

Talent-to-Industry Exchange

KC GLOBAL DESIGN



A Labor Analysis of the KC Global Design Industry

ENGINEERING AND ARCHITECTURE SECTORS

MID-AMERICA REGIONAL COUNCIL

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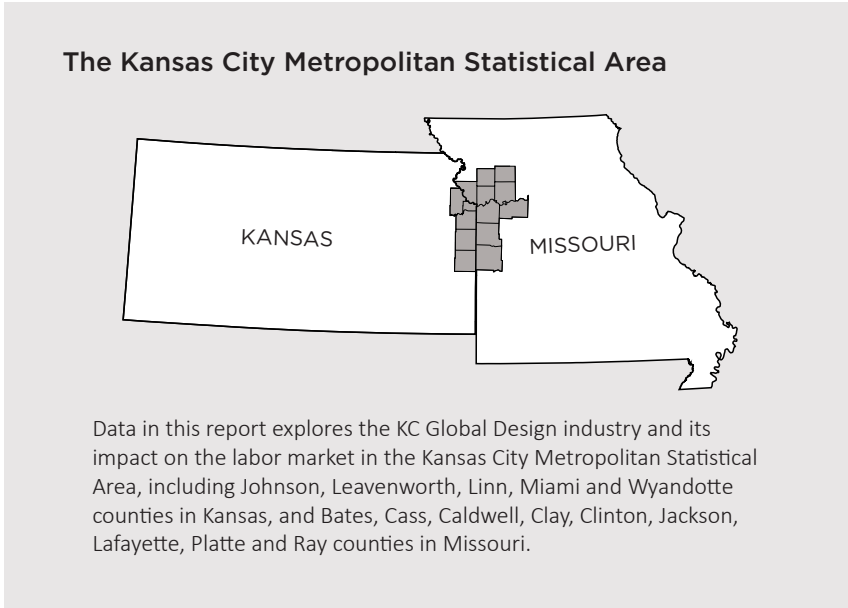
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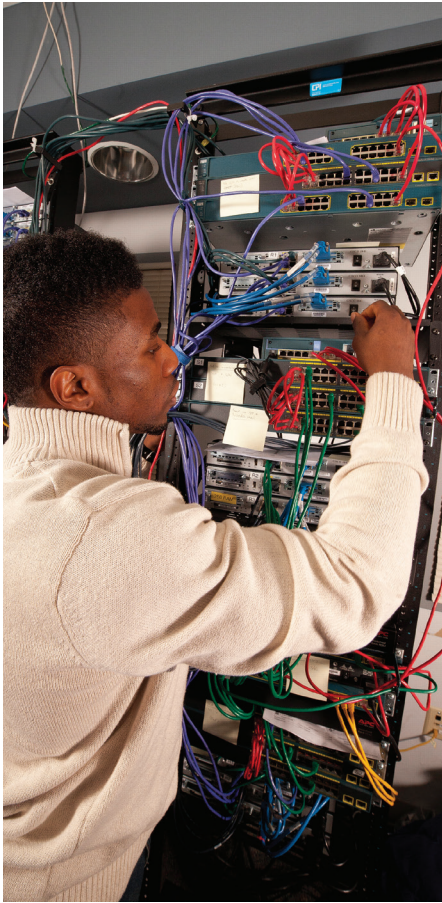
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TALENT-TO-INDUSTRY EXCHANGES

The Talent-to-Industry Exchange (TIE) concept was introduced in 2016 as a tool to gather real-time information and use it to inform strategies for growing the region's talent pool, strengthening the talent pipeline, and aligning employer and educational stakeholder interests. The concept was recommended by the KC Rising Pilot Project Task Force team and was adopted as the signature strategy in Year Two of KC Rising. With guidance from the KC Rising Human Capital Oversight Committee, project partners outlined a process for each industry-specific TIE. The following elements were deemed critical to success:



- TIEs must be industry led.
- TIEs must be regional and comprehensive in approach, covering the full education continuum, from kindergarten to graduate school.
- TIEs must be data driven and action oriented.

The TIE process has three phases: (1) a detailed economic and labor analysis, (2) a workforce action plan; and (3) plan implementation. An industry leader is identified to champion and lead each TIE. The industry leader may be an association or group of leading businesses in a chosen industry who agree to act as co-convenor and recruit employers to participate.

Educational stakeholders are engaged through GradForce KC. GradForce KC is Kansas City's regional network of education and community-based organizations focused on improving educational attainment and creating a talent pipeline for economic and civic vitality. Members of GradForce KC include the region's largest school districts (by enrollment), regional tech academies and representatives from a network of 17 public and nonprofit postsecondary institutions; nonprofit, philanthropic, and workforce organizations that are regional in scope and have a complementary mission; state officials located in the region whose work is related to education; and education intermediaries.

This report provides the economic and labor analysis for the engineering, architecture and related technician occupations that are part of the KC Global Design industry. It includes quantitative data about the labor market, as well as qualitative insights gathered through an online survey of industry leaders, facilitated group discussions, individual interviews with business leaders and two work sessions conducted in 2017.

This TIE is the second in an ongoing series. The Life Sciences TIE was completed in early 2017, and a third TIE, focused on Construction Trades, is underway in 2018.



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EXECUTIVE SUMMARY

Design is where knowledge and innovation intersect to create products and services that are essential to the way we live and work. Design creates value, providing a competitive advantage for individual firms and for regions that possess a design edge. Greater Kansas City is one such region.

The region is home to one of the largest concentrations of leading engineering and architecture firms in the nation. By exporting both design services and a multitude of products that embody cutting-edge design, Kansas City area firms are transforming the way people live, work and play, across the nation and around the world. Our firms launched the movement toward sustainable buildings and introduced innovative metal fabrication. They design advanced electronics for consumers, aerospace components for the federal government and information systems for hospitals. Their designs provide water to 20 percent of the world's population and have made Kansas City the center of sports architecture, originating 75 percent of American venues and facilities. Kansas City area firms are leaders in designing power, telecommunications and transportation infrastructure around the world.

This report was developed in collaboration with the KC Global Design sector. Through quantitative and qualitative analysis, it develops a broad and deep understanding of the labor needs of design firms and is intended to strengthen the alignment of talent produced by educational institutions with the skills and competencies required by businesses in the Kansas City area.

DATA ANALYSIS

The KC Global Design industry comprises both firms that sell engineering, architectural and construction services, and firms that use engineering to improve the products they sell. These two distinct groups are categorized as Professional Design Services firms and Product Engineering

firms. The metropolitan area is the national headquarters of several architecture, engineering and construction firms that sell design services around the globe, including Black & Veatch, Burns & McDonnell, Populous, HNTB, Western Forms, JE Dunn and McCownGordon. These firms engage in Design Services and collectively employ 9,400 design professionals locally. The region also is home to many companies that are powered by engineering and use design technology to improve the products and services they sell. These include Garmin, Honeywell, Cerner, Netsmart Technologies, Fike, Sioux Chief, Ford and GM. These firms engage in Product Engineering and collectively employ 9,600 design professionals locally.

While Professional Design Services firms are concentrated in two industries, Product Engineering is spread among many. Design Services are concentrated in architectural and engineering services (A&E) and construction, while the largest numbers of Product Engineering firms are found in the manufacturing, scientific and technical services¹ and public administration industries.

Engineers account for roughly 60 percent of all design professionals working in the region, with civil, mechanical, electrical² and industrial engineers comprising the largest specializations. Architects account for slightly less than 10 percent of the region's design professionals. The remaining 30 percent work in a wide variety of supporting technician positions.

More than half of all engineers in the region are employed in Product Engineering, while virtually all architects and a majority of technicians are employed in Design Services. More than 90 percent of civil engineers work in Design Services, and a similar percentage of industrial engineers work in Product Engineering. Mechanical and electrical engineers are split 60/40 in favor of Product Engineering.

Industry Analysis

The market for goods and services drives the demand for design professionals. While data on individual firms is unavailable, we can evaluate demand by examining the industries that employ the most design workers — A&E (8,900 jobs), manufacturing (4,000 jobs), and scientific and technical services (1,600 jobs).

The success of these industries depends, in part, upon local firms having an expertise not easily replicated elsewhere. This allows these firms to expand their markets beyond the region, resulting in industries that employ more people here than is typical across the nation. Kansas City's regional economy has its largest specialization in the A&E industry. The proportion of the region's jobs in this industry is 54 percent higher than the national average, ranking Kansas City fifth among 31 peer metros. The scientific and technical services industry is also a specialization for the region, as its proportion of total jobs is 46 percent higher than the national average, sixth among peer metros. Manufacturing, however, is not a specialization, as its proportion of the region's jobs is 14 percent below the national average, 17th among peer metros.

More important than current levels of specialization is whether they are increasing or decreasing. These industries are growing faster in the Kansas City region than the rest of the country, causing our level of specialization to increase. Jobs in both the A&E and scientific and technical services industries are growing twice as fast here as in the rest of the country. While manufacturing shows

1 The scientific and technical services classification includes architectural and engineering; computer systems design; management, scientific and technical consulting; and scientific research and development.

2 Software engineers are included in the electrical engineers classification, although some are also classified as software developers (not included in this report).

long-term systemic job loss in both the region and the nation, due in part to rapidly rising worker productivity, the nation has lost jobs three times faster than the Kansas City region.

ECONOMIC IMPACT

These industries are successfully selling their goods and services beyond the region's borders. They account for a third of all goods and services sold to consumers and firms outside the region and nearly 60 percent of those sold to the rest of the world. Manufacturing alone accounts for half of the region's international exports.

The KC Global Design sector generates substantial economic impact by bringing in outside dollars that recirculate throughout the regional economy. For every 1,000 jobs that exports create in Design Services, another 1,500 jobs are created elsewhere in the economy. Similarly, for every additional 1,000 jobs exports create in Product Engineering, another 2,400 jobs are created in the local economy.

OCCUPATION ANALYSIS

Occupational specializations derive from industry specializations. As might be expected from the Kansas City region's high level of A&E specialization, the number of architects employed here as a percent of total jobs is 28 percent higher than the national share, ranking Kansas City fifth among 31 peer metros. Our proportion of civil engineers is 26 percent higher than average, in 12th place among peer metros. Electrical engineers are employed here at a rate 36 percent higher than average, the highest among all engineering and architecture occupations, eighth among peer metros. Electrical engineers are in demand in two industries — scientific and technical consulting and A&E — with high levels of specialization. The region's relatively low proportion of manufacturing employment tells a different story, however. Our share of jobs held by industrial engineers is 25 percent below the national average, placing Kansas City 21st among its peers. Our proportion of other types of engineers — especially those associated with tech sector manufacturing, such as aerospace, biomedical, chemical, computer, electronics and materials engineers — is nearly 30 percent below average, which places the region 19th among peer metros.

All three major categories of design professionals — engineers, architects and technicians — have been growing faster here than in the nation in recent years, driving an increase in the region's occupation specialization. Since 2012, the number of engineers and architects has grown at least two times faster, and the number of technicians has grown five times faster than the U.S. This indicates that the KC Global Design sector is becoming increasingly competitive and the comparative advantages needed to excel in this sector are shifting toward the Kansas City region. In fact, the region appears to be building two new specialties, industrial and mechanical engineering, to complement the two engineering professions in which we already have high specialization, electrical engineering and civil engineering. All four of these professions have grown at least 12 percent locally over the last decade, compared to at most 2 percent growth nationally.

Design occupations are expected to add 1,700 new jobs over the next 10 years. This growth demand is only part of why KC Global Design firms will need more design professionals. Many more workers will leave the profession or retire, creating replacement demand for 14,000 additional workers over the next 10 years, eight times larger than growth demand.

The region's increasing specialization and competitiveness might lead one to expect wages for design professionals to be high relative to the nation and peer metros, but this is not the case, most likely due to our lower-than-average cost of living. Overall, the region's average wage across all design

occupations (\$78,400) is 7 percent lower than the national average and ranks 16th among its peers. Wages of individual design professionals generally rank either in the middle of the peer metros or slightly below middle. The principal exceptions are architects, whose average wage ranks 29th among the 31 peers, and electrical and electronic technicians, which rank fifth.

BUSINESS INSIGHTS

Participant insights on KC Global Design industry trends, challenges and opportunities were captured during the first half of 2017 through surveys of firms, facilitated discussions and individual interviews with more than two dozen industry leaders and educators. Many of the comments reinforced the quantitative analysis and filled in missing details.

GROWING THE TALENT PIPELINE

A more cohesive strategy around STEM attainment and attraction of STEM graduates is necessary to grow the region's talent pipeline. The current difficulty in attracting students to STEM results not only from a lack of exposure, but also the perceived complexity and rigor of required courses. Increasing STEM attainment is essential, but it may not be sufficient to increase the number of engineers and architects if students with quantitative aptitude choose to follow other career paths, such as technology or finance.

More diversity is needed to increase innovation and compete in a wider range of national and international markets. Area firms recognize that as the talent pipeline grows it must also become more diverse. Nearly 90 percent of their current workforce is white, and the percent of women in the workforce has increased only slightly since 2000. Developing strategies and systems that increase the number of women and minorities in the engineering and architecture professions is a significant opportunity for the industry. This is especially true with respect to efforts to retain more of the international students who make up a large portion of current graduates.

WORKFORCE PREPAREDNESS

Experiential learning has become increasingly important. Internship opportunities can help students from outside the Midwest establish roots and remain in the region after graduation. More generally, experiential learning — not just internships, but group projects, guest lecturers from industry and design competitions — helps align expectations among firms and recent graduates and produce greater levels of satisfaction for both. Working on strategies to expand experiential learning is another key opportunity for the KC Global Design industry.

Design firms are seeking workers with strong soft skills as well as technical skills. Employers are generally satisfied with the technical skills of new graduates from area educational institutions, although there is frustration with having to recruit nationally to fill some highly specialized positions. However, firms are less satisfied with recent graduates' soft skills — core competencies such as the ability to communicate with clients, collaborate on interdisciplinary teams and understand the business side of the firm's operations.

INDUSTRY DISRUPTORS

Industry disruptors will put a greater premium on developing, attracting and retaining top technical talent. KC Global Design firms continue to value the ability to use cutting-edge technologies such as building information modeling and 3D and 4D design. New technologies, such as 3D printing and additive manufacturing, advanced materials, “Big Data” and data analytics, and the “internet of things” are expected to bring dramatic changes to the industry.



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Design is where knowledge and innovation intersect to create products and services we want, need and can't live without. It is a multidisciplinary sector employing creative as well as technical talent.

There is an elegance, a joy, even beauty, in the use of a well-designed product or service. Design is the source of lasting value ... and repeat customers are willing to pay premium prices for high quality. As a result, design can forge a competitive advantage, both for individual firms and for regions that possess a design edge.

The Kansas City region has real strengths in certain aspects of the design sector, especially in the realms of engineering and architecture. Local firms in this sector have both a regional footprint and a global reach. In recognition of their combined strength, the region's design firms have joined together to create **KC Global Design** as an international brand and destination for top talent.

KC GLOBAL DESIGN INDUSTRIES

KC Global Design encompasses two distinct types of businesses — firms that sell engineering, architectural and construction services, and firms that use engineering to improve the products they sell. For this analysis of the KC Global Design sector, we classify the first group as **Professional Design Services**, which includes design professionals in the architecture and engineering services industry and the construction industry, and the second as **Product Engineering**, which includes design professionals working in all other industries, led by manufacturing, professional and scientific services, and public administration as the largest employers.

Professional Design Services firms sell engineering, architectural and construction services.

Greater Kansas City is the national headquarters of several architecture and engineering firms, including Black & Veatch, Burns & McDonnell, Populous and HNTB. These firms provide architecture and engineering services to cities and countries around the world, linking with construction companies like Western Forms, JE Dunn and McCownGordon to build structures and infrastructure that shape how and where people live and work. The architecture and engineering services (A&E) industry is the largest single employer of architects, engineers and related technicians in the Kansas City region, with 8,900 of these design professionals.

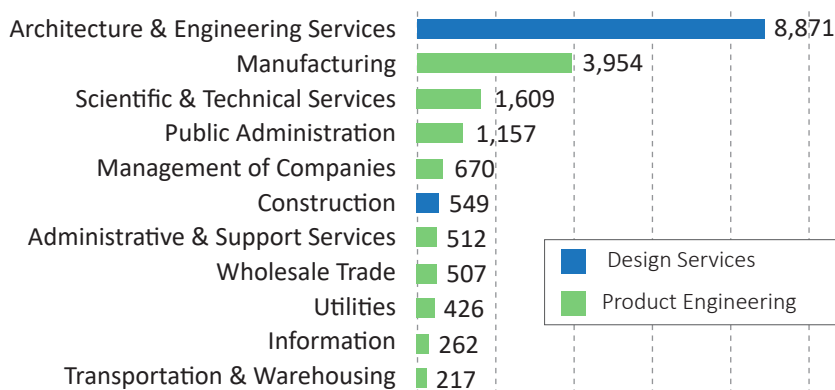
Product Engineering firms use engineering to improve the products and services they sell.

The construction industry is smaller, employing about 550 design professionals. Because the firms in these two industries principally sell services under contract to other organizations, they form the **Design Services** portion of the KC Global Design sector.

A larger number of the region’s design professionals, 9,600, are employed by firms working in a diverse set of industries that are outside of Design Services. The largest of these include 4,000 design professionals working in manufacturing, another 1,600 working in scientific and technical services, and 1,200 working in public administration. The products of these employers — for example, the wearables and avionics manufactured by Garmin, the motor vehicles made by Ford and GM, the national security and global aviation components built by Honeywell, the health information technology developed by Cerner, and the roads and bridges maintained by local governments — are powered by engineering, but engineering is not the primary good or service they produce. Engineering is a discipline to make what they produce better, more reliable and safer. These firms form the **Product Engineering** portion of the Global Design sector.

Design Professionals by Industry

Industries employing more than 200 design professionals

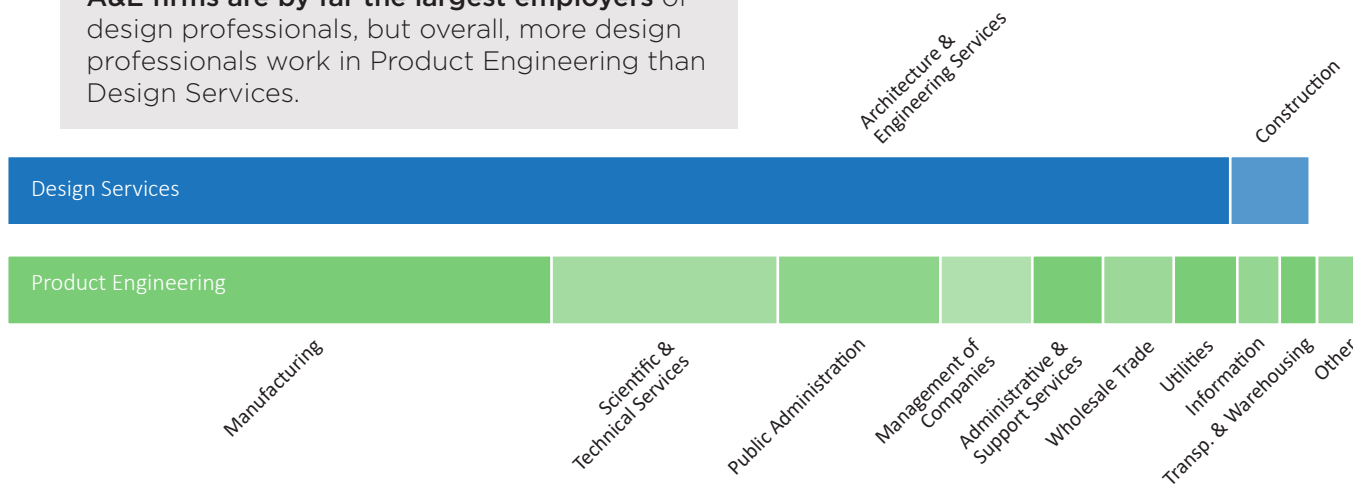


Professional Design Services are concentrated in two industries, while **Product Engineering** is spread among many.

Note: The Construction Industry will be explored in depth in a separate TIE labor analysis in the coming months.

Source: JobsEQ

A&E firms are by far the largest employers of design professionals, but overall, more design professionals work in Product Engineering than Design Services.



The division of the KC Global Design sector into two types of firms, those that directly sell engineering, architecture and construction services and those that use engineering to design and improve the products and services they sell, is useful because the workforce challenges facing them are likely to be different. To fully understand the labor market of the KC Global Design sector necessitates also looking at the occupations of these design professionals, both overall and for each type of engineering.

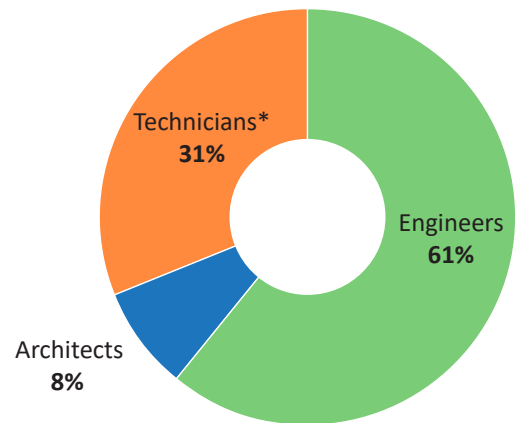
KC GLOBAL DESIGN OCCUPATIONS

Of the region’s 19,000 design professionals, engineers comprise the largest portion, at 61 percent. Architects account for 8 percent, while the remaining 31 percent includes various types of technicians — drafters, surveying and mapping technicians, as well as a wide range of engineering technicians.

Engineers account for well over half of the region’s design professionals.

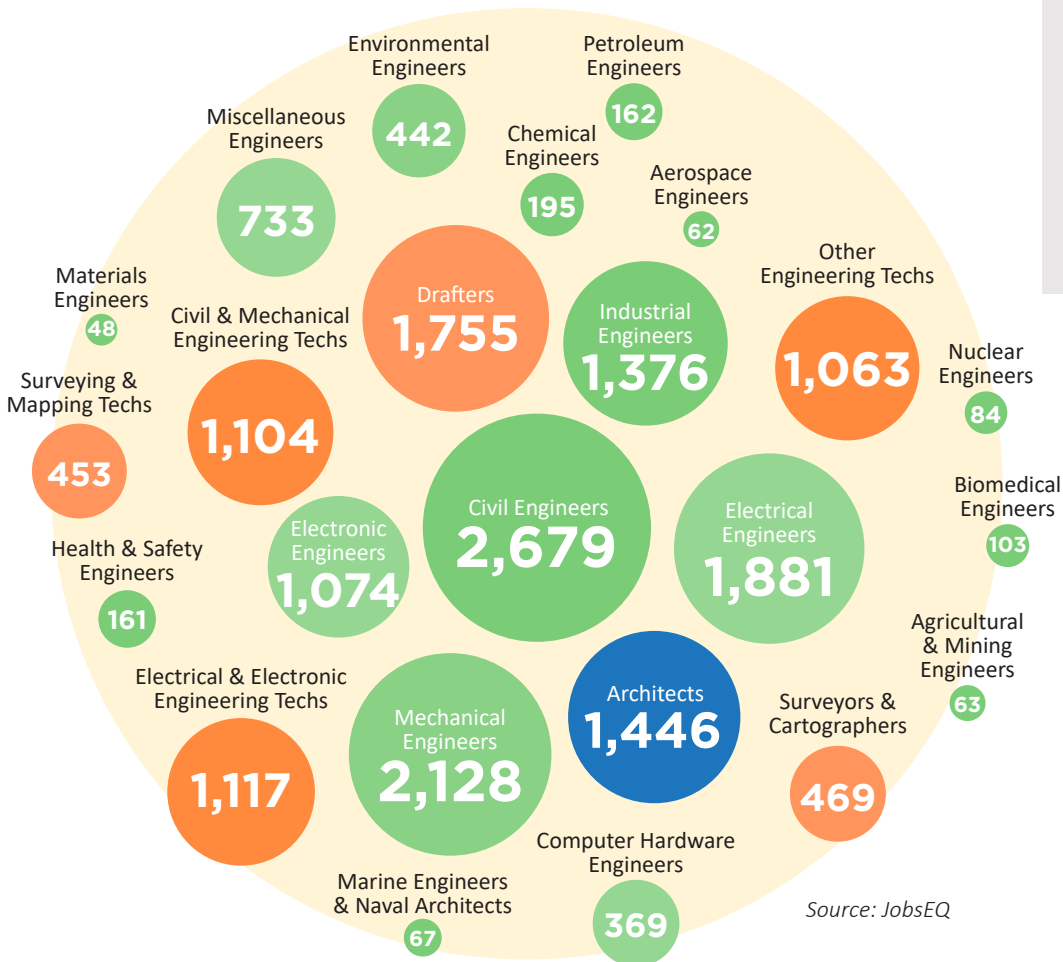
Examining the occupations of design professionals in more detail, we find that civil engineers make up the largest engineering profession in the region, totaling nearly 2,700.

KC Global Design Professionals by Broad Occupation Category



Source: JobsEQ

KC Global Design Professionals by Occupation



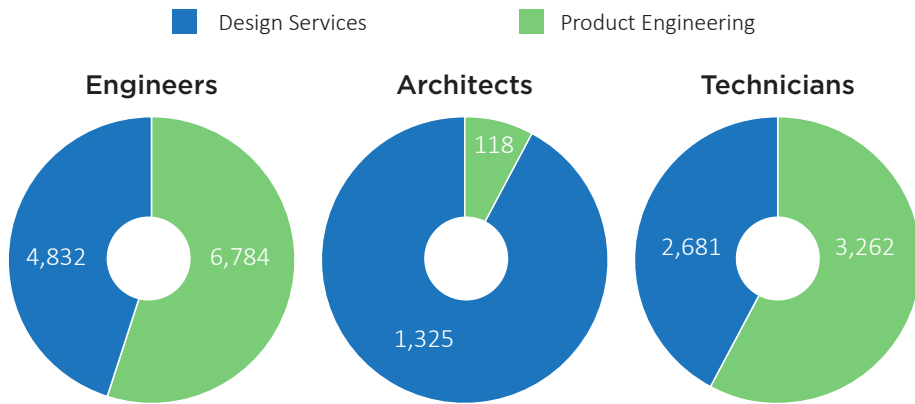
Though **civil engineers are the largest category**, the breadth of design occupations in the Kansas City region shows that any professional can find a home here.

Source: JobsEQ

*Note: To more effectively analyze the labor market for architects and engineers, the occupation category of surveyors, cartographers and photogrammetrists has been included under Technicians rather than Architects. Though the latter is suggested by the Standard Occupation Classification System, this would inflate the number of professionals counted as Architects by about one-third.

A significant majority (58 percent) of engineers in the region work in Product Engineering firms, while a similar majority (55 percent) of the area’s design technicians work in Design Services firms. Architects are the most concentrated profession, as almost all (92 percent) of the region’s architects work in Design Services firms.

KC Global Design Professionals by Type of Engineering
within broad occupation categories

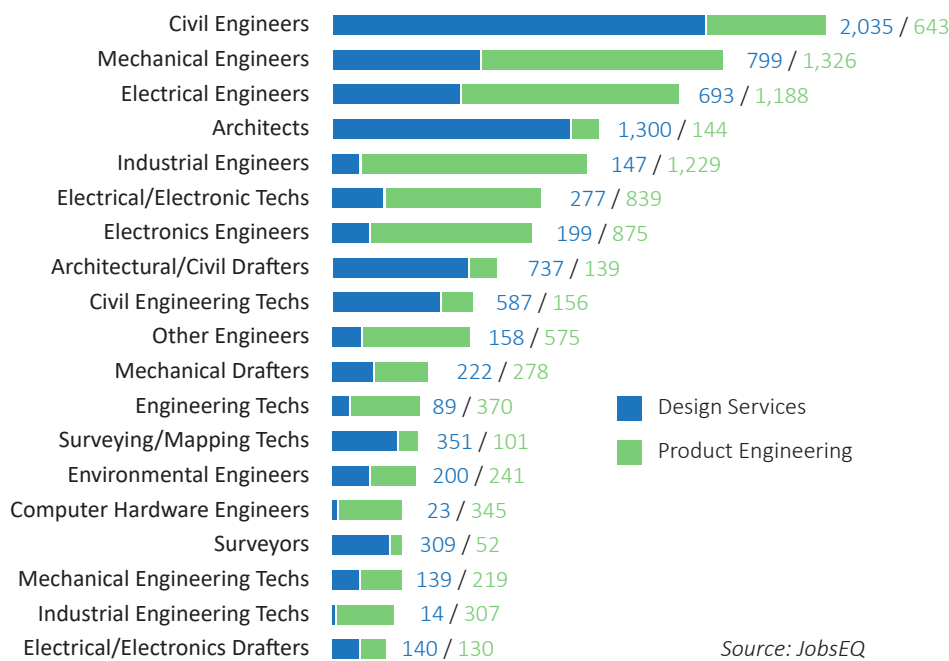


More than half of all engineers work in **Product Engineering**. Nearly all architects and a majority of technicians work in **Design Services**.

Source: JobsEQ

Examining the occupations in more detail we find that, similar to architects, the largest proportion of civil engineers (three out of every four) work for Design Services firms. Mechanical and electrical engineers, however, work mostly in Product Engineering firms, which employ more than 60 percent of people working in these professions. Product Engineering also employs the vast majority — nearly 90 percent — of the region’s industrial engineers. Combined, these top four engineering occupations plus architects account for half (9,500) of the region’s design professionals, with 5,000 employed in Design Services firms and 4,500 employed in Product Engineering firms.

KC Global Design Occupation Totals by Type of Engineering
for occupations with at least 200 jobs



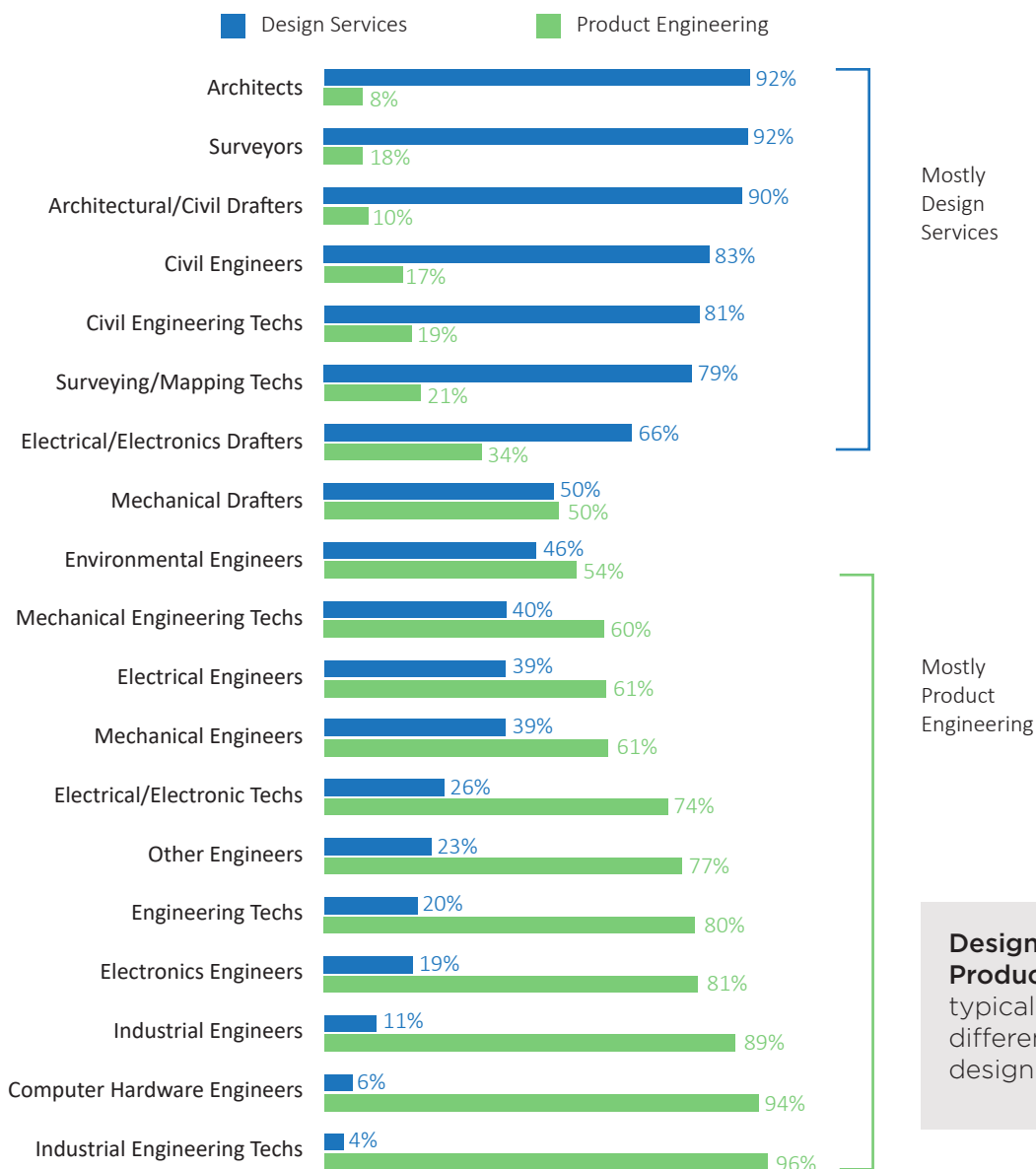
Of the five largest design professions, civil engineers and architects are mostly employed in **Design Services**, while mechanical, electrical and industrial engineers are mostly employed in **Product Engineering**.

Source: JobsEQ

Sorting design occupations by their proportion in each category of Global Design reveals the high degree to which the workforce needs of Design Services and Product Engineering differ from one another. Only one occupation — mechanical drafters — is evenly distributed between the two clusters, and just one other occupation — environmental engineers — is split by fewer than 20 percentage points.

Unsurprisingly, Design Services employs the highest proportion of those professionals designing the built environment, including civil engineers, architects, surveyors and their associated supporting technicians. Product Engineering employs the highest proportion of those professionals designing physical products and processes, including mechanical, electrical and electronic, and industrial engineers, along with their associated technicians.

Share of Occupations in Design Services and Product Engineering
for occupations with at least 200 jobs



Mostly Design Services

Mostly Product Engineering

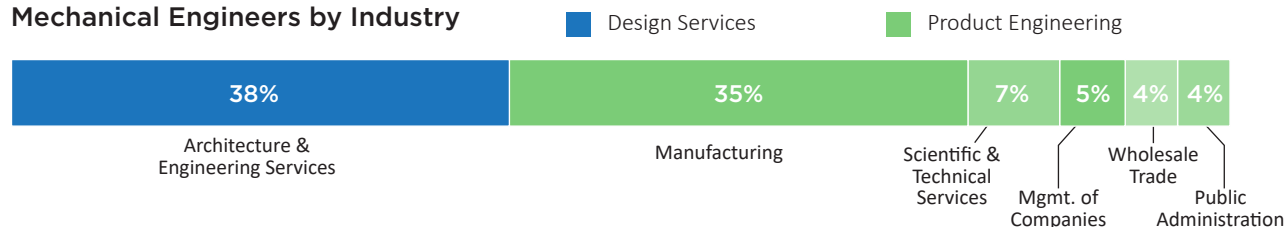
Design Services and Product Engineering typically demand different types of design professionals.

Source: JobsEQ

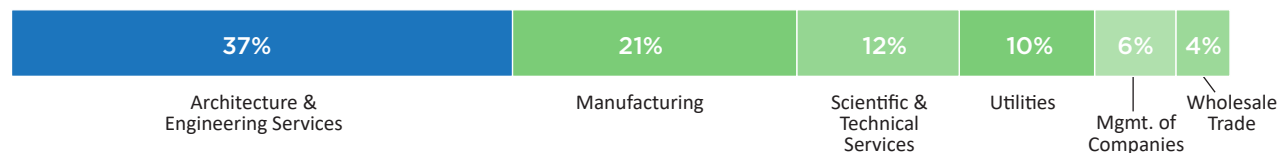
Even in those professions where Product Engineering employs the majority of design professionals, it is important to note that A&E firms are still often the single largest employer.

For example, although 61 percent of all mechanical engineers work in Product Engineering, this is spread across firms in many industries. The A&E industry is the single largest employer of mechanical engineers, at 38 percent, though manufacturing is a close second at 35 percent.

Mechanical Engineers by Industry



Electrical Engineers by Industry



Similarly, the A&E industry employs 37 percent of all electrical engineers. Manufacturing is the next largest industry employer of electrical engineers, followed by scientific and technical services and utilities.

Industrial engineers, on the other hand, provide an example where the A&E industry is not the largest employer. Instead, nearly two-thirds (64 percent) of industrial engineers work in manufacturing. The A&E industry is the second largest employer, followed by firms that manage other companies and firms providing scientific and technical services.

Industrial Engineers by Industry



Civil Engineers by Industry



Among the region's largest engineering professions, only civil engineers are employed in the A&E industry in proportions that are both a plurality and a majority, as 76 percent of civil engineers are employed by A&E firms. The public administration and construction industries also employ significant numbers of civil engineers, 8 percent and 7 percent respectively, but no other industry employs more than 2 percent.

Source: JobsEQ. Industries shown account for at least 90 percent of workers in each category.

INDUSTRY ANALYSIS

By examining the industries that employ the largest numbers of design professionals — architecture and engineering, manufacturing, and scientific and technical services — we can gain insight into the occupations experiencing increases in demand.

■ Industry Specialization

The success of KC Global Design industries depends, in part, on the degree to which local firms have some special expertise that cannot be easily found elsewhere. Location quotients assess the degree of specialization in the local economy. They compare each industry's share of the local economy to the same industry's share of the national economy. If the industry makes up a larger share of the local economy than the national, the local economy is said to specialize in that industry. A location quotient is calculated by dividing the industry's local share (industry employment as a percentage of total employment) by its national share. If the location quotient is greater than 1, the local economy specializes in that industry, although the specialization is not typically considered significant until the location quotient reaches at least 1.1).

The demand for design professionals is driven by the demand for the goods and services their firms sell.

KC Rising measures the regional economy in comparison to a set of 31 peer metros — the Kansas City metro, plus the 15 immediately larger and 15 immediately smaller by population, ranging from Seattle, Washington, with 3.8 million people, to Richmond, Virginia, with 1.3 million people.

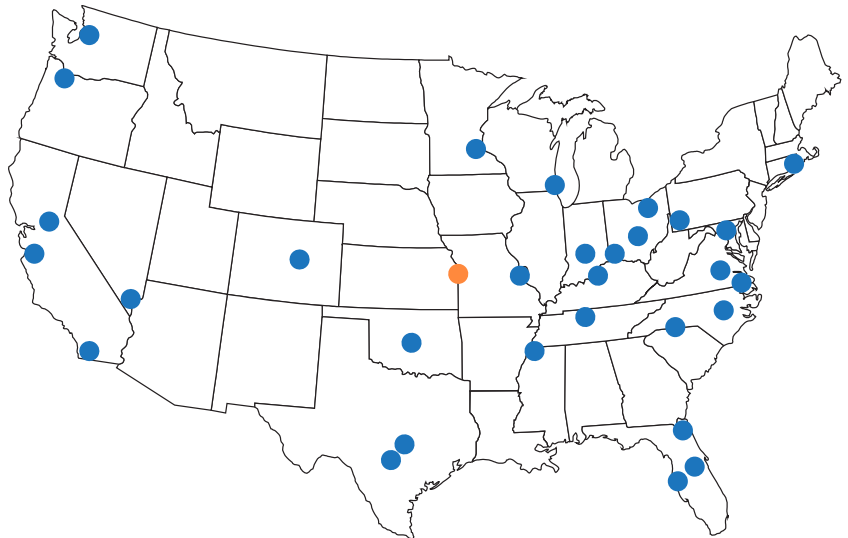
Peer Metros

15 Larger

Seattle
Minneapolis
San Diego
Tampa
Denver
St. Louis
Baltimore
Charlotte
Portland
Orlando
San Antonio
Pittsburgh
Sacramento
Cincinnati
Las Vegas

15 Smaller

Cleveland
Columbus
Austin
Indianapolis
San Jose
Nashville
Virginia Beach
Providence
Milwaukee
Jacksonville
Oklahoma City
Memphis
Louisville
Raleigh
Richmond



KC Metro Specialization in Top Three Industries Employing Design Professionals

	KC Metro Employment	Location Quotient	Rank Among Peer Metros
Architecture and Engineering Services	8,900	1.54	6th
Manufacturing	4,000	0.86	17th
Scientific and Technical Services	1,600	1.46	6th

Source: JobsEQ

The Kansas City regional economy specializes in providing architecture and engineering services. Its location quotient of 1.54 indicates that the proportion of Kansas City area jobs in this industry is 54 percent higher than the national average. Kansas City ranks sixth highest among peer metros, following Denver (1.96), Virginia Beach (1.79), Raleigh (1.73), San Diego (1.61) and Baltimore (1.58).

The regional economy also specializes in providing scientific and technical services, with the share of jobs in this industry 46 percent higher than the nation’s. San Jose, where Silicon Valley is located, ranks first by a wide margin (3.41), followed by Austin (1.90), Raleigh (1.80), San Diego (1.68), Baltimore (1.59) and Kansas City (1.46).

The Kansas City area economy does not specialize in producing manufactured goods. While the region has strengths in particular types of manufacturing — motor vehicles, for example — the highest concentrations of total manufacturing employment in peer metros are found in San Jose (1.74), Milwaukee (1.67), Louisville (1.49) and Cleveland (1.40).

■ Industry Trends

An industry that grows faster locally than nationally produces an increasing share of the nation’s output in that industry, generating an increasing location quotient for the region over time.



The architecture and engineering services industry has grown significantly since 2002. While the Great Recession caused much job loss in this industry, employment levels have fully recovered and stand 20 percent above the 2002 level and more recent lows.



Manufacturing employment shows a long-term systemic decline. While the industry’s economic output continues to increase, the more rapid increase in manufacturing worker productivity relative to service worker productivity has resulted in job losses of about 8 percent since 2002. However, manufacturing employment was 15 percent lower at its lowest point in the aftermath of the recession, and has since rebounded by about 8 percent.

While location quotients provide a snapshot of the region’s current specializations, industry trends determine how those specializations are changing.

+113%

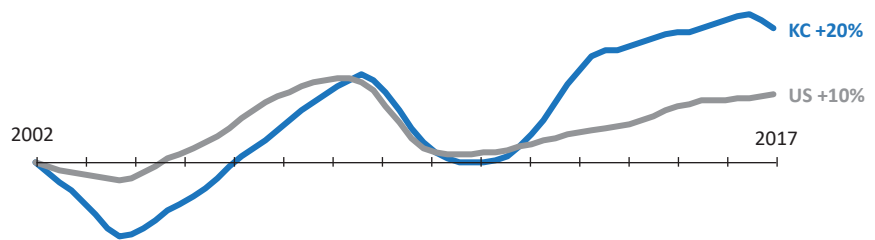
The scientific and technical services industry has shown the most rapid growth among the largest industry employers of people in the design professions, more than doubling since 2002. The recession had less impact on this industry, which includes many of the region’s information technology and technical consulting firms, such as Cerner. This industry’s growth appears to have accelerated since 2014, with employment 63 percent above its recession lows.

All three of these industries are performing substantially better than the national average, even manufacturing. These above-average growth rates show that the local industries employing the most design professionals are highly competitive relative to the rest of the nation.

KC vs. US Employment Trends by Industry

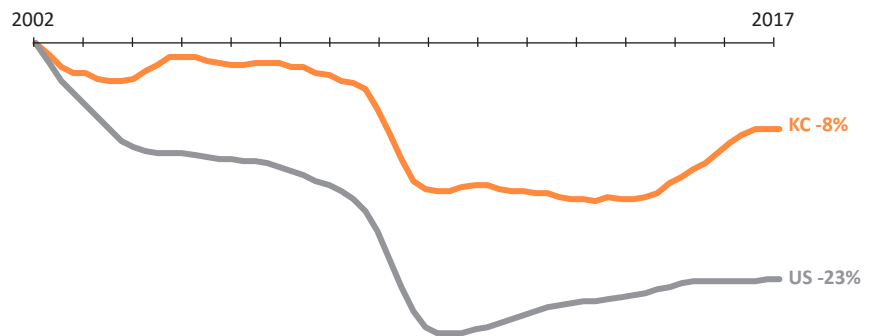
ARCHITECTURE AND ENGINEERING SERVICES

A&E firms have added jobs twice as fast in Greater Kansas City as in the country overall since 2002.



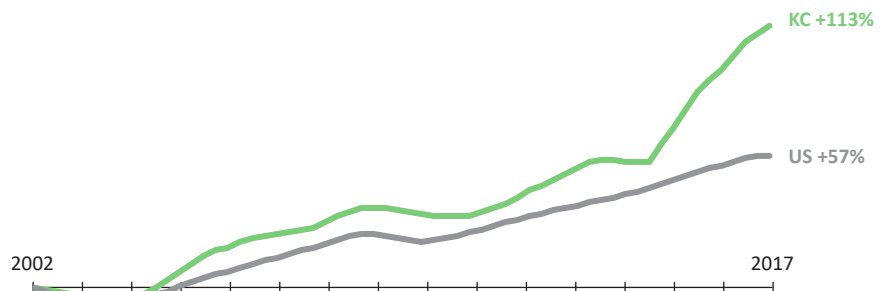
MANUFACTURING

Though the region’s manufacturing employment declined by 8 percent since 2002, the national rate of job loss is nearly three times as great, at 23 percent.



SCIENTIFIC AND TECHNICAL SERVICES

Employment in the scientific and technical services industry has grown twice as fast locally as nationally.



Source: JobsEQ

This also means the growth in the region’s demand for design professionals is also likely outstripping the nation. As a result, these relatively rapid rates of growth are a double-edged sword, signifying economic success, but at the cost of potential talent shortages that could constrain the future growth of the KC Global Design sector.

ECONOMIC IMPACT

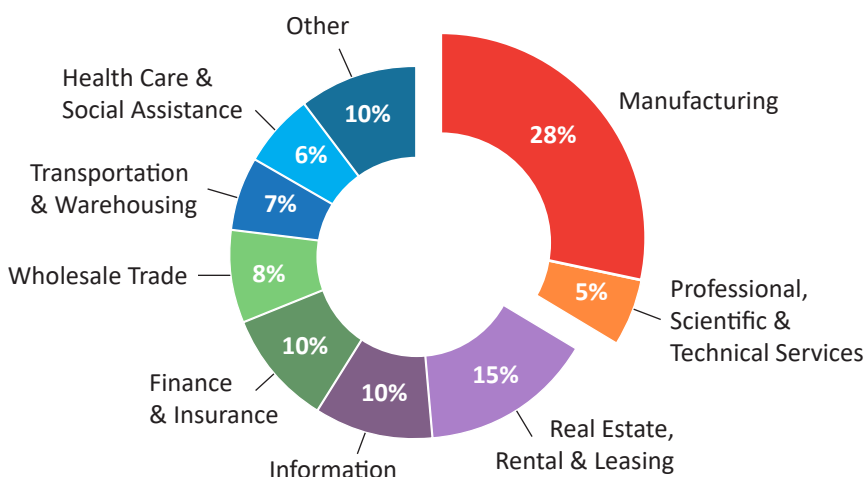
Firms in the architecture and engineering services, manufacturing, and scientific and professional services industries have an economic impact that extends beyond the confines of their businesses. These industries are significant exporters of goods and services to the rest of the world, which brings new dollars to the region.

These industries are significant exporters of goods and services, which brings new dollars to the region.

In 2017, firms in metropolitan Kansas City are estimated to have exported \$64 billion of goods and services to other parts of the U.S. and \$12 billion internationally, for a total of \$76 billion. About one-third of all exports, or \$26 billion, were generated by the industries employing the largest numbers of design professionals. Manufacturing firms alone account for 28 percent of the region’s exports, while firms in the professional, scientific and technical services industry (which includes architectural and engineering services firms) account for another 5 percent.

These industries also provide critical linkages to the economies of the rest of the world. Manufacturing firms generate half of the region’s international exports, and professional, scientific and technical services generate an additional 9 percent — demonstrating the international reach of KC Global Design. Firms in these industries play an extremely important role in bringing new dollars to the region and fueling its economic growth.

Greater Kansas City’s Total 2017 Exports by Industry



Source: Regional Economic Models, Inc.

Their increased revenue is spent on worker wages and salaries and to purchase needed inputs, which include everything from offices, plants and equipment to software, insurance and maintenance. Many of their suppliers are local firms, and they also spend increased revenues on workers and supplies. When they, too, buy from local suppliers, the impact on the regional economy continues to multiply.

KC Global Design industries account for one-third of the region's total exports. Manufacturing alone accounts for more than a quarter of all exports and more than half of international exports.

In this way, dollars coming to the economy via sales to consumers, businesses and governments outside the region generate successive rounds of spending. These rounds of spending create an impact much bigger than that of the initial sales. This ultimate impact that can be estimated using economic models that describe the flow of dollars from firm to firm, firm to worker and then workers back to firms as they consume goods and services.

Using the Mid-America Regional Council’s regional economic model, Policy Insight™ from Regional Economic Models, Inc., we can estimate the potential impact on metropolitan Kansas City that would result if sales by either Design Services firms or the Product Engineering firms resulted in adding 1,000 jobs. This analysis examines each type of engineering in turn, and assumes the additional jobs are distributed across the industries that comprise them in proportion to their number of design professionals, as shown in the chart on page 9.

DESIGN SERVICES

An additional 1,000 jobs in the region’s Design Services firms would result in:

Total Employment



Gross Domestic Product



Disposable Personal Income



PRODUCT ENGINEERING

An additional 1,000 jobs in the region’s Product Engineering firms would result in:

Total Employment



Gross Domestic Product



Disposable Personal Income



Both Design Services and Product Engineering generate significant economic impact for the Kansas City region. For example, an increase in sales that resulted in an additional 1,000 jobs in Design Services is estimated to generate an additional 1,500 jobs elsewhere in the economy, for a total of 2,500 jobs in the regional economy. Dividing the total job gain by the initial job gain yields a Design Services multiplier of 2.5.

Similarly, sales sufficient to produce a 1,000-job gain in Product Engineering are estimated to generate an additional 2,400 jobs elsewhere in the economy for a total of 3,400 jobs — 37 percent more than in Design Services — for a multiplier of 3.4.

Product Engineering’s larger economic impact is likely due to its manufacturing component, which tends to have more in-town suppliers so that dollars stay local longer and recirculate more often.

The real personal income of the region’s residents would be expected to ultimately jump \$267 million from an initial 1,000-job boost to Product Engineering, 41 percent higher than the \$189 million impact in Design Services. This is in line with the difference in job generation.

However, Product Engineering’s impact on regional Gross Domestic Product is larger than can be accounted for by its job impact, possibly as a result of the high productivity in the manufacturing portion of this cluster. An additional 1,000 jobs in Product Engineering is estimated to produce a \$386 million increase in inflation-adjusted GDP (2009 dollars), compared to a \$214 million gain for the same job increase in Design Services, a difference of 80 percent.

OCCUPATION ANALYSIS

Driven by the size and performance of the industries employing design professionals, the regional economy requires specialized design skills. These can be assessed by examining the kinds of occupations concentrated here relative to other parts of the country.

■ Specialization by Occupation

The table below shows the region's degree of specialization in the design professions by broad occupational category — engineers, architects and technicians — as measured by their 2017 location quotients.

KC Metro Specialization in Design Occupations
by broad occupational category

	KC Metro Employment	Location Quotient	Rank Among Peer Metros
Engineers	11,600	0.97	17th
Architects	1,400	1.28	5th
Technicians	5,900	0.87	20th

Source: JobsEQ

The Kansas City economy employs roughly the same proportion of engineers as the national economy. Its location quotient of 0.97 ranks 17th among the region's peer metros. San Jose (3.15), San Diego (1.68) and Seattle (1.58) lead the peer metros in specializing in engineering occupations, as the proportion of their total jobs held by engineers is at least 50 percent higher than the national average.

The region's employment of architects, however, is substantially above average, posting a location quotient of 1.28. The share of the region's employment working as architects is nearly 30 percent higher than the national average, which ranks fifth among the 31 peer metros. Those metros with concentrations of architects even higher than Greater Kansas City — Seattle (1.74), Denver (1.69), Austin (1.58) and Portland (1.58) — all specialize at rates that are at least 50 percent higher than the nation.

The Kansas City region does not appear to specialize in engineering and architectural technicians. It's location quotient of 0.87 means the area economy employs a somewhat lower number of technicians for its size than would be expected, based on national averages. This result likely follows from the region's mid-range proportion of engineers since their numbers largely drive the demand for the technicians needed to support them. As a result, metropolitan Kansas City's rank regarding technician specialization is 20th among the 31 peer metros.

The region's lack of specialization in engineers is somewhat puzzling, given the strengths of the many local firms relying on engineering. To better understand what's behind this, we dive deeper and examine more detailed occupational classifications of the engineering professions. Architects are shown for comparison.

KC Metro Specialization in Selected Engineering & Architecture Occupations

	KC Metro Employment	Location Quotient	Rank Among Peer Metros
Electrical Engineers	1,900	1.37	8th
Architects	1,400	1.28	5th
Civil Engineers	2,700	1.26	12th
Mechanical Engineers	2,100	1.02	16th
Industrial Engineers	1,400	0.75	21st
Tech Sector* Engineers	1,900	0.71	19th

Source: JobsEQ

*Tech Sector engineers defined by MARC as an aggregation of aerospace, biomedical, chemical, computer, electronics and materials engineers. See explanation below.

The Kansas City regional economy’s proportion of electrical engineers is 37 percent higher than the nation, making it the engineering occupation with the region’s highest degree of specialization. Electrical engineering skills are in demand by two industries, scientific and technical consulting and architecture and engineering services, which also have high levels of local specialization. A location quotient of 1.37 ranks the region eighth among its peers, with San Jose (3.81), Raleigh (2.05) and San Diego (2.00) leading the way.

Close behind in degree of specialization among engineering occupations is civil engineering. Its location quotient of 1.26 is roughly the same as that for architects. However, the competition appears to be a bit stiffer, as the region ranks 12th in the proportion of its employees that are civil engineers compared to fifth in its proportion of architects. Sacramento (2.02), Raleigh (1.91) and Denver (1.83) have the highest levels of civil engineering specialization.

The region’s proportion of jobs held by mechanical engineers is roughly average, with a location quotient of 1.02, which ranks 16th among the 31 peer metros. Milwaukee (1.96), San Jose (1.93) and Columbus (1.60) have the highest proportion of mechanical engineers.

Greater Kansas City’s share of jobs held by industrial engineers is 25 percent below the national average, consistent with its relatively low proportion of manufacturing employment. The region’s location quotient of 0.75 ranks 21st among the peer metros. San Jose (2.40), Cincinnati (1.89) and Minneapolis (1.85) lead in the proportion of jobs held by industrial engineers.

Tech sector engineers mark the region’s lowest degree of specialization among the engineering professions. These other types of engineering, including aerospace, biomedical, chemical, computer, electronics and materials engineers, also appear to be impacted by the region’s low proportion of manufacturing employment. Combined, they represent many of the engineering professions that are associated with the technology sector of the economy. With a location

quotient of 0.71, the region's proportion of these engineers ranks at nearly 30 percent below the national average, and 19th among its peer metros. San Jose, with a location quotient of 6.90, is highest, followed by San Diego (2.34) and Seattle (2.18).

Having examined the region's specialization in engineering occupations in detail, we can now reaggregate them along with their corresponding technician occupations into Design Services and Product Engineering.

- **Design Services employs the highest proportions of architects and civil engineers**, professions in which the Kansas City economy enjoys high levels of specialization relative to the rest of the country. As a result, the region's location quotient for Design Services is 1.48, which ranks seventh among its 31 peers.
- **Product Engineering employs the highest proportion of industrial and tech sector engineers**, professions that the regional economy does not currently demand in sufficient numbers to create a high level of specialization relative to the rest of the country. The region has strong individual companies in Product Engineering, but their share of the Kansas City economy is smaller than the share in most of the metropolitan economies with which we compete. As a result, the region's location quotient for Product Engineering is 0.78, which ranks 23rd among 31 peers.

Combined, the proportion of the region's jobs held by design professionals is very close to the national average, yielding a location quotient of 1.02 that ranks 16th among the peer metros.

■ Employment Trends by Occupation

Current levels of specialization result from the combination of historical factors and local decisions that produce comparative advantages in each metropolitan area for attracting and retaining certain kinds of industries and occupations. However, an examination of recent trends reveals the degree to which those advantages are shifting.

Engineers, architects and technician occupations all experienced substantial job losses during the Great Recession, but architects were affected most. The region lost nearly 30 percent of its architects from the peak employment prior to the recession to its trough. Engineers declined by 8 percent and technicians by 11 percent during the downturn. While engineers and technicians have more than recovered the lost employment and stand 11 percent and 9 percent, respectively, above their 2007 levels, the region's architects remain 9 percent below their levels in 2007.

KC Global Design Occupation Trends, 2007-2017
by broad occupational category



Architects



Technicians



Engineers

Source: JobsEQ

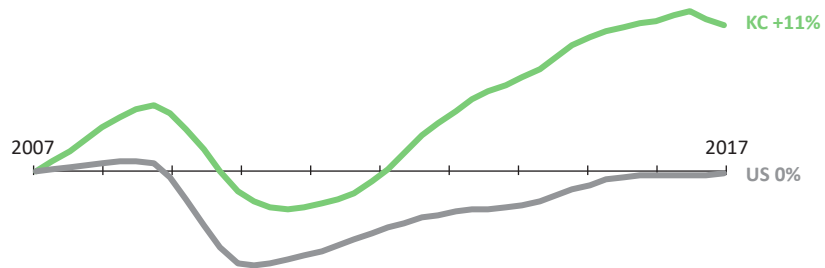
While engineers, architects and technicians all lost substantial jobs during the Great Recession, only architects have not yet fully recovered.

All three categories of design professionals have been performing better than the U.S. in recent years.

KC vs. US Employment Trends by Broad Occupation Category

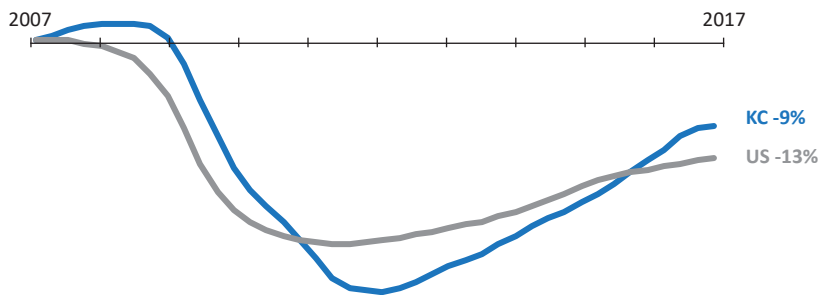
ENGINEERS

U.S. engineering jobs are unchanged from a decade earlier, while the Kansas City region has seen 11 percent growth. Since 2012, the region's engineering jobs have grown 2½ times faster than the U.S.



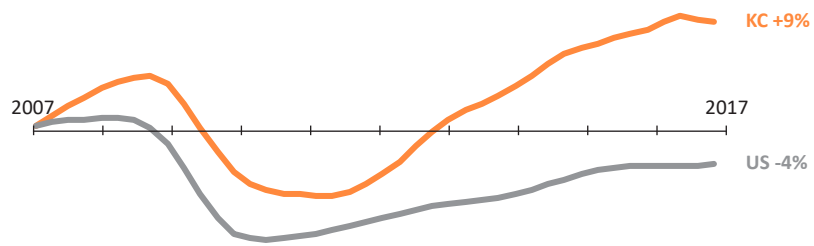
ARCHITECTS

While still below 2007 levels, employment of architects has rebounded more quickly in the Kansas City region than in the nation, growing more than twice as fast since 2012.



TECHNICIANS

Employment of design technicians* has grown in the Kansas City region, while still below 2007 levels for the nation. Both have added technicians since 2012, but the rate of growth here is five times faster.



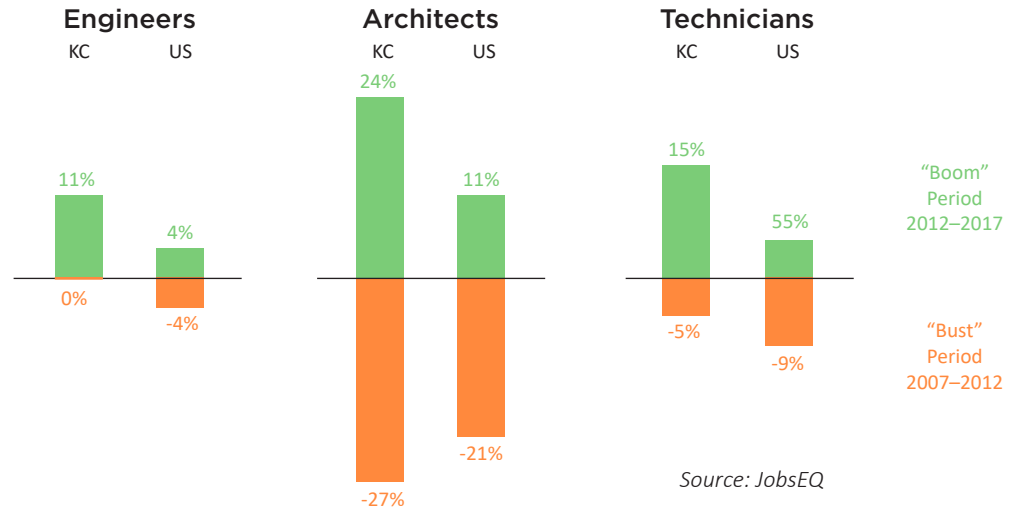
* Includes surveyors, cartographers and photogrammetrists.

Source: JobsEQ

Comparing growth rates for Greater Kansas City and the U.S. over the two halves of the 10-year period shown above — 2007–2012 and 2012–2017 — shows dramatically different results. (See chart on the following page.) The first five years includes the period of the Great Recession and shows mostly decline. The second half covers the recovery period and shows growth across the board. Note that employment of engineers and technicians not only grew faster than the U.S. in the recovery period, but also declined significantly less in the first five years. The growth of architects in the second half of the decade is faster than that of engineers and technicians, but jobs are still rebounding from a deep rate of loss, higher than the U.S. average, in the first five years.

KC and US Design Occupation Employment | 2007–2012 vs. 2012–2017

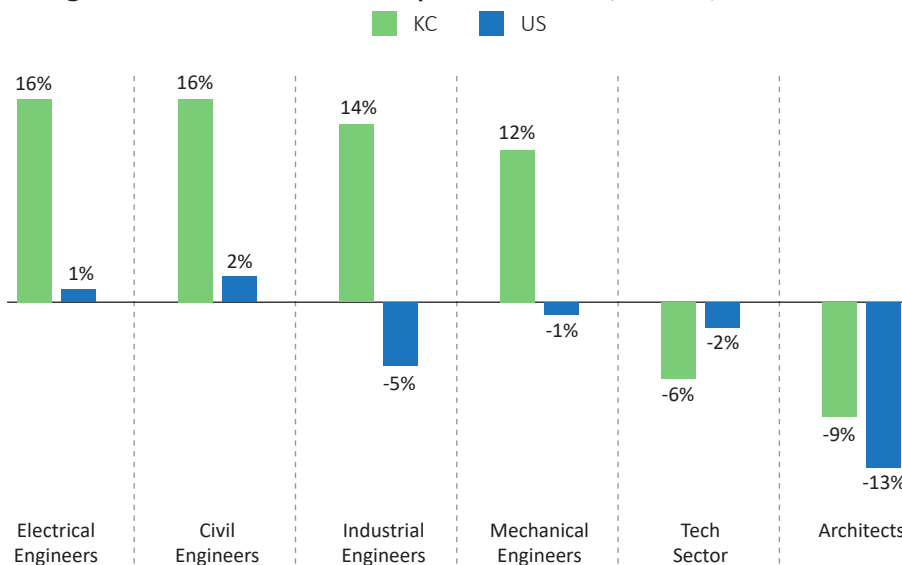
Employment of engineers and technicians has been steadier than that of architects during both the “bust” and “boom” periods of the last decade.



Recent trends, then, reveal that local performance across the broadly defined design professions exceeds that of the U.S. This indicates that the KC Global Design sector is becoming increasingly competitive and the comparative advantages needed to excel in this sector are shifting toward the Kansas City region. To determine which engineering professions are driving this change, we dive deeper into the occupational classifications. Architects are shown for comparison.

The two engineering professions in which the region has the highest specialization, electrical engineering and civil engineering, are also professions that are growing much faster than the U.S., indicating those specializations are likely to continue to improve. Both professions grew 16 percent locally between 2007 and 2017, but only grew 2 percent or less nationally during this period.

Engineer and Architect Occupation Trends | KC vs. US, 2007–2017



The region is beginning to build new specializations in industrial and mechanical engineering to complement the professions in which it already specializes, such as electrical and civil engineering.

Source: JobsEQ

While the regional economy does not currently specialize in employing industrial engineers, the pace of their employment growth in the Kansas City region far exceeds that of the nation, indicating a new specialization may be building.

A similar story is true for mechanical engineers. Even though the current proportion of the region's jobs held by mechanical engineers is average, their growth has been much faster than average. If this performance continues, the region's specialization in mechanical engineers relative to the nation should also begin to increase significantly.

The number of tech sector engineers, however, does not appear to be growing. They are fewer in number now than in 2007 in both the region and the nation, but the rate of decline has been faster here. As a result, it appears unlikely that the region's low rate of specialization in tech sector engineers relative to other peer metros will change in the near future.

■ Wages by Occupation

The region's average wage across all design occupations, \$78,400, is 7 percent lower than the national average. As a result, Greater Kansas City's average design occupation wage ranks 20th when compared against the region's 31 peer metros.

KC Global Design firms generally pay wages to professionals that rank in the middle of peer metros or below.

By comparison, the region ranks 14th in median household income, indicating the relative pay of design professionals may not be as high here as it is in some peer metros.

2017 Average Wages Selected Engineering & Architecture Occupations

	KC Metro Average Wage	Rank Among Peer Metros
Architectural & Civil Drafters	\$51,600	17th
Electrical & Electronic Engineering Techs	\$68,400	5th
Architects	\$71,000	29th
Mechanical Engineers	\$83,100	19th
Civil Engineers	\$84,500	17th
Industrial Engineers	\$86,900	16th
Electrical Engineers	\$95,300	15th
Total Design Occupations	\$78,400	20th

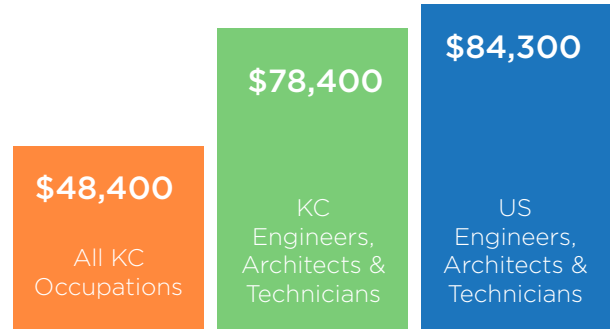
Source: JobsEQ

Engineering occupations tend to compete relatively better than other design occupations, as the pay of electrical engineers ranks 15th among peer metros, industrial engineer wages rank 16th, civil engineer pay ranks 17th and the wages of mechanical engineers rank 19th. The average wage of the region's architects ranks surprisingly low, however — 29th out

of 31 peers — given it is an area of specialty. Specialization typically implies high levels of workforce competition which leads to wages that are higher than average.

On the other hand, area design firms pay electrical and electronic engineering technicians, the largest of the technician occupations, relatively well. Average wages for this occupation are fifth highest among the region’s peers. The second largest technician occupation in Greater Kansas City is architectural and civil drafters. They are paid wages more consistent with the region’s design occupation wage rates overall, resulting in an average wage ranked 17th among peer metros.

Average Annual Wage by Occupation



Median Wage by Experience Level
Engineer, Architect & Tech Occupations, KC Metro

	Entry Level	Median	Experienced
Engineers	\$60,500	\$86,100	\$104,100
Architects	\$41,300	\$67,300	\$85,800
Technicians	\$41,300	\$57,500	\$69,000

Source: JobsEQ

■ Trends in Occupation Demand

The health of an industry’s employment is often measured using growth demand, also called net new growth, which measures the net new jobs created in an industry over a given period of time. Over the next 10 years, design occupations are expected to add 1,700 new jobs, led by growth in civil, mechanical, electrical and industrial engineers.

Net growth alone does not fully measure the total number of additional workers that will be needed in architecture and engineering over the next 10 years. A significant portion of the existing workforce will retire or may move to other industries, creating additional demand. This replacement demand is expected to be eight times larger than the growth demand. Total demand — the combination of both growth and replacement demand — provides the best overall measure of the number of people the region’s design industry will need to be educated and trained in the appropriate fields. That number is expected to total nearly 16,000 over the next 10 years.

Replacement demand is expected to be eight times larger than growth demand over the next 10 years.

Some of the fastest growth will occur in positions that pay well but require at least a bachelor’s degree.

The following table shows the forecast growth, replacement and total demand by occupation, as well as each occupation’s average annual wage. Some of the fastest growth in design occupations over the next few years will occur in positions with high pay that require at least a bachelor’s degree. The growth demand forecast is based on the region’s historical trend, part of which includes the Great Recession. As a result, these demand numbers are expected to be conservative.

10-year Demand for Design Occupations

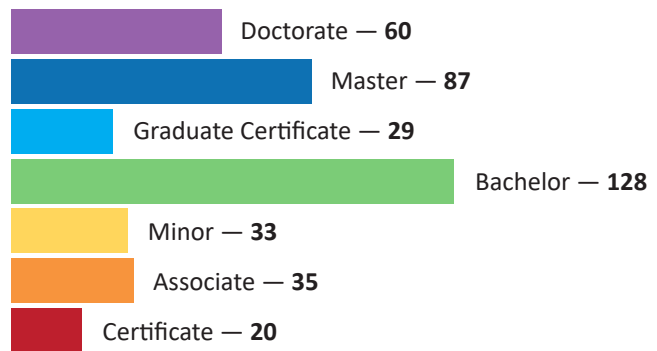
Occupation	Current Jobs	Average Wage	Entry-Level Credential	10-year Labor Demand Forecast		
				Growth Demand	Replacement Demand	Total Demand
Total Design Occupations	19,037	\$78,400		1,708	14,163	15,872
Civil Engineers	2,679	\$84,500	Bachelor	282	1,991	2,272
Mechanical Engineers	2,128	\$83,100	Bachelor	253	1,389	1,643
Electrical Engineers	1,881	\$95,300	Bachelor	202	1,242	1,444
Industrial Engineers	1,376	\$86,900	Bachelor	190	935	1,126
Architects, Except Landscape and Naval	1,240	\$71,500	Bachelor	83	895	978
Electronics Engineers, Except Computer	1,074	\$89,400	Bachelor	46	690	735
Engineers, All Other	733	\$91,200	Bachelor	50	476	525
Environmental Engineers	442	\$88,500	Bachelor	36	293	329
Computer Hardware Engineers	369	\$98,000	Bachelor	35	239	273
Surveyors	362	\$60,300	Bachelor	44	267	311
Landscape Architects	206	\$68,400	Bachelor	16	149	166
Chemical Engineers	195	\$106,300	Bachelor	16	128	144
Petroleum Engineers	162	\$138,800	Bachelor	13	107	121
Health and Safety Engineers	161	\$103,300	Bachelor	14	108	121
Cartographers and Photogrammetrists	107	\$57,400	Bachelor	19	80	100
Biomedical Engineers	103	\$79,100	Bachelor	7	69	76
Nuclear Engineers	84	\$100,000	Bachelor	8	65	72
Marine Engineers and Naval Architects	67	\$94,300	Bachelor	8	42	50
Aerospace Engineers	62	\$113,100	Bachelor	6	38	44
Materials Engineers	48	\$71,900	Bachelor	2	34	36
Mining and Geological Engineers	47	\$97,300	Bachelor	5	35	40
Agricultural Engineers	16	\$73,000	Bachelor	2	11	12
Associate Degree or Less						
Electrical/Electronic Engineering Techs	1,117	\$68,400	Associate	24	959	982
Architectural and Civil Drafters	876	\$51,600	Associate	84	767	851
Civil Engineering Technicians	745	\$51,700	Associate	74	661	735
Mechanical Drafters	501	\$49,700	Associate	34	434	467
Engineering Techs, Except Drafters	458	\$64,400	Associate	26	399	426
Surveying and Mapping Technicians	453	\$45,100	High School	49	494	543
Mechanical Engineering Technicians	359	\$50,400	Associate	23	314	337
Industrial Engineering Technicians	323	\$55,300	Associate	3	276	278
Electrical/Electronic Drafters	271	\$48,300	Associate	20	235	256
Environmental Engineering Technicians	127	\$45,000	Associate	17	114	131
Drafters, All Other	107	\$60,900	Associate	9	93	102
Electro-Mechanical Technicians	89	\$54,600	Associate	2	77	78
Aerospace Engineering/Operations Techs	66	\$67,100	Associate	7	59	67

Source: JobsEQ, MARC. Occupation categories are from the North American Industry Classification System (NAICS)

■ Educational Opportunities

To help meet the demand for KC Global Design occupations, area educational institutions are working to offer more opportunities for students to acquire the necessary skills and degrees. According to MARC’s 2017 Education Asset Inventory, 392 engineering and architecture degrees and related credentials are available at 30 public, private and for-profit colleges and universities in the region. The asset inventory, including a list of programs by institution, is available online at kcworkforce.com.

Degree Programs Available | Engineering and architecture degrees available by credential



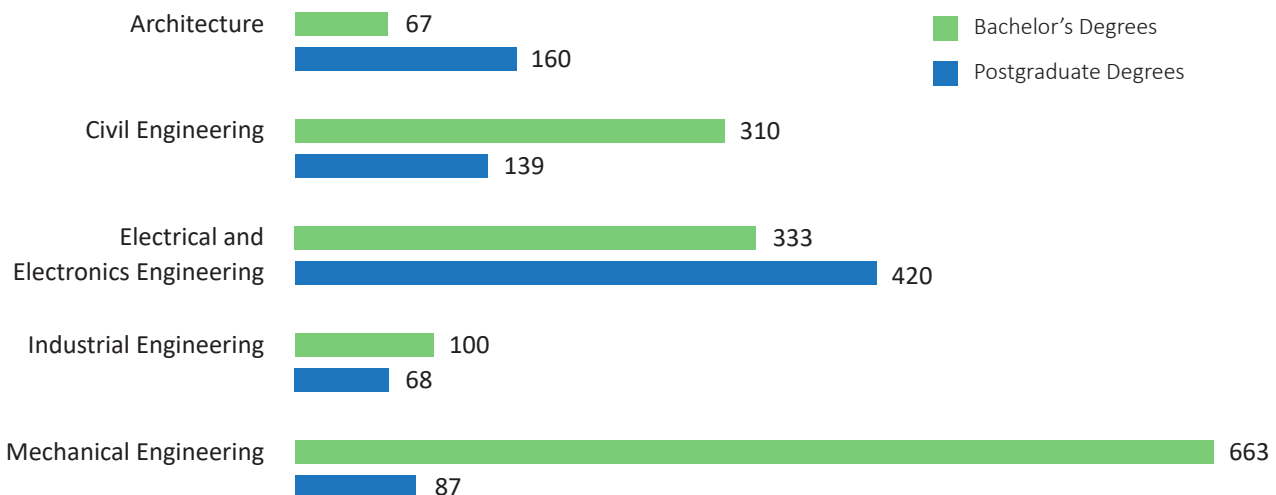
Source: MARC Educational Asset Inventory

In the 2015-2016 academic year, 6,109 degrees and related credentials were awarded in engineering and architecture at schools within a 150-mile radius of Kansas City. Nearly 85 percent of degrees awarded were bachelor’s degrees or higher.

For engineering jobs, a bachelor’s degree is often a minimum requirement, while positions in architecture often require a master’s degree. Moving up the ladder in either field may also require a specialized license.

This high entry threshold limits access for graduates with less than a four-year degree. However, both industries provide numerous opportunities for students to work as interns while earning their degrees. Engineering and architecture firms depend heavily on internships for feeders into the workforce, and many local firms say the best path to a permanent position starts with an internship.

Degrees Awarded | Top five engineering and architecture occupations, awarded by colleges and universities in a 150-mile radius of Kansas City, 2015–2016 school year



Source: JobsEQ



global design

ARCHITECTURE | ENGINEERING | TECHNOLOGY

In 2017, the Mid-America Regional Council hosted facilitated discussions with industry leaders and educators to capture their insights on KC Global Design industry trends, challenges and opportunities. In addition, nearly 200 CEOs and human resource managers completed an online survey and more than two dozen individual interviews were conducted.

Many of the comments made by participants reinforce the quantitative data included in this report. Key insights, including gaps and potential opportunities, are summarized in the following pages in three general categories: growing the talent pipeline, workforce preparedness and industry disruptors.

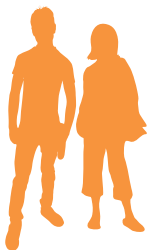
GROWING THE TALENT PIPELINE

As KC Global Design firms seek talented workers, both to fuel growth and replace those who retire, they have two choices: attract workers to the Kansas City region or grow their own talent here at home. Both of these present challenges and opportunities.

Supply and Demand

Factors that may limit the supply of talented workers in engineering and architecture include a perception of difficulty, a lack of early exposure to the industry, greater interest in technology-based programs, and challenges in attracting talent to the Kansas City region. At the same time, industry leaders say, demand for these workers is high because of the strong economy,

WHY IS SUPPLY LOW?



STUDENTS

- Aren't exposed to the industry
- Perceive the work as too hard, too much math
- Choose tech-based programs instead



TALENTED WORKERS

- Often leave the area after graduation
- Can be difficult to attract to and retain in the KC region
- Have lots of options and can be choosy

WHY IS DEMAND HIGH?



COMPANIES

- Are growing in a strong economy
- Are losing boomers to retirement
- Lack mid-level talent due to 'lost generation'



COMPETITION

- Firms compete with other industries such as consulting, technology, finance
- Engineering degrees have universal value

a lost generation of mid-level talent, the retirement of baby boomers, and competition with non-traditional firms.

Several disciplines have significant worker shortages, including mechanical and electrical engineers. Businesses anticipate future shortages in non-technical positions, support staff, and workers with expertise in data science and robotics/automation.

In a survey of nearly 200 CEOs and human resource managers, industry leaders expressed overall satisfaction with the quality of graduates from most area colleges and universities. In general, public universities had the highest satisfaction ratings, followed by clusters of private colleges and universities and community colleges. Kansas State University received the highest rating among four-year universities, at 9.09. Rockhurst led private universities, with a rating of 8.53, while Johnson County Community College led all area community colleges with a rating of 6.90.

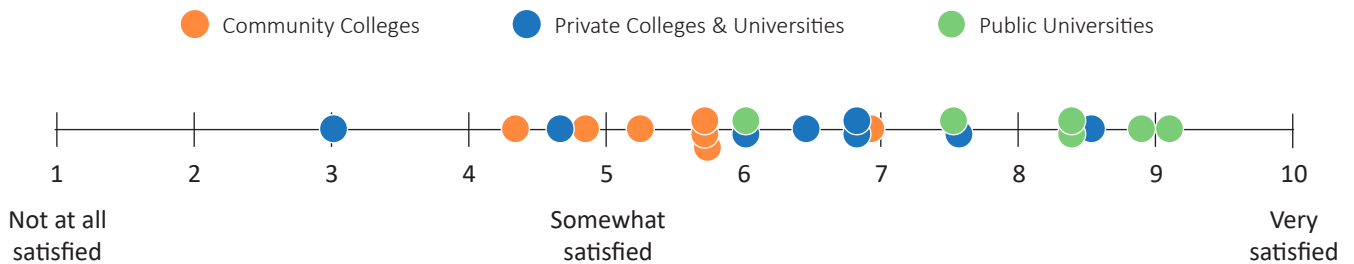


“The opportunities in engineering are phenomenal. I don’t know any firms, from Garmin and Cerner to construction and traditional engineering firms, that are not looking for people right now.

Architects are the same thing. The schools can’t get enough qualified architects out the door fast enough to serve the needs of the industry.”

— Industry Leader

Satisfaction with Graduates of Regional Institutions



Source: MARC Industry Leader Survey

Survey participants were also asked how often they recruited from outside the region. Nearly half (48 percent) said they had not done so in the past year, while another 20 percent described outside recruitment as rare. Of the remaining firms, 23 percent said they occasionally recruit outside the Greater Kansas City region, and 9 percent said they do so frequently.

Several industry leaders expressed concern about having enough homegrown talent to meet demand in the coming years.

Employment Outlook



of KC-area Global Design firms plan to grow in the next three years.



expect to add 100 or more employees in that timeframe.

Source: MARC Industry Leader Survey

■ Diversifying the Pipeline

Business leaders and educators pointed out benefits of a diverse workforce in three areas: (1) For organizations, diversity brings a fresh perspective along with innovation. Diversity expands company culture and can better serve a diverse client-base. (2) For educational institutions, diversity creates a reputation as a global educator, increases the international footprint and makes Kansas City an education hub for design. (3) For the community, diversity adds cultural richness, creates an inclusive environment, gives the region outside exposure and prepares children for a multicultural world.

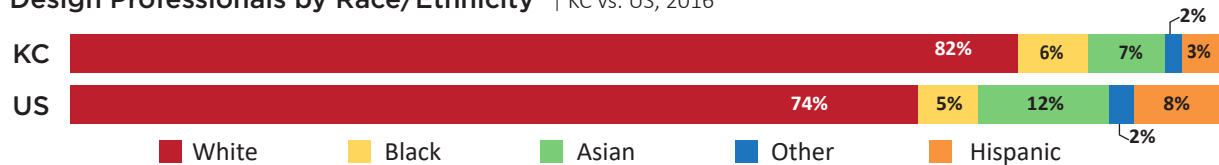
Discussion participants also highlighted systemic challenges that limit the pipeline, such as a lack of internship opportunities, limited entry points and retention challenges.



“We need deliberate and intentional cultivation of diversity in all aspects. Without that there is no innovation, there is no progress, there is no vibrant economy. Bring the global talent here and export knowledge around the world. We have to make this place more vibrant culturally and educationally so that it is welcoming, accommodating, and it becomes a destination.”

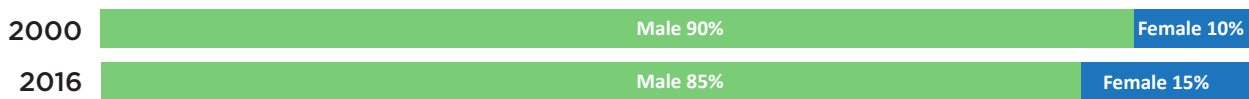
— Educator

Design Professionals by Race/Ethnicity* | KC vs. US, 2016



*White, Black, Asian and Other categories exclude those of Hispanic ethnicity as they are counted in the Hispanic category.
Source: IPUMS-USA, University of Minnesota, www.ipums.org, based on 2016 ACS, 5-year data.

Design Professionals by Gender | KC Metro, 2000 vs. 2016



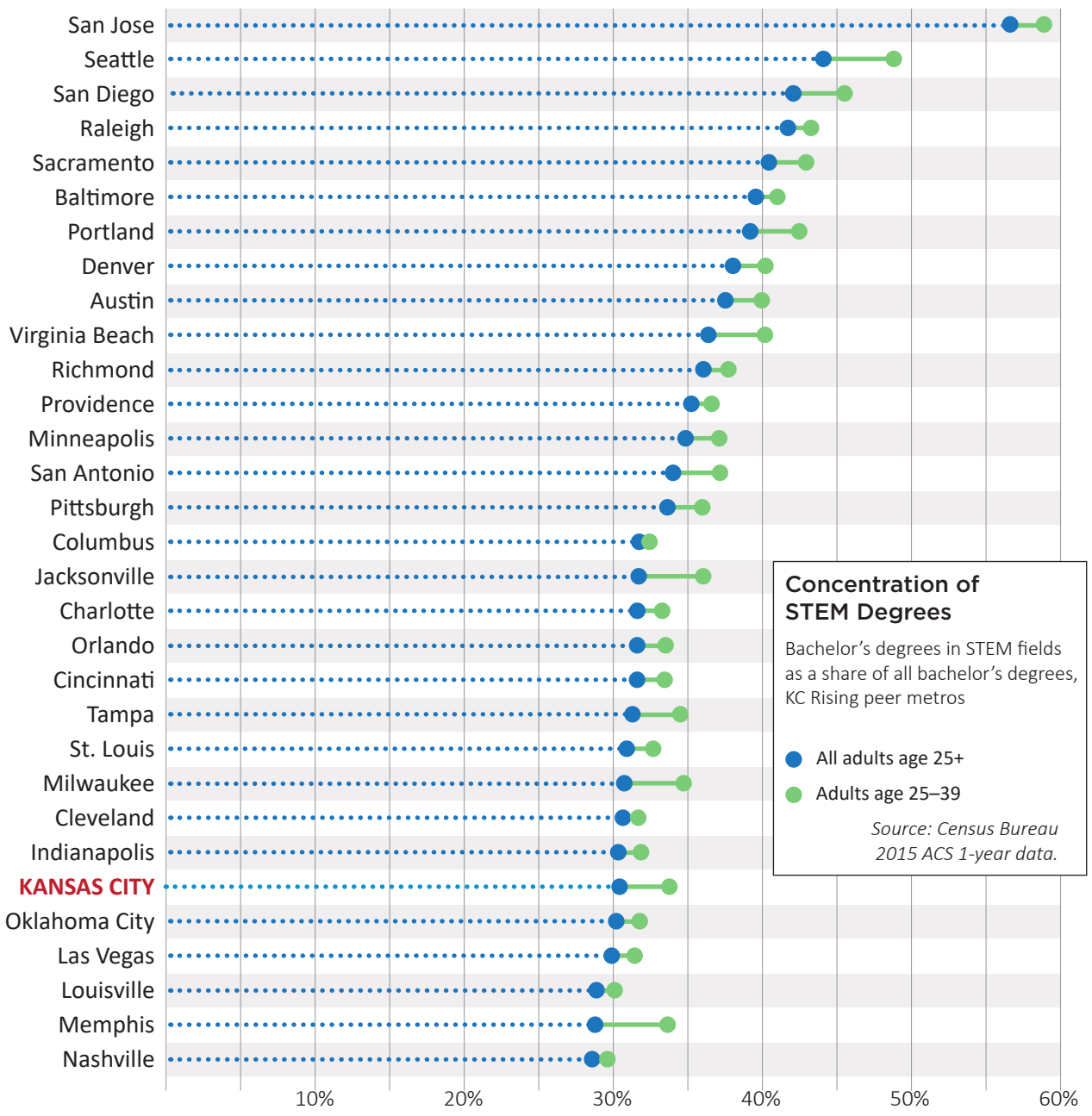
Source: IPUMS-USA, University of Minnesota, www.ipums.org, based on the 2000 Census and 2016 ACS, 5-year data.

■ The STEM Gap

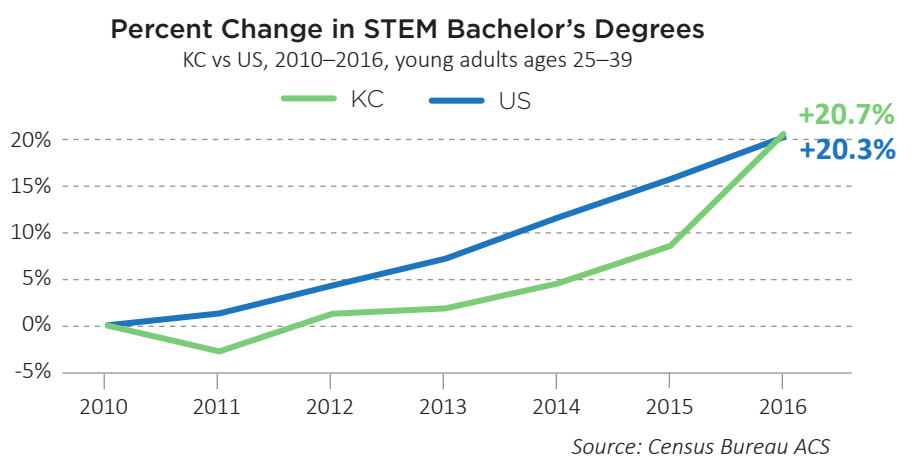
To replenish the “lost generation” described on page 33 and ensure an adequate future supply of talent in the architecture and engineering industry, a growing number of young adults will need to enter into science, technology, engineering and math (STEM) fields. Although the number of young adults in the Kansas City metro with STEM degrees is on the rise, the region does not fare well in this category compared to its peer metros.

The following chart shows the percentage of bachelors degrees earned in STEM fields as a share of all bachelor’s degrees, both for all adults (in blue) and for young adults aged 25-39 (in green).

In the Kansas City metro, only 30.3 percent of all bachelor’s degrees are in STEM fields, ranking the region 26th among 31 peer metros. For young adults, the region’s share is somewhat higher, at 33.7 percent. As a result, the region’s ranking on STEM share of bachelor’s degrees for young adults rises to 19th among its peers.




The region's STEM degrees among young adults grew from 49,359 in 2010 to 59,572 in 2016, a 20.7 percent growth rate. A surge in STEM degrees among young adults in 2016 pushed the region past the national growth rate of 20.3 percent over the same period.



■ Early Exposure

Industry leaders recognize that building homegrown talent starts with exposure to STEM in elementary schools. By middle school, many students have already decided whether they like science and math.

Currently, about 30,000 high school students, about one-third of total enrollment, in the Kansas City metro area participate in career tech programs related to STEM at their schools. Project Lead The Way, a STEM initiative supported by the KC STEM Alliance, had 32,141 elementary school students enrolled for the 2016–2017 school year, compared to just 3,664 two years ago. At the middle school level, 13,969 students enrolled, up from 8,269 two years ago. In the 2017–2018 school year, Project Lead the Way is offering 67 high school engineering programs, 63 middle school programs and 104 elementary school programs.




“We’re seeing kindergartners able to work as a team and talk about engineering design processes and iterative design and what it means for building a house, like the ones in the Three Little Pigs.”

— Educator

WORKFORCE PREPAREDNESS

■ Core Competencies

Business leaders feel that college-level students are getting a good technical foundation but many lack core competencies, including written communication, public speaking, collaboration, business knowledge and interdisciplinary understanding.



“I look more for attitude and personality type. Are they going to fit into our culture? Are they passionate about the profession? They’ll come out knowing hardware and software. But we also look for the soft skills; that’s almost as important as talent.”

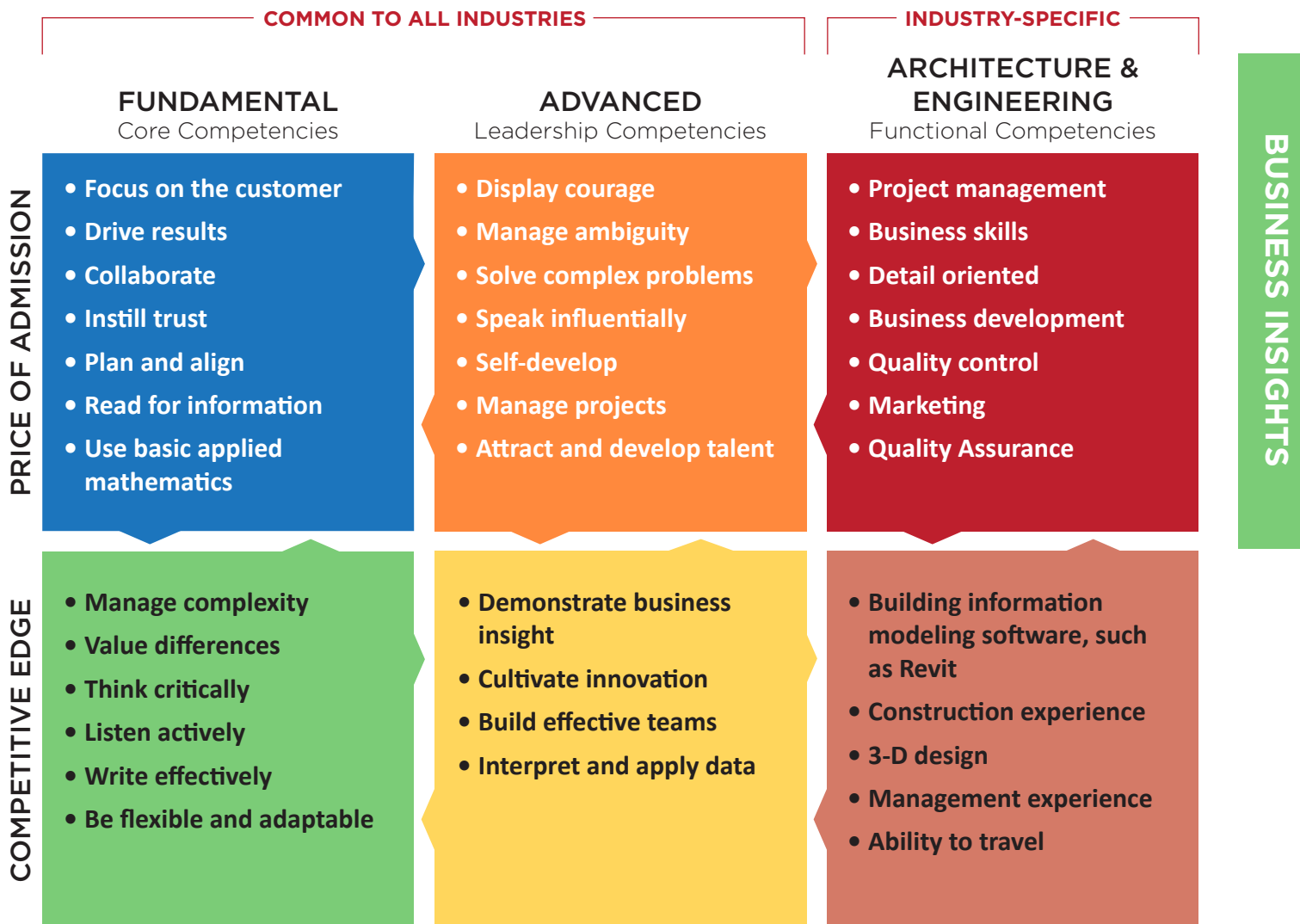
— Industry Leader

The KC Rising Human Capital Common Sector Competencies Task Force developed the model on page 33 to illustrate the progression in competencies that leads to a more skilled workforce.

Common sector competencies (in the left and middle columns) are the key strengths and essential qualifications for employee performance across critical industries and sectors in the Kansas City region. Specific competencies for the engineering and architecture industry are shown in the right column. In addition, competencies are grouped by “price of admission” in the top row — skills that are easier to find or train for — and “competitive edge” in the bottom row — skills that are less intuitive, more difficult to develop, and often in short supply.

These lists were created using established collections of competencies, job postings, and surveys of hiring managers and industry leaders about their competency needs.

A **competency** is the combination of observable and measurable knowledge, skills, abilities and personal attributes required to successfully perform tasks in a defined work setting.



■ The Lost Generation

Architects and engineers appear to have weathered the Great Recession differently. Although employment at architecture firms declined much more significantly than did employment in engineering firms (see page 22), the losses appear to have affected all levels of experience proportionately. By contrast, losses of engineers seem to have disproportionately affected those who had completed their early careers and were ready for advancement. In interviews conducted with engineering firms, industry leaders talked of a “lost

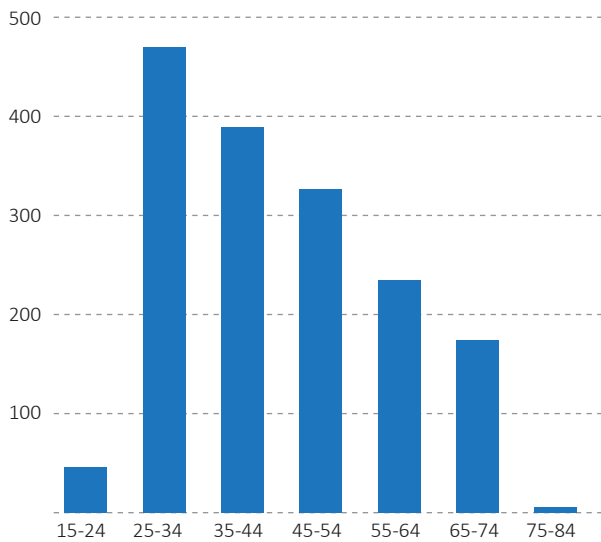
“Right now a project manager with about 12 to 15 years experience is in demand, maybe by every firm in the country. That’s solely a function of the recession, because those people were at a point in their career where they were really targeted for layoffs. They were graduates who maybe had three to six years of experience. A lot of them were laid off and never came back to the profession. It has created a gap of experience ... it’s a pretty significant hole in our workforce. If we could find five of those people, we’d hire them tomorrow.

— Industry Leader

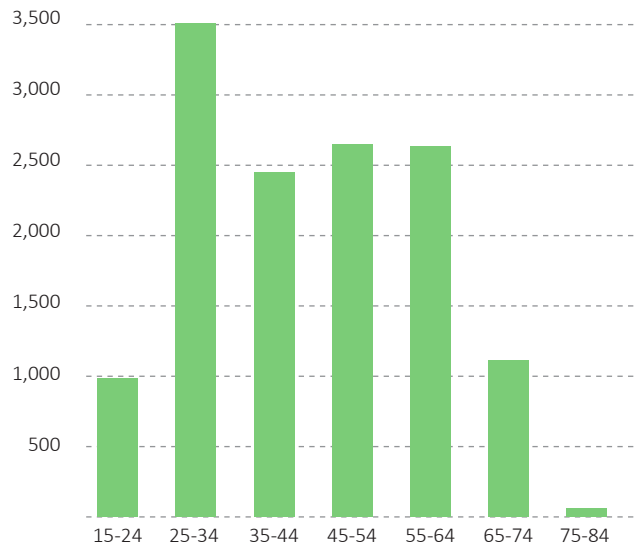
generation” of engineers who left the field when demand declined. This has now created a gap in experienced project managers.

Industry leader perceptions are supported by Public Use Microdata Sample (PUMS) census data examining the region’s age distribution of architects versus engineers. Architects show a typical age distribution, with the number of workers declining smoothly with age and experience. Engineers, on the other hand, show an unusually steep drop between those just out of school and those between the ages of 35 and 44. On the plus side, this gap may provide an opportunity for younger engineers to move up the career ladder more quickly, as firms seek young workers with experience who can begin to take on managerial roles.

Average Employment by Age
KC Architects, 2015



Average Employment by Age
KC Engineers, 2015



Source: IPUMS-USA, University of Minnesota, www.ipums.org

■ Experiential Learning

Recent graduates shared their most valuable experiences.

- In the classroom: Graduates found value in learning from guest speakers from the industry, participating in real case studies/projects, working in groups and presenting, and rubbing elbows with professionals.
- Outside the classroom: Students valued extracurricular design programs, contests and on-the-job experiences that let them work in different areas. These experiences helped them figure out what they enjoyed and exposed them to company culture.



“My internship showed me exactly what I did and didn’t want to do. I spent a lot of time going around to all the different departments to explore different opportunities, and that’s how I found the department I’m in now, which I really enjoy.”

— Recent Graduate

“The experience that helped me the most was interning the summer after my freshman year. You can listen to lectures about the problems you’ll solve, but actually facing the problems themselves and understanding why they’re problems — that is really what kind of made it click for me.”

— Recent Graduate

■ Opportunities

Industry leaders identified five key opportunity areas for growing the talent pipeline and preparing workers for KC Global Design careers. These will be explored in more detail in the KC Global Design workforce action plan, the next step in the Talent-to-Industry Exchange (TIE) process.

- 1 ***Develop a more cohesive strategy around the STEM talent pipeline.***
- 2 ***Create a clear entry point and career pathway for the non-degreed workforce.***
- 3 ***Create a system to improve access to employers for female, minority and international students.***
- 4 ***Create a better balance between technical skills and core competencies, both in and out of the classroom.***
- 5 ***Expand experiential learning opportunities, inside and outside of the classroom, to provide maximum exposure and align expectations.***

MORE SURVEY RESULTS

82%

of companies anticipate expanding their workforce in the coming year.



37%

recruit from outside the region frequently or occasionally, most often for niche specialties or increased international diversity.



44%

offer a tuition benefit to employees who want to continue their education.

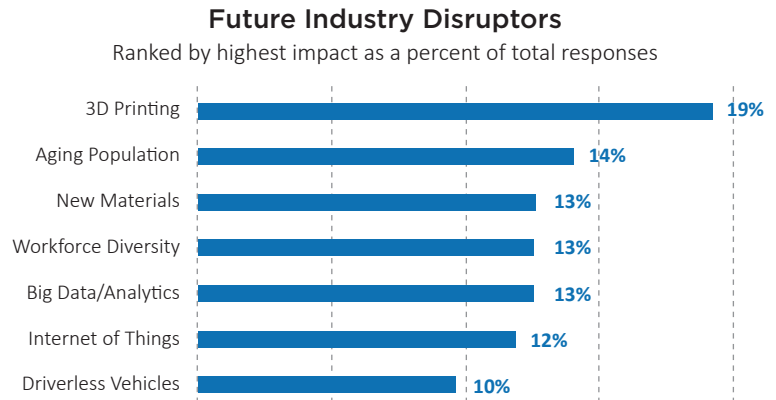


68%

of staff positions require a bachelor's degree or higher.

INDUSTRY DISRUPTORS

The rate of technological change in the KC Global Design industry is increasing, and local firms must master new tools in order to keep pace. As one of the nation's largest concentrations of Autodesk users, area firms have mastered 3D and 4D design, building information modeling and other cutting-edge tools that have disrupted the industry in the past. But industry leaders see more disruptors on the horizon, as shown in the chart on the right.



Source: MARC Industry Leader Survey

Technological Innovations

Technological innovations in engineering and architecture largely result from the increasingly rapid infusion of information into the physical world.

- New materials, often the product of years of research, are allowing the construction of buildings and infrastructure with components that are stronger, lighter, and break down less often. As a result, they are less expensive to operate and maintain.
- Some of these materials are being used in 3D printing and additive manufacturing, which allow mass production pricing of custom-built components and increase the speed of transformation from idea to product.
- The internet of things employs inexpensive sensors throughout structures and vehicles to monitor conditions and location. They provide the Big Data that powerful data analytics and machine learning algorithms process to alert professionals of potential problems and even suggest solutions for them to consider.
- The internet of things will also help guide autonomous and connected vehicles that require vehicle-to-vehicle and vehicle-to-infrastructure communications in order to operate safely. This will not only affect infrastructure design, but also the optimal design of buildings as past models for auto ownership and the land required to meet parking demands change.

These technologies not only have the potential to vastly improve efficiency, but allow new design innovations that increase both the functionality and the beauty of the built environment. Those firms that master them best will gain a competitive edge.

"The cohort coming in now will graduate in four, five or six years and that means we have to educate them for the world that is going to be. We've got to have a good grip on trends and understanding of where the world is headed."

— Educator

"I can't imagine what the practice will be like in 10 years with new technology and software. I think it's going to cause a huge shift in how we do our work."

— Industry Leader



CONCLUSION AND NEXT STEPS

The KC Global Design industry is a critical component of the regional economy. The region has a high rate of specialization in several engineering and architecture occupations and an international reputation for excellence in design. We have a strong combination of established firms and educational opportunities, but the ability to supply a sufficiently trained, educated and innovative workforce could threaten the continued growth of these sectors. We need a growing pipeline of talented workers and graduates who are prepared to meet employer needs.



Workforce quality is an essential element in the competitiveness of local firms. The best talent produces the best innovation and best results, necessities in a highly competitive, global marketplace. The industry not only must produce safe and attractive designs, but also must be positioned on the cutting edge of emerging technologies.

Kansas City area firms are challenged to attract and retain talent for a variety of reasons:

- The region's colleges and universities currently produce enough graduates to meet the KC Global Design industry's employment needs. Their graduates, however, do not all remain in the Kansas City area, especially if they come from outside of the region, or they join firms in other industries. Additionally, degrees awarded locally may not always align with employer needs, especially in certain specialties.
- Many Kansas City area design firms express concern that recent graduates lack proficiency in common sector competencies, or soft skills. Employers cite deficiencies in skills such as public speaking, written communication, collaboration and interdisciplinary understanding, and note they may recruit outside the area to find employees who are more proficient in these areas.
- While the Kansas City region is experiencing a positive trend in the number of young adults with STEM degrees, the metro still lags a majority of its peers. Introducing students to STEM and experiential learning opportunities at younger ages can stimulate their interest in the design sector and influence their postsecondary education and career choices.
- The KC Global Design industry workforce needs more diversity. Industry leaders recognize that a more diverse workforce generates a host of benefits for the firms, educational institutions and the surrounding community. These leaders cite the need for more effective efforts to recruit and retain women, minorities and international talent, both at their firms and at area universities.

Strengthening Kansas City's position as a global leader in design will require industry leaders and educators to work together to address these issues. The community needs a long-term commitment to expanding the workforce pipeline, a more cohesive strategy to enhance and expand the STEM pipeline, and more experiential learning opportunities, both inside and outside classrooms. In the coming months, civic, industry and educational partners will use this analysis to develop an action plan to meet these challenges.



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University of Missouri–Kansas City
Workforce Partnership





Contact:

Sheri Gonzales-Warren, Community and Economic Development Program Director
Mid-America Regional Council
600 Broadway, Suite 200, Kansas City, MO 64105
swarren@marc.org or 816-701-8308