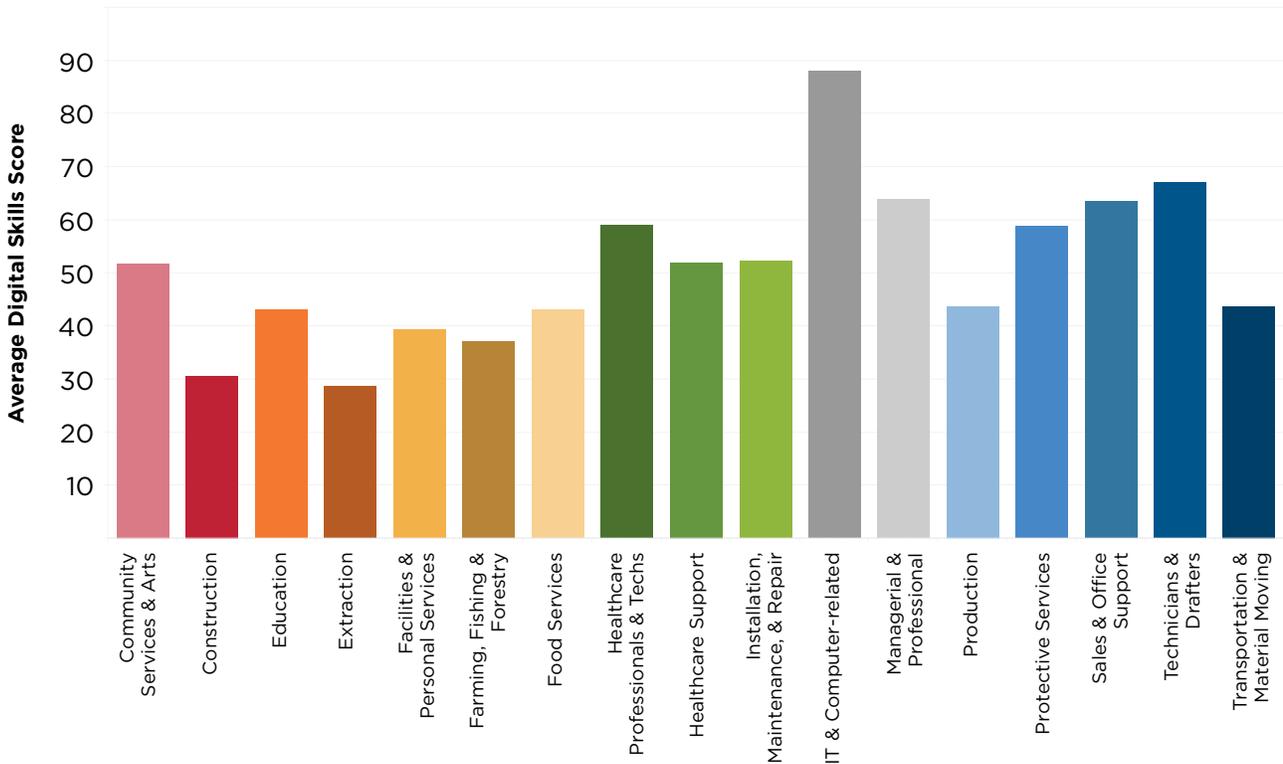
Source: TEconomy's analysis of EMSI 2019.2 automation index.

High-demand middle-skill occupations over the next five years are focused in services-oriented as well as labor and production-oriented occupations, two broad groupings that have very different automation risk profiles. Crafting interventions that meet short-term demand for high-demand occupations in high automation risk segments like construction and maintenance, installation, and repair may necessitate a diverse set of strategies to enable these workforces to adapt if new technologies come online unexpectedly. Similarly, ensuring that there are significant investments made in lower automation risk jobs that diversify the occupational portfolio of the region will help mitigate the future impacts of technological change.

At the same time that there are significant risks of worker displacement, the same technologies coming online also require new skill sets for workers to utilize them most effectively. Digital skills are becoming an increasingly necessary requirement for workers regardless of industry or education level; and assessing gaps in digital skills preparedness can reveal places for targeted intervention to help workers remain competitive in a rapidly changing landscape. Based on O*Net data on required computer knowledge and interactivity in each middle-skill occupation, a Brookings Institution

study approach estimates a measure of the digital skills profile of different occupations.¹⁹ Figure 19 shows the average digital skills scores across different occupational segments based on Brookings' methodology with the mean across all middle-skill occupations in the region scored at 49.5 out of a maximum digital skills score of 100.

Figure 19: Average Digital Skills Scores for Occupational Segments Covering Middle-Skill Jobs in Greater Houston

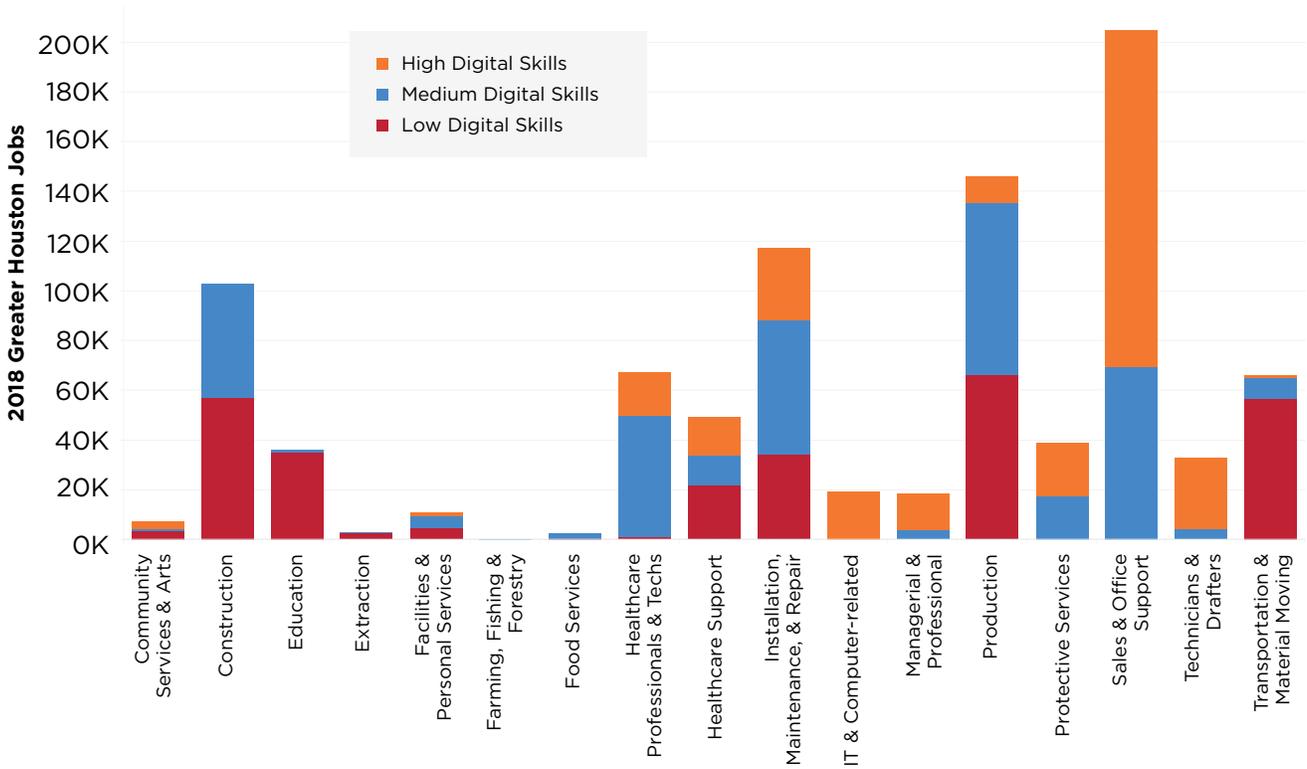


Source: TEconomy's analysis of O*Net and Brookings Institution methodology

As shown below in Figure 20, Houston's middle-skill jobs with higher concentrations of digital skills requirements are focused in healthcare, technician, professional, sales, and protective services segments with the largest middle-skill employment footprint requiring higher levels of digital skills estimated to be in sales and office support jobs. Conversely, construction and production segments with high employment footprints in Houston have low digital skills profiles and represent a potential opportunity for workforce development stakeholders to increase applied digital skill sets to build resiliency as new dynamics and even new types of occupations emerge with the increasing integration of digital technologies into legacy industry sectors.

19 Digitalization and the American Workforce, Muro, Liu, Whiton, & Kulkarni. Brookings Institution, 2017.

Figure 20: Employment in Digital Skills Tiers Across Middle-Skill Occupational Segments in Greater Houston



Source: TEconomy's analysis of O*Net and Brookings Institution methodology

Key Recommendations and Implications

As established at the outset of this report, middle-skill jobs clearly matter in Greater Houston. They account for a larger share of regional jobs than the national average and are expected to continue to grow faster over the next 5 years. Several potential interventions by, and considerations for UpSkill Houston have been highlighted throughout the report. In this section, we summarize some of the key recommendations and implications of the study.

- This report focuses on a quantitative assessment of the regional demand for middle-skill jobs in Greater Houston. In order to further strengthen and utilize the findings of this report, TEconomy recommends that UpSkill Houston convene some of its industry, education and community stakeholders to share these findings, as well as consider the supply side of the workforce equation.
 - » UpSkill Houston should engage with employers to add their perspectives to this analysis. The projections for occupational demand are based on historical trends and models and, therefore, may have limitations. Employers and industry can provide additional information and nuance related to the projections, as well as how the skills required among these occupations may be shifting.
 - » In addition, UpSkill Houston should examine and consider key indicators related to the supply of workers and talent, including graduation levels/rates in key degree fields that align with priority middle-skill areas, and the educational attainment of the existing workforce.
- As it considers forming employer-led collaboratives, UpSkill Houston should focus on regional industry clusters/drivers that have a particularly strong concentration of middle-skill employees, as well as utilization of high-demand middle-skill occupations.
 - » There is a potential participation gap in the initiative that should be considered for employers in the digital transformation space (including IT, telecommunications firms, and advanced business firms involved in consulting, legal and accounting services, etc.).
 - » Likewise, the region's real estate sector is a major employer of middle-skill workers and also should be considered for more formal participation in the initiative.
- The findings highlight implications for potential interventions, including the nature of industrial utilization of middle-skill roles and areas where varied industries can aggregate demand for similar skill needs and collaborate on solutions.

- » For an occupation that plays a key role across many industry clusters, such as industrial machinery mechanics, aggregating demand and tackling upskilling across several clusters and corporate partners is likely the best approach for UpSkill Houston.
 - » Installation, maintenance and repair as well as sales and office support are deployed and in relatively high demand across virtually all key industrial areas in the region. These represent targeted skill areas for interventions due to a strong aggregated demand context for a broad swath of employers, regardless of industry. Consider cross-sector initiatives to leverage the region's broad demand context.
 - » An advanced middle-skills level occupational cluster such as technicians and drafters has multiple industrial dimensions, but reflects a specialized nature and industrial context of these skill sets that almost uniformly require an Associate's degree. UpSkill Houston should consider interventions and awareness around a range of 2-year degrees and high-demand career opportunities for technicians and drafting professionals which are deployed across a number of regional industries. In promoting awareness to stakeholders, it will be important to illustrate the multi-industry specialized opportunities.
 - » Production occupations represent a hybrid context, where the production-oriented focus is logically concentrated in manufacturing and other manufactured product-centric industries. There are other key industry demands for production workers including in biomedical where the industrial life sciences component is manufacturing pharmaceuticals and medical devices. UpSkill Houston should identify and explore common skill sets across industry clusters with aggregated regional demand for production workers.
 - » For an occupation such as chemical technicians, where the demand is more industry siloed, it is appropriate for one cluster (petrochemicals) to focus on these activities.
- The study identifies 47 occupations that should be considered “high-priority” occupations and skill sets for Greater Houston and middle-skill occupations going forward. These occupations represent areas in which UpSkill Houston should direct individuals for career awareness, upskilling opportunities, and other initiatives.
 - The analysis also provides UpSkill Houston with an approach to better understand and identify optimal “pathways” for helping workers transition up the skills continuum and into more viable career opportunities. There are also occupational segments that sometimes reach certain “choke points” in viable upskilling pathways that should be examined. Some advanced middle-skill occupations may provide a viable endpoint for upskilling when they provide relatively high standards of living as well as job stability.
 - The study further examined key issues related to the impact of automation. UpSkill Houston should consider crafting interventions that meet short-term demand for high-demand occupations in high automation risk segments while also ensuring that there are significant investments made in lower automation risk jobs that diversify the occupational portfolio of the region.

Conclusion

Greater Houston has been experiencing tremendous regional growth and both the benefits and challenges it brings. The Partnership and regional employers are coming together in innovative ways to address a key challenge brought to the forefront—that of sourcing, hiring, and retaining workers in jobs that require more than a high school diploma but not a 4-year college degree. The UpSkill Houston initiative is working each day to illuminate and connect to the breadth of opportunities for workers in these careers. The demand-side analysis developed in this study is intended to refresh the landscape for UpSkill Houston’s work in this space, and has shined a spotlight on a number of high-priority areas in the middle-skills upon which to focus and target its initiatives now and into the near future. In addition, the study has sought to highlight powerful analytical approaches available for identifying viable career upskilling pathways and transitions to inform its work into the future. But disruptive changes and forces abound, including waves of automation and digitization that will impact this workforce and must also be considered. UpSkill Houston is advancing an important and vital mission for both Houstonians and its dynamics employer base, and with the right intelligence in hand, can continue its impactful role in the regional ecosystem.

Appendix

The following data tables provide further information on the 47 detailed occupations identified as high-priority jobs for targeted interventions in the Greater Houston region.

Table A-1: High-Priority Occupations for Strategic Interventions—Typical Entry Level Requirements

Occupational Title	Middle-Skill Level	Typical Entry Level Education	Work Experience Required	Typical On-The-Job Training
Construction				
Elevator Installers and Repairers	Entry	High school diploma or equivalent	None	Apprenticeship
Insulation Workers, Mechanical	Entry	High school diploma or equivalent	None	Apprenticeship
First-Line Supervisors of Construction Trades and Extraction Workers	Entry	High school diploma or equivalent	5 years or more	None
Structural Iron and Steel Workers	Entry	High school diploma or equivalent	None	Apprenticeship
Construction and Building Inspectors	Entry	High school diploma or equivalent	5 years or more	Moderate-term on-the-job training
Electricians	Entry	High school diploma or equivalent	None	Apprenticeship
Plumbers, Pipefitters, and Steamfitters	Entry	High school diploma or equivalent	None	Apprenticeship
Operating Engineers and Other Construction Equipment Operators	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Healthcare Support				
Physical Therapist Assistants	Advanced	Associates degree	None	None
Installation, Maintenance, & Repair				
Control and Valve Installers and Repairers, Except Mechanical Door	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Industrial Machinery Mechanics	Entry	High school diploma or equivalent	None	Long-term on-the-job training

Occupational Title	Middle-Skill Level	Typical Entry Level Education	Work Experience Required	Typical On-The-Job Training
Mobile Heavy Equipment Mechanics, Except Engines	Entry	High school diploma or equivalent	None	Long-term on-the-job training
Electrical Power-Line Installers and Repairers	Entry	High school diploma or equivalent	None	Long-term on-the-job training
Bus and Truck Mechanics and Diesel Engine Specialists	Entry	High school diploma or equivalent	None	Long-term on-the-job training
Telecommunications Line Installers and Repairers	Entry	High school diploma or equivalent	None	Long-term on-the-job training
Managerial & Professional				
Title Examiners, Abstractors, and Searchers	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Transportation, Storage, and Distribution Managers	Entry	High school diploma or equivalent	5 years or more	None
Tax Preparers	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Paralegals and Legal Assistants	Advanced	Associates degree	None	None
Production				
Chemical Equipment Operators and Tenders	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Chemical Plant and System Operators	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Petroleum Pump System Operators, Refinery Operators, and Gaugers	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Gas Plant Operators	Entry	High school diploma or equivalent	None	Long-term on-the-job training
Welders, Cutters, Solderers, and Brazers	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Structural Metal Fabricators and Fitters	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Inspectors, Testers, Sorters, Samplers, and Weighers	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Protective Services				
Police and Sheriff's Patrol Officers	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Sales & Office Support				
Real Estate Sales Agents	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training

Occupational Title	Middle-Skill Level	Typical Entry Level Education	Work Experience Required	Typical On-The-Job Training
Sales Representatives, Services, All Other	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Brokerage Clerks	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Technicians & Drafters				
Geological and Petroleum Technicians	Advanced	Associates degree	None	Moderate-term on-the-job training
Chemical Technicians	Advanced	Associates degree	None	Moderate-term on-the-job training
Mechanical Engineering Technicians	Advanced	Associates degree	None	None
Surveying and Mapping Technicians	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Mechanical Drafters	Advanced	Associates degree	None	None
Life, Physical, and Social Science Technicians, All Other	Advanced	Associates degree	None	None
Civil Engineering Technicians	Advanced	Associates degree	None	None
Architectural and Civil Drafters	Advanced	Associates degree	None	None
Environmental Science and Protection Technicians, Including Health	Advanced	Associates degree	None	None
Electrical and Electronics Engineering Technicians	Advanced	Associates degree	None	None
Engineering Technicians, Except Drafters, All Other	Advanced	Associates degree	None	None
Transportation & Material Moving				
Captains, Mates, and Pilots of Water Vessels	Advanced	Postsecondary nondegree award	Less than 5 years	None
Wellhead Pumpers	Entry	High school diploma or equivalent	Less than 5 years	Moderate-term on-the-job training
Flight Attendants	Entry	High school diploma or equivalent	Less than 5 years	Moderate-term on-the-job training
Transportation Inspectors	Entry	High school diploma or equivalent	None	Moderate-term on-the-job training
Crane and Tower Operators	Entry	High school diploma or equivalent	Less than 5 years	Moderate-term on-the-job training

Table A-2: High-Priority Occupations for Strategic Interventions—Presence Across Regional Industry Clusters/Key Drivers

Occupational Title	Significant Deployment Across Regional Industry Clusters/Drivers										
	Biomedical	Construction	Corporate HQs	Digital Transformation	Education	Empl. Services	Energy	Mfg.	Petrochemicals	Real Estate	Transport & Logistics
Construction											
Elevator Installers and Repairers		✓									
Insulation Workers, Mechanical		✓									
First-Line Supervisors of Construction Trades and Extraction Workers		✓					✓				
Structural Iron and Steel Workers		✓									
Construction and Building Inspectors				✓							
Electricians		✓				✓	✓		✓		
Plumbers, Pipefitters, and Steamfitters		✓					✓				
Operating Engineers and Other Construction Equipment Operators		✓					✓				
Healthcare Support											
Physical Therapist Assistants	✓										
Installation, Maintenance, & Repair											
Control and Valve Installers and Repairers, Except Mechanical Door							✓				
Industrial Machinery Mechanics							✓	✓	✓		

Occupational Title	Significant Deployment Across Regional Industry Clusters/Drivers										
	Biomedical	Construction	Corporate HQs	Digital Transformation	Education	Empl. Services	Energy	Mfg.	Petrochemicals	Real Estate	Transport & Logistics
Mobile Heavy Equipment Mechanics, Except Engines							✓				
Electrical Power-Line Installers and Repairers							✓				
Bus and Truck Mechanics and Diesel Engine Specialists											✓
Telecommunications Line Installers and Repairers				✓							
Managerial & Professional											
Title Examiners, Abstractors, and Searchers											
Transportation, Storage, and Distribution Managers											✓
Tax Preparers				✓							
Paralegals and Legal Assistants				✓							
Production											
Chemical Equipment Operators and Tenders									✓		
Chemical Plant and System Operators									✓		
Petroleum Pump System Operators, Refinery Operators, and Gaugers							✓		✓		
Gas Plant Operators							✓				

Occupational Title	Significant Deployment Across Regional Industry Clusters/Drivers										
	Biomedical	Construction	Corporate HQs	Digital Transformation	Education	Empl. Services	Energy	Mfg.	Petrochemicals	Real Estate	Transport & Logistics
Welders, Cutters, Solderers, and Brazers		✓				✓	✓	✓			
Structural Metal Fabricators and Fitters								✓			
Inspectors, Testers, Sorters, Samplers, and Weighers				✓		✓	✓	✓	✓		✓
Protective Services											
Police and Sheriff's Patrol Officers					✓						
Sales & Office Support											
Real Estate Sales Agents										✓	
Sales Representatives, Services, All Other		✓	✓	✓		✓	✓			✓	✓
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products			✓				✓	✓	✓		
Brokerage Clerks											
Technicians & Drafters											
Geological and Petroleum Technicians							✓				
Chemical Technicians									✓		
Mechanical Engineering Technicians											
Surveying and Mapping Technicians				✓							

Occupational Title	Significant Deployment Across Regional Industry Clusters/Drivers										
	Biomedical	Construction	Corporate HQs	Digital Transformation	Education	Empl. Services	Energy	Mfg.	Petrochemicals	Real Estate	Transport & Logistics
Mechanical Drafters											
Life, Physical, and Social Science Technicians, All Other						✓					
Civil Engineering Technicians				✓							
Architectural and Civil Drafters				✓							
Environmental Science and Protection Technicians, Including Health											
Electrical and Electronics Engineering Technicians				✓				✓			
Engineering Technicians, Except Drafters, All Other											
Transportation & Material Moving											
Captains, Mates, and Pilots of Water Vessels											✓
Wellhead Pumpers							✓				
Flight Attendants											✓
Transportation Inspectors											✓
Crane and Tower Operators											✓

Source: TEconomy's analysis of EMSI 2019.2 Staffing Patterns Data.

Note: A check mark means the occupation accounts for 0.4% or more of total industry cluster employment in Greater Houston.



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