The Maker Economy:
The Growing Demand of Small Urban Manufacturers in Houston
Houston LISC is a local office of the Local Initiatives Support Corporation (LISC), the nation’s largest community development support organization. With residents and partners, we forge resilient and inclusive communities of opportunity across America—great places to live, work, visit, do business and raise families. By providing capital, technical expertise and training, LISC helps to develop local leaders and invest in the creation and growth of affordable housing, local community centers, and businesses that create new jobs. Houston LISC is proud to have provided funding support for this report.

TX/RX Labs is Houston’s non-profit makerspace. Housed in the East End District, we seek out opportunities to learn, create and innovate, and we encourage this in others. Our diverse network of creators, artists, and inventors coupled with tools and knowledge, enable dreams to become reality. We teach people of all ages and backgrounds the skills they need to build a future full of novelty and inspiration. TX/RX Labs is proud to have provided support for this report.
Executive Summary

Houston, like other cities across the United States, has had a long and storied history with urban manufacturing and industrial production. While manufacturing firms first congregated in central cities in the 19th and early 20th centuries, during the latter half of the 20th century the sector vacated inner-city neighborhoods for the suburbs and abroad—leaving behind vacant industrial corridors ripe for redevelopment and revitalization. During the 1990s and early 2000s, however, the manufacturing sector experienced an urban revival. This rebirth has brought with it higher-paying jobs, technological innovation, and a renewed sense of entrepreneurship to formerly-industrial corridors across the country, including the East End and other neighborhoods adjacent to downtown Houston.

While Houston’s small urban manufacturing sector is clearly on the rise, policymakers, stakeholders, and even consumers recognize that there remains an overall lack of knowledge around the industry. Contributing to this is the fact that these small firms, most of whom employ fewer than 25 workers, operate under the radar in refurbished industrial spaces throughout Houston’s east side and other industrial neighborhoods.

To address this knowledge gap and help facilitate a clear strategy for the sector’s future, the Kinder Institute for Urban Research at Rice University was tasked with surveying manufacturers operating east of downtown. With guidance, funding, and technical support from TX/RX Labs, the Houston office of Local Initiatives Support Corporation (LISC), and BeehiveFund/TMAC Gulf Coast, the Kinder Institute team set out to raise awareness around small urban manufacturing in Houston, culminating in this report.

Key Findings

From April 2019 through August 2019, the Kinder Institute surveyed and collected data directly from 69 small urban manufacturers, artists, and makers operating in the Greater Houston Region. Findings from the survey were supplemented with one-on-one conversations with a selection of small manufacturers operating in neighborhoods directly adjacent to downtown.

For full aggregated results from the survey, please refer to the attached Appendix. From this study, the team uncovered the following key points:

- On the whole, small manufacturers contributed 28% ($33 Million) to total manufacturing sales volume in 2018.
- Although structural challenges remain, 79% of all survey respondents are optimistic about growth opportunities for small manufacturers operating in Houston and 84% have a desire to remain in their city.
Nearly half of all survey respondents indicated that appropriately-sized, affordable industrial space remained the number one barrier inhibiting their growth.

Forty-five percent of all survey respondents have struggled to find sufficient capital to scale operations; some have resorted to commercial bank loans or sought contributions from family and friends.

Although many businesses rely on referrals to find new workers, 41% mentioned that finding qualified workers in Houston, with the requisite skills for specialized manufacturing, remains a barrier to growth.

One-third of survey respondents expressed their desire to expand their customer base both within Houston and beyond, but find it difficult to do so without external support for marketing and branding to promote their products.

Roughly one-third of survey respondents highlighted a need for improved access to the right equipment to scale their businesses. From 3D printers to CNC Machines, respondents need larger, technology-enabled tools and equipment that are both costly in terms of real estate and capital.

One-third of respondents indicated they had not worked with any local service provider, and 38% of respondents indicated they did not know how or where to access free or affordable services to support their businesses.

Of the businesses surveyed, 60% were owned by men and 82% were owned by non-Hispanic whites; this is not necessarily reflective of Houston’s population diversity.

One out of ten small manufacturers caters entirely to the local economy. Small manufacturers generally operate a diverse market portfolio for their products, with half of their production going into the local economy, a fifth into the state economy, a fourth into the national economy, and the rest into the global economy.

These challenges are endemic to the Houston context. However, they are not insurmountable. Locally, actors are working tirelessly to bring the support small manufacturers need to overcome these structural barriers. Looking beyond Houston’s borders, other cities, too, have found unique approaches and strategies to address similar challenges in support of their burgeoning urban manufacturing networks. Specifically, dedicated manufacturing and infrastructure investments—an industrial corridor model—offers a unique approach to neighborhood revitalization driven by urban manufacturing and local businesses. Similar strategies could be molded to fit the Houston context and policy environment.

Fortunately, this is a pivotal moment for manufacturing in Houston. There is growing momentum to see these challenges not as limits to manufacturing’s potential in the city, but rather as opportunities to leverage the information contained within this report and bring the small urban manufacturing sector to the next level in Houston. With groundbreaking in November 2019, Urban Partnership CDC’s East End MakerHub, which will be the future home to an expanded TX/RX Labs among other clients, represents a key moment for the industry. This is a huge opportunity for the city and region to bolster their small manufacturer, maker, artist, and craft community and achieve economic growth over the long-term. Investing in this community has the potential to revitalize neighborhoods, provide high-wage jobs, and create a local identity to promote the region.
Houston has a vibrant network of small-scale, small-batch manufacturers, artisans, and makers. From mixed-material furniture to metal fabrication to gelato, this little-known, but growing network is producing a wide array of finished goods and products. These products are not only unique to Houston but also directly support the supply chains of other industries in the region. Today, Houston’s manufacturing sector is becoming a larger and more valuable source of high-skill, high-paying jobs—a boon to the city’s diversifying labor market and economy.

In some of Houston’s neighborhoods, particularly areas east of downtown, there is a notable clustering of small urban manufacturers operating out of converted garages, rehabilitated warehouses, and community makerspaces, such as TX/RX Labs in the East End. This clustering is particularly beneficial to small-batch manufacturers because it fosters and encourages cross-sector collaboration, idea-sharing, and networking. This clustering is also advantageous in implementing a place-based industrial corridor strategy to localize small manufacturing and provide the structural support for the continued growth of the sector.

However, there is generally insufficient knowledge of these firms at both the consumer and policy levels. Not only do these firms often employ fewer than 25 employees they also operate under the radar and can be difficult to track. As such, the goods they produce, their contributions to the regional economy, and, most importantly, their ongoing needs and challenges in operating in the Houston region remain largely unknown.

Compounding this challenge is the fact that most data collected around manufacturing and industry is done at the county or regional level. This macro-level analysis ultimately means small urban manufacturers are overlooked or not included in industrial sector assessments. Overall, this lack of awareness means that existing programs and policies targeting small businesses do not always meet the unique needs of small manufacturers and makers.

**Study Background & Approach**

The Kinder Institute for Urban Research at Rice University was tasked by TX/RX Labs and Houston LISC with conducting a survey and analysis of small urban manufacturers operating in the neighborhoods east of downtown. The results from this survey are intended to fill this knowledge gap by identifying the existing needs and challenges of the sector. These results also serve to inform and support the upcoming East End MakerHub (home to TX/RX Labs’ expansion), which could anchor a future industrial corridor in Houston. To that end, the primary study area includes Second, Third, and Fifth Wards, as well as, Acres Homes and Near Northside; however, the team ultimately gathered data from manufacturers operating across greater Houston to support the study.

With funding, guidance, and technical support from TX/RX Labs, Houston LISC and BeehiveFund/TMAC Gulf Coast, the study was conducted for six months beginning in early 2019. From April 2019 through August 2019, the team actively collected survey responses via Google Forms. Survey findings were also supplemented with case
study interviews conducted with small manufacturers operating in the East End and Near Northside.

**Limitations of the Study**

To distribute the survey, the Kinder Institute primarily relied on the expertise and existing networks of TX/RX Labs, BeehiveFund/TMAC Gulf Coast, and Fresh Arts. Additional organizations, stakeholders, and economic development groups rooted in neighborhoods adjacent to downtown also assisted in survey distribution.

In total, the survey received over 80 responses by a variety of small manufacturers across the Houston region. However, after deleting duplicate and nongermane responses, the survey yielded 69 unique responses.

Because of the shape of our outreach, the results contained within this report do not provide the most comprehensive picture of small urban manufacturing in Houston. Rather they reflect the businesses and small firms most likely to interact with our partners. As mentioned, our results are also reflective of firms from all across Houston. We did not limit responses from outside the original target area: neighborhoods east and south of downtown.

To truly understand the economic impact of small manufacturers in the target area, city, and region, a complete economic census of every small manufacturer in the region would be necessary. However, a complete economic census was not possible within the time frame. With limited resources, we were not able to build the necessary trust with the untold dozens of small manufacturers operating in our region to conduct a full census. Future iterations of this study should focus on filling this gap with targeted outreach to small manufacturers over a longer period. In so doing, a more accurate picture and assessment of the sector’s economic impact could be attained.

Despite these limits, the unique perspectives, challenges, and ideas contained within this report are critical data points in any efforts to devise strategies and inform policies that better support the growth and success of small urban manufacturing in Greater Houston.

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**Year of None—Mikey Kendrick**

After graduating with a business degree from the University of Houston in 2015, Houston-native Mikey Kendrick started out in the oil and gas industry before saving up enough money to start his own furniture design business, a hobby he had been tinkering with since middle school. **Year of None**, Kendrick’s modern, sustainable small-batch furniture shop with a nod towards the aesthetics of mid-century modernism and functionalism, operates out of a rented woodworking space within TX/RX Labs in the East End.

Seeking a creative step away from oil and gas, Kendrick ultimately found a unique niche for his company that sets his brand apart: high-quality, handmade furniture sourced from eco-friendly materials at accessible prices. And although he has contemplated moving away, Houston’s big-city resources at unbeatable prices has been essential to his shop’s steady growth over the last few years, and ultimately kept **Year of None** local.

Kendrick has a big vision for **Year of None**’s future. While TX/RX Labs has been his home base for almost two years, and he recognizes that it is one of the few organizations in the Houston area helping like-minded makers get their businesses off the ground, larger affordable live-work space is necessary for him to scale his operations. Ideally, space that could house the new machinery he hopes to acquire.

Additionally, Kendrick acknowledges that while there is a lot of momentum and support for artists in the Houston area, more should be done to connect, support, and raise awareness around the city’s burgeoning small-batch manufacturing scene. The momentum is certainly there for organizations like TX/RX Labs, or the newly-launched Houston Craft Association, to fill that gap. However, Kendrick recommends more consistent engagement with makers and manufacturers such as himself to figure out what exactly is needed in the market.
Transformation of America’s Cities into Manufacturing Hubs

From the Industrial Revolution to the present, manufacturing in America has had a long history tied to the development of its metropolitan regions. Early roots can be traced back to the 19th century when manufacturing businesses were small-scale, congregated closely in downtown districts, and intermingled with housing and commercial establishments. This colocation not only opened up new markets but also provided firms access to power sources and raw materials to support growth. It was during this time that manufacturing became truly integrated into the social and built fabric of America’s burgeoning cities and small towns.

However, it wasn’t until the late 19th and early 20th centuries when cities in the Northeast and Midwest became leading centers of larger-scale manufacturing and production. Urban manufacturing became the leading engine of growth and development in cities—fueling economies locally and attracting workers from across the nation and abroad. Large-scale American manufacturing helped build the powerhouses of Pittsburgh (“Steel City”), Detroit (“Motor City”), and Milwaukee (“Brew City”)—industrial legacies that still shape these cities today.

Before World War II, urban manufacturing jobs were readily accessible and available to a majority of Americans, especially newly-arrived immigrants from Europe, Asia, and elsewhere. A vast majority of these manufacturing jobs were entry-level—requiring little prior education or training. These jobs also offered higher than average wages for the time. For millions of Americans at the time, manufacturing was considered the key entry into the middle class.

By mid-century, however, America’s manufacturing sector faced increased competition from abroad, where labor was cheaper, and from its expanding suburbs and exurbs, where land was cheaper. The rise of telecommunications and other technologies further accelerated this decline. Technological advancement diminished the necessity of clustering in urban centers for tapping into local consumer and labor markets.

Over time, while manufacturing experienced an increase in net output, the actual number of employed workers and the sector’s share of total employed decreased. Eventually, urban manufacturing’s slow but steady decline resulted in an exodus from inner-city neighborhoods and urban cores.

The mid-century decline of manufacturing employment significantly impacted the economies of America’s cities. It left behind pockets of poverty, crime, and joblessness as well as diminished educational and economic opportunities for those who remained. Most visibly, the exodus left behind vacant factories, warehouses, and homes—a recognizable urban landscape familiar to many in New York City, Pittsburgh, and even on the east side of Houston.

Rebirth of Urban Manufacturing in America

After decades of decline, America’s manufacturing legacy hit a critical moment of revival in the 1990s and early 2000s. With renewed interest in America’s cities during this time, there was also a growing recognition that manufacturing and other high-tech or creative production industries do benefit from agglomeration, adaptive reuse of vacant industrial space, and the face-to-face networking only made possible in dense cities.

Although today’s urban manufacturers are building from the foundations left by the industrial legacy of the mid-20th century, the sector has evolved over the last few decades as technology and production capacities have advanced. No longer a major source for entry-level, low-
skilled jobs, manufacturing operations are significantly leaner and, enabled by technological change, often employ high-skilled labor at higher than average wages.7

Due to specialization and innovation, the modern incarnation of manufacturing has played and continues to play a crucial role in the revitalization of inner-city economies across the United States. Most notably, technology-enabled manufacturing brings with it an infusion of external money and wealth into long-neglected neighborhoods through product differentiation and place-based marketing.8 This ultimately has helped boost the overall industrial output and productive potential of firms already operating the city.

The re-clustering of modern manufacturing into industrial corridors, enabled by the strategic re-purposing of vacant industrial spaces left behind, has also helped foster the rise of a creative maker economy—or small-scale, hyperlocal manufacturing and entrepreneurship.9 With an acute focus on product design, creative innovation, and technology, makers benefit from the large consumer markets and industrial supply chains available in urban centers.10 Likewise, urban economies benefit from this sector of small-batch manufacturing through job creation, knowledge-sharing, and localized economic development.

**Benefits of Modern Urban Manufacturing**

Since the Great Recession, interest in supporting and attracting urban manufacturing firms, including small-scale makers and artisans, has grown significantly among policymakers across the United States. Not only does manufacturing help revitalize inner cities through job growth, but it also revives long-neglected, formerly-industrial communities or corridors.11 Locally, promoting the

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### Greenwood Bay Woodworking Studio—Bob Card

Bob Card worked in the corporate world for over 25 years when he decided it was time to rethink his professional career. Despite quitting his job amid the market crash of 2008 and 2009, Bob decided to tap into his lifelong hobby of woodworking to start Greenwood Bay, a custom woodworking studio specialized in wood-based furniture, art, and sculpture.

The business started slowly in the early years while operating out of his unairconditioned studio off Polk Street. But once his first commission came through for custom table pieces for Starbucks’ locations in Houston, Dallas, and Tuscon, Arizona, Greenwood Bay’s business took off. Over time, Bob learned to evolve his craft with the demands of the market, responding to the desires of his clients—from custom residential live-edge furniture to commercial pieces for interior designers and clients from architectural firms.

For the last four years, Greenwood Bay has been operating in a former saw manufacturing facility that has since been repurposed for creative professionals in the East End. His space includes an attached showroom overlooking the workroom and nearby meeting space, allowing clients to fully visualize their designs from start to finish. The studio is well-positioned for access to the Downtown market but is admittedly not the most affordable—a growing concern among the maker community as prices rise for manufacturing space.

Bob credits the welcoming atmosphere and the “can do” attitude for small, locally-owned businesses in the city as keys to his success, especially early on. Even without an official portfolio to showcase his work, early clients saw his potential. However, one thing that has been an issue for Greenwood Bay from the beginning is knowledge and exposure—a concern echoed by other manufacturers in the area. There is a vibrant community of makers and artists currently operating under the radar in Houston; and, without targeted marketing assistance for these makers, very few people will ever know just how vibrant it is.
sector is also seen as a potent regional economic development strategy—an opportunity for cities to market their unique identity through industry-enabled products while building a national market for local products.  

Manufacturing’s slow-but-steady return to the inner city has been a boon to the revitalization of legacy industrial corridors across the United States, including those in Indianapolis, Pittsburgh and elsewhere. While many cities are undergoing a central city renaissance, urban manufacturing and technology are playing key roles in that process. Through job growth, urban manufacturing attracts new residents, infuses technological advancement into the local economy, and precipitates a renewed sense of entrepreneurship in many cities.

In Indianapolis, for instance, the North Mass District, a former industrial corridor just northeast of downtown, has in the last decade been transformed into a “creative and commercial corridor” through the strategic redevelopment of underutilized and vacant properties along North Massachusetts Avenue. Development of the district was and continues to be lead by the Riley Area Development Corporation with funding support from LISC Indianapolis. Along with state and local programs, the North Mass District offers place-based incentives, workforce development programs, and affordable, flexible industrial space to attract new businesses to the corridor and maintain existing ones.

Today, the District is anchored by the RUCKUS Makerspace hub which offers surrounding communities the opportunity to meet, socialize, exchange ideas, and share industrial equipment in a collaborative, community-oriented environment. Since launching in 2014, the North Mass District has become home to 75 small businesses on 500 acres of industrial property—and continues to grow. Colocation in the district has helped localize a small manufacturing renaissance in northeast Indianapolis, furthered networking opportunities among existing and new small businesses in the area, and raised local and state awareness around the unique products and services offered by Indianapolis-based manufacturers.

**Houston’s Manufacturing Legacy**

Although Houston is a younger city than the industrial powerhouses of the Northeast and Midwest, its manufacturing legacy is no less important or apparent, even today. At the turn of the 20th century, growth in Houston’s manufacturing sector was largely driven by two of its economic engines: the rise of the oil and gas industry and the opening of the nearby Port of Houston. For neighborhoods on the east side of downtown, the East End and the Historic Second Ward in particular, it was their proximity to both the city’s commercial center in downtown and the newly opened Port that fostered initial growth in manufacturing and residential development during this time.

Additionally, the early 1900s witnessed a significant rise in immigrants from Asia, Central America, and beyond, many of whom entered through the Port of Houston itself. As neighborhoods including Magnolia Park and Idylwood developed to house newly arrived immigrants, demand for nearby, accessible, middle-class jobs with low barriers to entry rose precipitously in the neighborhoods east of Downtown.

These developments transformed the historic Second Ward and East End neighborhoods into beacons for the American dream. Both offered opportunities in manufacturing tied directly to the Port and Ship Channel. This proximity and agglomeration also led to the rise of related manufacturing industries, including cement and steel fabrication, cotton and textile factories, and chemical plants tied to the region’s oil and gas industry.

Seeking opportunity in Houston’s growing industrial sector, migrants from across the American South came to Houston’s east side neighborhoods in the years leading up to World War II.

**Manufacturing Revival on Houston’s East Side**

Houston, too, experienced a revival of small urban manufacturing parallelling other American cities. Economic development and real estate interest returned to east Houston beginning in the 1990s. This renewed interest in the area’s industrial legacy, built environment, and cultural heritage also brought about neighborhood change on a scale not seen since the early 20th century.

Although the oil and gas industry remains a dominant force in Houston, and its influence continues to fuel-related manufacturing industries like metal fabrication and chemical production, the large-scale manufacturing of the mid-20th century has mostly vacated inner-city Houston for its growing suburbs and elsewhere. Instead, operating out of the long-vacant industrial warehouses and complexes on the east side of downtown Houston are the small urban manufacturers, artists, and makers that are the subject of this study.

Additionally, new manufacturing support organizations have established footholds in the city and are likewise
re-occupying spaces previously housing historic industrial operations, including the space that TX/RX Labs now occupies in the East End. Even larger facilities, including the plant that first housed Ford’s Model T production line and later housed Maxwell House Coffee, are now being repurposed for modern industry.

Manufacturing was once the key economic driver of urban development in American cities; and, although the sector is no longer the powerhouse and major source of middle-class, entry-level jobs it once was, the ongoing revival of small urban manufacturing is bringing innovation and a renewed sense of entrepreneurship that is worthy of support at all levels. In Houston specifically, opportunities abound for its burgeoning urban manufacturing sector, especially within the corridor on the east side of downtown—site of the future UP CDC East End MakerHub and TX/RX Labs’ expansion.

**Urban Manufacturers Operating in Houston and Harris County**

Houston has a storied legacy and unique history rooted in industry and manufacturing. At the same time, the growth of TX/RX Labs, and similar makerspaces and support organizations in the area, represents an opportunity for taking small-scale manufacturing to the next level, which could include the development of an industrial corridor. Houston only stands to gain in providing targeted, strategic support to the growing network of makers, small-scale manufacturers, and tech-oriented startups already operating throughout the region.

To effectively support this growing network in Houston and Harris County, it’s important first to take stock of the manufacturers themselves. Understanding who they are, what products they produce, who their customers are, and what contributions they make to the region’s economy will help leaders, stakeholders, and policymakers more adequately respond to their challenges, needs, and barriers.

While the presence of small urban manufacturing in neighborhoods east of downtown is both notable and opportune for organizations already operating in the area, such as TX/RX Labs, manufacturing operations are spread out across many neighborhoods in Houston and Harris County. Utilizing data gathered in 2018 covering business and demographic information from 11,840 businesses with 25 employees or less located in Harris County, Figure 1 displays the count of individual small manufacturers by census tract.
Total Sales Volume by Census Tract (2018)

Total Sales Volume by Census Tract, Small Manufacturers (2018)
According to the data, all manufacturers operating in Harris County in 2018 recorded nearly $120 million in total sales volume. Of that figure, 28% can be attributed to small manufacturers ($33 million). Figures 2 and 3 highlight the monetary contributions of manufacturing by census tract. Figure 2 illustrates the contributions of all manufacturing firms in Harris County, while Figure 3 hones in on the contributions of just small manufacturers. Notably, downtown and neighborhoods just east, as well as the northeast and southern periphery, appear to contribute the most in terms of total sales volume across all manufacturers in Harris County.

Beyond the 2018 county-wide data explored in the maps above, the key data points gathered from the 69 small urban manufacturers who employ fewer than 25 workers provide another picture to be considered. The survey respondents were businesses primarily owned by a single owner (62%) and founded or started by the current business owner (86%). Further, the majority of business owners were male (60%) and non-Hispanic whites (82%).

Surprisingly, this is not necessarily reflective of Houston's underlying diversity. On the one hand, this might indicate a need to improve opportunities in small business manufacturing for minorities and underrepresented groups. On the other hand, this might simply be reflective of those who we were able to reach to take the survey. Additional outreach would be necessary to draw either conclusion in future iterations of this study.

Operating out of backyard shops, retrofitted warehouse spaces, and within manufacturing incubators and industrial corridors that dot the city, this growing network of small-scale manufacturing (including the makers and artisans) are developing hyper-local products that are uniquely tied to the City of Houston. Generated from the survey results, the word cloud in Figure 4 illustrates the diversity of a subsection of small urban manufacturers operating in Houston. Consumer products feature prominently, including art, jewelry, and food. The sector is also utilizing raw and other finishing materials such as wood, metal, and steel to manufacture products for consumers and other businesses.

Small urban manufacturers also continue to play a crucial role in support of the region’s larger economy. Not only are these small urban manufacturers bringing Houston-made products to the local market, but they are also reaching regional, state, and national consumers—helping drive external wealth and economic opportunity into the city’s small business scene.

One out of ten small manufacturers caters entirely to the local economy. Five-percent of respondents catered exclusively to the national market, and another five percent catered exclusively to the international market. On average small manufacturers operated with half of their products going directly into the local economy, a fifth to the state economy, a fourth to the national economy, and the remainder to the international economy. Small manufacturers operate a diverse portfolio across markets; while the most important sector is the local economy, Houston’s small manufacturers keep up with Houston’s gravity in the state, national, and global economy.

As in other cities, Houston’s small urban manufacturing network boosts the city's entrepreneurial spirit, showcasing new pathways for all Houstonians to not only become self-reliant but also become more deliberate in their creative pursuits and career choices. From the survey, it is clear that Houston’s small manufacturing, craft, and art community is vested into the strength and vitality of the region as 84% indicated a desire to remain in Houston in the coming years. However, while 79% of survey respondents are optimistic about growth opportunities for small businesses in Houston, clear structural challenges must be addressed.
Challenges Facing Small Manufacturers in Houston

Small urban manufacturers operating across the Houston region are encountering challenges and barriers that continue to impact growth and development. Understandably, these challenges are tied to the Houston context and existing policy environment. However, they are also challenges already identified by manufacturing firms operating in peer cities across the country. Fortunately, this offers stakeholders in this city a growing list of national best practices that could potentially be employed in Houston.

Additionally, while these barriers were flagged by the survey respondents, it’s important to acknowledge that there are existing Houston and Texas-based organizations already operating in this space. Many organizations are actively working to address the challenges identified in the following section. These results may simply be reflective of a need to improve the effectiveness of existing programs through targeted outreach, better information sharing, and overall awareness.

In fact, despite the plethora of service providers working in support of manufacturing, a third of survey respondents indicated they had not worked with any local service providers. Additionally, 38% of respondents indicated they did not know how or where to access free or affordable services to support their business. One-on-one conversations with small manufacturers further confirmed this conclusion. Though businesses indicated a desire to work with organizations to grow their business, they had very little knowledge of who these organizations were, what services they provided, or where these organizations were located. Awareness remains a major barrier for many service providers active in the Houston region.

Moreover, some respondents indicated a negative experience with one or more service providers, shying them away from working with others in the future.

Lastly, the challenges identified in this study appear, at first, to be major weaknesses tied to Houston as well as insurmountable roadblocks to the continued growth of the sector. However, awareness of these challenges could not have come at a more pivotal moment. This is a unique opportunity for stakeholders and policymakers to harness this knowledge, coalesce around a common goal and vision, and identify creative solutions to collectively support Houston’s growing network of makers, artisans, and small-scale manufacturers.

To get at the heart of the challenges faced by small urban manufacturers in Houston and provide direction for organizations and stakeholders already operating in the manufacturing space, the survey directly asked respondents to consider the top five challenges impacting their business and their ability to scale operations in Houston. Figure 5 illustrates the five most pressing challenges identified by survey respondents:
1. Affordable Space

Industrial space is critical for scaling production as small businesses grow. When asked if they desire to be in larger space in the next few years, approximately 45% of respondents said “yes”. However, nearly 50% of all survey respondents noted that while the supply of industrial space in Houston has historically been both ample and affordable, a boon for early-stage, small-scale manufacturers, the cost of larger real estate has been rising in recent years. For those seeking larger space, the growing unaffordability of industrial space is an obstacle that is difficult to overcome, particularly for small firms.

When asked why they needed new space, the majority of respondents indicated a need for larger machinery to scale their businesses to keep up with consumer demand. With increased attention and investment from developers and new residents, demand for industrial real estate, especially in Houston’s East End neighborhoods, has risen sharply—squeezing out small-scale manufacturers wishing to keep up with market demand.

Reiterating the need for affordable space, a similar proportion of respondents (46.3%) indicated that they have sought free or affordable services to help find space within their current neighborhoods. With easy access to Downtown consumer markets, existing manufacturing networks, and transportation, some respondents expressed a desire to remain in their current inner-city corridors, even though the cost of real estate is cheaper on the periphery.

The barrier is not necessarily finding affordable space to start, but expanding within or growing into new space. There is a vision for the future for small manufacturing, but that future is not accessible with non-amenable regulations to expand and competition for land-grab in revitalizing neighborhoods. Pursuing an industrial corridor strategy tied to financial incentives and regulations that attract and maintain small businesses within could help address the rising cost of real estate and the diminishing supply of industrial space.

Local Practice

Developing space inevitably requires a significant amount of capital—a tall order for a small business. It can be a major barrier both to small businesses looking to develop or redevelop their own spaces as well to non-profit organizations looking to build affordable space for others. Locally, Houston LISC offers a portfolio of loan opportunities designed to help organizations unlock the necessary capital to realize their projects and have a positive, long-term impact on the surrounding community. Currently, LISC is providing a predevelopment loan to UP CDC for the

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**FIGURE 5**

**Top Five Challenges of Survey Respondents**

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Count of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affordable space for my business</td>
<td>32</td>
</tr>
<tr>
<td>Access to capital</td>
<td>30</td>
</tr>
<tr>
<td>Finding qualified workers</td>
<td>28</td>
</tr>
<tr>
<td>Attracting new customers</td>
<td>26</td>
</tr>
<tr>
<td>Right equipment to scale production</td>
<td>24</td>
</tr>
</tbody>
</table>

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**FIGURE 6**

**In the next one to three years, do you expect your business to be in a larger space or facility?**

- Yes: 19.40%
- No: 35.82%
- Not Sure: 44.78%
development of their new 300,000 square foot East End MakerHub—the future home of TX/RX Labs and others.

**National Practice**
Across the country, increased attention to former- and current-industrial properties has skyrocketed, pricing out many small urban manufacturers and start-ups in the process. Experiencing a similar issue in San Francisco’s notoriously expensive real estate market, SFMade, the non-profit manufacturing support organization for the city, launched PlaceMade in 2013, its non-profit industrial real estate development arm. In collaboration with both the public and private sectors, PlaceMade works directly with property owners to renovate existing industrial buildings or construct new ones. In exchange for financial and technical assistance from PlaceMade, the owner must guarantee that the property remains affordable to small urban manufacturers. PlaceMade also works closely with the city to help guide the redevelopment of publicly-owned properties suitable for industrial uses.

2. Access to Capital
Forty-five percent of all survey respondents indicated that access to capital for business growth and development remains a barrier in Houston. Accessing sufficient capital is necessary for any startup business, including small-scale manufacturers. Securing capital is essential for existing businesses hoping to scale production capacity through the procurement of raw materials, tools, equipment, machinery, real estate, and/or workers.

Without a strong venture capital network targeting small urban manufacturing, makers, and start-ups, many small manufacturing businesses in Houston must rely on commercial bank loans, personal financing, or support from friends and family to grow. Additionally, it is sometimes the case that, even in large cities like Houston, existing venture capital networks do not focus enough on makers and small-scale manufacturers to be effective. More attention must be drawn to this growing network here in Houston whether through grant opportunities tied to businesses operating in a defined industrial corridor or other small business support mechanisms.

**FMW|fablab—Hillary & Ford Waters**
Seven years ago, looking to take more deliberate control of their daily lives and creative pursuits, husband and wife duo, Hillary and Ford Waters, started their custom-design/fabrication business, FMW|fablab, in the backyard shop of their 100-year-old home just east of Downtown.

From the start, Hillary, a commercial interior design professional by training, and Ford, a self-taught metal worker, kept a small client list, focusing on residential projects while biding their time to refine their product and expertise. Seven years and a few relocations later, including a brief stint at Houston Makerspace, FMW|fablab employs ten, occupies showroom space in Sawyer Yards, and has since shifted focus to commissioned commercial installations for hotels, coffee shops, and restaurants across the city.

Working in a field of talented designers and fabricators popping up all over Houston, it is their attention to detail, the trusting relationship they have built with their clients, and their commitment to Houston that sets them apart. And while theft, hiring, and planning for the ups-and-downs of the custom design market have challenged them, the couple credits much of their success to all Houston has to offer.

With its diversity of clients, a growing support network of like-minded creatives, and assistance from organizations such as FreshArts and the East End Management District, Houston has many of the tools small businesses need to get off the ground and thrive. What’s missing? FMW|fablab would like to see a cooperatively-owned tool sharing space—particularly for larger machinery requiring more real estate that most small businesses currently can handle, such as a large 3D Printer for prototyping. Additional support for hiring, perhaps in the form of a vocational trade jobs board, would also help improve hiring prospects as their business continues to grow here in Houston.
Local Practice

**LiftFund** works closely with Houston-based small businesses with limited access to capital.33 As a national, non-profit community development financial institution (CDFI), **LiftFund** provides affordable credit opportunities and loans for small business owners to establish, stabilize, or expand their company. For existing businesses, **LiftFund** offers loans of up to $1 million; for startups, they offer loans up to $50,000. **LiftFund** also administers the Small Business Administration’s (SBA) 504 Loan Program in Texas which allows businesses to purchase real estate and equipment at below-market rates.

In partnership with **Kiva, LISC** currently sponsors one-to-one matching funds that help small businesses, including small manufacturers, reach their loan goal through its Kiva Crowdfunded Loan program. Qualified borrowers work alongside a LISC Trustee to qualify for and gain access to matching funds to grow their business. These loans tend to range from $0 to $10,000 with 0% interest. They are offered to both startup and existing businesses and can be used to help scale operations through equipment, space, or other capital acquisitions. Regionally, **BeehiveFund/TMAC Gulf Coast** also provides customized support to manufacturers within their regional network. This can include information and insight into existing loan programs operated by the State or Federal government as well as technical assistance for accessing those loans.35

National Practice

**Seattle Made**, a collaboration of over five hundred local producers and manufacturers operating in the Seattle Metropolitan Region, partnered with the City of Seattle, Seattle Bank, and BECU to establish the **Seattle Made Matching Fund** to improve access to capital among its

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DC American—Leigh Martin, Chris Sonnier, Jennifer Couch

Leigh Martin, Chris Sonnier, and Jennifer Couch have been operating Houston-based **DC American** for well over a decade. As the founder of the business, Chris’ initial focus was on printmaking. Leigh, wanting to take his life into his own hands and transition from his career in real estate, joined the team and helped transition the business from print to more durable, locally-produced sign manufacturing.

Since moving from their Midtown location two years ago, **DC American** now occupies a larger facility just north of downtown—down the road from Saint Arnold Brewing Company. Even with eight full-time employees, there is still an endless supply of work to go around, requiring an all-hands-on-deck approach to the business.

Known for their quick turnaround, high-quality materials, and personal installation, **DC American** signs can be seen all over Houston from apartment complexes to commercial offices to grocery stores. With business booming, their market reach now extends into Central Texas and even Dallas.

Over the last few years, **DC American** has been able to carve out a Houston-focused niche. Much of this Leigh credits to the city’s business-friendly environment and to its network of professionals that have provided support and advice for small business upstarts such as themselves. However, they’re the first to admit there is still room for growth, especially with the inner workings of the business—culture, systems, and communications. Leigh suggests affordable small business courses, taught by successful entrepreneurs, covering these topics would benefit other businesses operating in Houston.

And despite all their success, Leigh is confident that the Houston environment is ready for their next venture. Whether that involves selling the business or hiring managers to handle the day-to-day, “there’s definitely another business, another career in the future for all of us” here in Houston.
network. The loan matches funds raised by community members on a local crowd-lending program with a 0% loan. The program was initially piloted in 2015 during which it successfully assisted five small urban manufacturers operating in Seattle raise nearly $100,000 in capital to scale their business and meet growing consumer demands. The capital funds were only made available to manufacturers who are part of Seattle Made—a membership-driven umbrella organization.

3. Finding Qualified Workers

Although the majority of small-batch manufacturers rely on referrals for hiring, over a third of survey respondents (41%) acknowledged that finding qualified workers to scale their business is difficult in Houston. One-on-one conversations with manufacturers in the East End further confirmed the following:

- Skilled manufacturing employees are beginning to retire or starting their own businesses
- No appropriate industry-specific platform exists for manufacturers to target and advertise job openings for the highly-specialized positions their businesses require to scale
- Many workers in the market lack the specialized skills needed in small manufacturing; most manufacturers operating in Houston value soft skills and previous industry experience above all else in the hiring
- While there are several vocational options to gain skills in manufacturing, the skills acquired from trade schools do not align with the needs of small manufacturers
- Younger generations do not view manufacturing as an attractive career option

Today’s manufacturing jobs require a much higher technical skill set that can only be acquired on-the-job or through training, apprenticeships, and placement programs. While a new hiring platform specific to high-skilled manufacturing jobs would help raise awareness around the wide variety of high-paying jobs available in the sector, improved job training initiatives for the next generation of skilled workers would have a more lasting impact on the industry in Houston.
Local Practice
Engaging students in STEAM-focused opportunities during and after school, with close collaboration from local businesses and organizations, can help prepare students for higher-paying jobs in Houston’s growing urban manufacturing sector. Locally, HISD runs the Futures Academy Program which prepare HISD students for future jobs in select industries.\(^3\) In partnership with Houston Community College, the Futures Academy Program allows students to earn an Associate’s degree in high-demand career fields, including manufacturing, all while finishing high school. HISD’s program is specifically tailored to meet the current and future needs of the region’s fastest-growing industries. Similarly, TX/RX Labs\(^5\) and LISC’s Financial Opportunity Center\(^9\) program workshops and classes that offer children and adults alike the opportunity to learn, develop, and improve technical skills while readying themselves for careers in manufacturing and elsewhere.

National Practice
Manufacturing Works, a non-profit that supports local manufacturers in the Greater Cleveland Area, runs a program called Encore Cleveland: Technical Corps Program. This program forges connections between retired former-manufacturing employees and Cleveland-area schools. Together, they run targeted skill-building and training programs and classes for students. Most importantly, the hands-on experience from knowledgeable professionals helps prepare students for apprenticeships and connects them with internships in local manufacturing in the region.

4. Attracting New Customers
One-third of all survey respondents indicated finding new customers is an ongoing challenge they face in growing their business locally, regionally, and nationally. While many small manufacturers and makers credit their success in Houston to the supportive network of customers they have already acquired locally, marketing and awareness of their product line remain a barrier to growth, especially beyond the Houston region.

Surprisingly, although a majority (85%) of respondents already have a presence online to market their products and promote their brand individually, 69% would like additional external support in marketing and branding to
expand their current customer base within and beyond Houston and Texas. This finding further underlines the need for an umbrella organization that has the potential to provide collective branding and marketing for small-batch manufacturers in Houston.

Local Practice
In *Advancing Equitable Innovation in Houston: Local Strategies to Support Urban Manufacturing*, a report highlighting the key findings from the Equitable Innovation Conference held in Houston in April 2018, local stakeholders identified the lack of an umbrella organization as one of the “most glaring holes in Houston's small urban manufacturing ecosystem.” Not only would an umbrella organization help consolidate the existing programs targeting urban manufacturers operating across the city, but it would also offer an opportunity for collective branding and marketing for products unique to Houston.

National Practice
Across the country, cities see economic opportunity in the place-based promotion of local products, manufacturers, and makers. Not only is it a way of showcasing the unique diversity of its products, people, and firms, but it also helps cities differentiate their identity. In recent years, this has become a potent strategy for driving local economic development and tourism. Numerous examples of umbrella-like branding organizations and nonprofits already exist across the U.S. For instance, the counterpart to San Francisco’s SFMade in New York City is Made in NYC. Similar to SFMade, Made in

S&H Manufacturing—Chrystel Smith, Callie Perez, Margan Nixon
Family-run since 1947, S&H Manufacturing is the leading local fabricator of steel, alloy and other custom metal products in the East End. For its first few decades, S&H was owned and operated by the Sundeen family until 2014 when Chrystel Smith, an employee at the time, purchased the company from the family.

Continuing its family legacy, Smith brought on her children to build on what the Sundeens had started nearly 70 years ago. Her daughters, Callie Perez and Margan Nixon, and son, Blake Delahoussaye, guide the continued growth of the business. Today, S&H is a certified woman-owned business that operates very much like a family. Not only is it firmly rooted in the East End business community—through organizations including the local Rotary Club, TX/RX Labs, and others— their small size (20 employees) has also enabled them to foster their employees both at work and at home.

However, while S&H remains optimistic about their business in the East End, a few challenges remain. Most notably, they are in need of more space in order to keep up with an increasing demand in the market. Not wanting to sell the plant that has been home to S&H since 1947, the company initiated a development plan that would include installing modular office buildings on their adjoining lot. However, two years of navigating the City’s permitting requirements, including a major investment required on their part for storm sewer installation, eventually put an end to the expansion plan. S&H hopes to remain in the East End, but is actively looking for a new, affordable facility nearby to house their expanded operations, and ultimately add value to the economic development of the area.

Smith and her daughters credit their success to the firm roots S&H has planted in the East End. The business-to-business connections they have made over the years have been fruitful, both for themselves and for other business. Likewise, the support from organizations such as TX/RX Labs and local school programs left them optimistic about finding qualified workers in the future. But, to continue the growth of manufacturing in the East End, S&H would like to see more sustained networking opportunities between manufacturers and more concerted engagement from policymakers to demonstrate their investment in the community and its future.
NYC is an initiative of the Pratt Center for Community Development that offers marketing and branding opportunities to nearly 1,200 member companies based in all five boroughs of NYC. With the renowned Made in NYC branding materials at hand, the organization has successfully enhanced the visibility of the city’s vibrant manufacturing network and products, both online and off. New York City and San Francisco, of course, are not alone. Cities of all sizes have created similar city branding organizations, including Portland Made,43 Cincinnati Made,43 and Made in Baltimore.44

5. Access to Equipment

Whether looking to own or share among a network of makers and manufacturers, roughly one-third of the survey respondents indicated that having access to the right equipment to scale their operations is a persistent challenge in Houston. Undoubtedly, access to the right equipment is inextricably tied to the ongoing need for capital. Our conversations with local manufacturers in the East End revealed that those who need new equipment are looking for 3D printers for large-scale prototyping and CNC (computer numerical control) machines. Both are costly in terms of real estate and capital, but leverage computer technology to automate processes that are otherwise consuming in terms of time and human capital.

Given the desire to forge deeper connections among the dispersed community of makers and manufacturers in Houston, there is an opportunity to create a membership-driven shared facility for existing, later-stage businesses to gain access to the large, technologically-advanced equipment they need to properly scale production capacity. This is especially pertinent for those who are not currently in a position to acquire the larger real estate footprint required or to take on such a large financial investment for equipment.

Several makerspaces operate within this capacity in the Greater Houston area, much like TX/RX Labs; however, respondents to the survey suggested that some of these service providers do not currently offer the machines they need, namely larger equipment.

Local Practice

As a membership-driven makerspace, TX/RX Labs certainly fills this role in Houston, especially in the East End neighborhood. Other makerspaces exist in the region as well, including Fab Lab Houston at the BakerRipley Community Center in East Aldine45 and The MakerBarn46 in the Woodlands—each offering an array of tools, equipment, and classes for the surrounding community. In the East End, TX/RX specifically has found success in helping launch early-stage manufacturing businesses with classes, workshops, and summer camps for kids and young adults. However, as indicated in the survey and during one-on-one conversations with makers operating in the East End, space remains limited at its current facility and is not conducive to later-stage operations. Its new facility opening in 2020 presents an opportunity for TX/RX Labs to help fulfill the equipment and space needs for later-stage businesses that have since grown out of the smaller workspace available at its current facility.

National Practice

The Brooklyn Navy Yard (BNY) in New York City is a 300-acre waterfront industrial park that is today home to over 400 businesses employing more than 7,000 people.47 Operating out of the former U.S. Navy Yard that was first established in 1801, BNY is managed by the Brooklyn Navy Yard Development Corporation. Working closely with tenants across the city, the Development Corporation helps find skilled employees and facilitates the acquisition of affordable industrial space for both manufacturers and tech companies in the area. Housed within BNY is New Lab, an 84,000 square foot manufacturing hub that offers community space to nearly 760 small-batch manufacturers who share access to raw materials, CNC machines, digital lathes, and 3D printers for prototyping.48 Tenants at New Lab not only benefit from the shared workspace, feeding off of one another to generate new, innovative ideas and techniques but also can tap into new consumer networks for their products through shared connections. The key to New Lab’s success is its space; there is ample room for later-stage firms to leverage shared equipment to scale their business and grow their product offerings alongside early-stage firms.
Conclusion & Next Steps

With an industrial legacy to build from, a widespread, but growing network of makers and manufacturers, and a dedicated group of stakeholders and actors working closely in support of the sector, Houston finds itself at a pivotal moment. The challenges identified in this study must be viewed with an eye towards the future, as a unique opportunity to overcome these barriers and facilitate the continued growth of manufacturing in the region’s diverse economy. These challenges are not insurmountable.

Fortunately, there are many local actors and service providers already working diligently in the Houston region to support small manufacturing—many of whom are featured prominently throughout this report. However, now is the time for local and state policymakers to strengthen this network through targeted programming, robust funding opportunities for small manufacturing, and strategic long-term planning to protect and maintain industrial space in the city. Houston is not alone in this pursuit. Peer cities across the U.S., including but not limited to those mentioned in this report, offer a litany of precedents and techniques that could be replicated to fit the Houston context.

Alternatively, several of the major challenges faced by small manufacturers can be mitigated through dedicated planning for an industrial corridor—a designated zone(s) where small urban manufacturers, makers, artists, and the craft community can operate under an amenable and supportive environment. The Mass Ave Industrial Corridor in Indianapolis described earlier in this report offers a scalable model that could be similarly employed to bolster and cluster small urban manufacturing operations and support services in Houston’s East End, or elsewhere in the Greater Houston Region. Not only will the resulting cluster of manufacturing boost networking opportunities for firms within, but it will also help raise awareness of the growing sector in the Houston region and beyond through place-based branding and marketing.
Next Steps

The success of the Indianapolis North Mass Industrial district, as well as its scalability, is because of the Riley Area Development Corporation taking a lead role and overseeing improvements in the area. The ability to advocate for resources, aid in business attraction and serve as an anchor, elevates the maker community and drives inclusive growth.49

Based on the precedent provided by Indianapolis and other successful industrial corridors, the following must be considered, in no particular order, to achieve a similarly robust industrial corridor in Houston.

Umbrella organization: a go-to resource for manufacturing within Houston

A go-to resource for small manufacturers, service providers, and policymakers alike would be necessary to lead the development of a manufacturing-based corridor in Houston. This could take the form of a place-based branding and manufacturing service provider like Made in NYC or SFMade, or an economic development corporation, such as the Riley Area Development Corporation which continues to lead the development of the North Mass District in Indianapolis.

Center point of the industrial corridor: a communal space for the maker and small manufacturing community

This could be the forthcoming Ion in the former Sears building in Midtown or the new UP CDC East End MakerHub. Alternatively, it could be several peripheral focal points scattered throughout pre-identified industrial neighborhoods in the Greater Houston area. Creating a hub for the corridor(s) would help centralize operations, further facilitate networking and training opportunities, and help manufacturers better access services provided by local organizations, nonprofits, as well as city, state, and federal programs.

Legislation: a special district or another vehicle to designate an industrial corridor through long-term comprehensive planning

To spur initial development and help preserve industrial space, there needs to be a region-wide study of vacant land and other space amenable to industry to identify where the industrial corridor(s) would be most beneficial in the Houston Region. A special industrial district would enable land-use codes or intensity building codes to be used to maintain low rental prices as well as plan and account for the future development of the corridor. Facilitated conversations with impacted communities would need to be a part of this process as well, to ensure the corridor strategy aligns with the current and future needs of the community.

Funding stream: targeted incentives and grants to support development

From the Small Business Facade and Property Improvement Program operated by LISC50 to state and local funds provided to attract small businesses,51 there are several incentives and matching grant programs to support nonprofit developers and small businesses operating within the North Mass Industrial Corridor in Indianapolis. These funding mechanisms have been crucial in reigniting development within the corridor while also revitalizing its infrastructure and built environment to attract new businesses to the area. Funding streams and incentive programs tied to a similar industrial corridor in Houston would be necessary not only to spur initial development but also to guarantee ongoing maintenance and future expansion, ensuring its long-term viability as an attractive corridor for workers in manufacturing and other supportive firms and small businesses.

Manufacturing directory: who is your local craft and manufacturing community?

Makers.Melbourne52 is a website created by and for the maker community in Melbourne, Australia, which allows users to better locate local makers, including contact information and the services/products in which they specialize. This online information hub not only enables the community to better understand the products produced locally by industry-enabled design and manufacturing in the city, but it’s also an opportunity to raise awareness around the network of small businesses operating under the radar.

In addition to local branding and place-based marketing, a similar manufacturing directory would help raise awareness around the diverse firms and unique products tied to Houston. On the manufacturing side, a similar directory could help facilitate networking, partnership, and hiring opportunities among manufacturers currently operating in Houston. A successful site would need to be housed and maintained by a motivated umbrella organization (described above) that can consolidate this information into a website accessible to both consumers and manufacturers alike.
Local branding: promoting manufacturing unique to Houston
One of the major steps to bring an identity to our local maker community is to create a local brand, allowing local, regional, and national consumers to more easily connect manufacturing with Houston. Several similar place-based branding organizations already exist across the country that could serve as a model for Houston. An umbrella organization would be required to lead the development of a branding campaign for Houston-based products.

Ultimately, the maker, small manufacturing, and artist community is thriving in Houston, but their continued success is limited by roadblocks to scaling production. Their local contribution to the economy is contingent upon how much the region is willing to invest in its small businesses. Addressing the challenges identified in this study with place-based strategies, such as an industrial corridor, would be a durable asset to Houston, and the metropolitan region more broadly.

Today, Houston finds itself at a pivotal moment as the first steps towards the creation of an industrial corridor are beginning. The upcoming East End MakerHub represents a catalytic opportunity to further entrench the sector in the neighborhoods surrounding downtown, facilitate its continued growth and development, and ensure its long-term success tied to Houston’s unique identity. In the end, it is in the hands of local policymakers and community organizations to keep the momentum going and keep this community and the local economy thriving.
Endnotes

1 Smart Growth American. "Made in Place: Small Scale Manufacturing and Neighborhood Revitalization."
3 Ibid.
8 Ibid.
10 Ibid.
11 Smart Growth American. "Made in Place: Small Scale Manufacturing and Neighborhood Revitalization."
14 North Mass: https://www.northmassindy.com
15 LISC Indianapolis: North Mass Industrial District: http://liscindianapolis.org/north-mass-industrial-district/
16 LISC Indianapolis: North Mass Industrial District: http://liscindianapolis.org/north-mass-industrial-district/
17 RUCKUS Indy: http://www.ruckusindy.com/
18 East End Houston: Then & Now: http://eastendhouston.com/the-east-end-then-and-now/
19 Ibid.
21 East End Houston: Then & Now: http://eastendhouston.com/the-east-end-then-and-now/
22 Ibid.
24 The subset only contains businesses under the NAICS codes starting with 31, 32, 33, and 238, which are generally the businesses observed as manufacturers.
25 This number is arbitrarily chosen to indicate small manufacturers. For this study, firms with 25 employees and fewer are considered small.
26 Census tracts with incomplete or no data are not included.
27 This figure includes combined data from the small, medium, and large-scale manufacturers.
28 This figure includes data from manufacturers with 25 employees and fewer.
29 For the full aggregated results see Appendix 1.
30 The respondents were asked to fill in their business description during the first section. The business description was pulled from each respondent’s survey. The descriptions were tokenized by the anonymized id for every respondent. The words were then filtered to remove “stop words,” i.e., commonly used words such as “the,” “a,” “in,” etc.
31 Opportunity to note UMA’s work in Philadelphia, Milwaukee, Baltimore, etc.
32 San Francisco PlaceMade: http://placemade.org/
33 LiftFund: https://www.liftfund.com/about/mission/
34 LISC/Kiva Crowdfunded Loans: http://www.lisc.org/our-model/lending/loan-products/loans-business/
35 BeehiveFund/TMAC Gulf Coast: https://www.beehivefund.org/our-services/
37 HISD—Futures Academy Program: https://www.houstonisd.org/futuresacademy
38 TX/RX Labs—Classes and Workshops: https://apps.txrxlabs.org/classes/
41 Made in NYC: https://madeinnyc.org/
42 Portland Made: https://www.portlandmade.com/
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43 Cincinnati Made: http://www.cincinnatimade.org/
44 Made in Baltimore: https://madeinbaltimore.org/
45 Fab Lab Houston: https://www.fablabs.io/labs/fablabhouston
46 The MakerBarn: https://www.themakerbarn.org/
47 Brooklyn Navy Yard: https://brooklynnavyyard.org/
48 Brooklyn Navy Yard—New Lab: https://newlab.com
50 2018 LISC Facade Grant: https://www.northmassindy.com/2018-facade-grants
51 Indiana—A State That Works: https://www.northmassindy.com/indy-chamber-and-state-incentives
52 Makers.Melbourne: http://makers.melbourne/
53 One respondent did not input a correct address.
Background

The Kinder Institute for Urban Research at Rice University was tasked by TX/RX Labs and Houston LISC with conducting a survey and analysis of small urban manufacturers operating in the neighborhoods east of downtown. The results from this survey were intended to identify the existing needs and challenges of the sector and to inform and support the upcoming East End MakerHub (home to TX/RX Labs’ expansion), which could anchor a future industrial corridor in Houston. The primary study area includes Second, Third, and Fifth Wards, as well as, Acres Homes and Near Northside; however, the team ultimately gathered data from manufacturers operating across greater Houston to support the study.

With funding, guidance, and technical support from TX/RX Labs, Houston LISC and BeehiveFund/TMAC Gulf Coast, the study was conducted over the course of six months beginning in early 2019. From April 2019 through August 2019, the team actively collected survey responses via Google Forms. Survey findings were also supplemented with case study interviews conducted with small manufacturers operating in the East End and Near Northside.

To distribute the survey, the Kinder Institute relied on the expertise and existing networks of TX/RX Labs, BeehiveFund/TMAC Gulf Coast, and Fresh Arts. Additional organizations, stakeholders, and economic development groups rooted in neighborhoods adjacent to downtown also assisted in survey distribution.

In total, the survey received over 80 responses from a variety of small manufacturers across the Houston region. However, after deleting duplicate and nongermane responses, the survey yielded 69 unique responses.

Because of the method of our outreach, the results contained within this report do not provide the most comprehensive picture of small urban manufacturing in Houston. Rather they reflect the businesses and small firms most likely to interact with our partners. As mentioned, our results are also reflective of firms from all across Houston as we did not limit responses from outside the original target area: neighborhoods east and south of downtown.

To truly understand the economic impact of small manufacturers, in the target area, city, or region a complete economic census of every small manufacturer in the region would be necessary. However, a complete economic census was not possible within the time frame. Additionally, our team lacked the necessary resources to build effective relationships with the untold dozens of small-scale manufacturers operating in our region to conduct this census.

Future iterations of this study should focus on filling this gap with targeted outreach to small manufacturers over a longer period of time. In so doing, a more accurate pictures and assessment of the sector’s economic impact could be attained.

Despite these limits, the unique perspectives, challenges, and ideas contained within this report are critical data points in any efforts to devise strategies and inform policies that better support the growth and success of small manufacturing in Greater Houston.

Survey Results

This section covers each component of the aggregate survey results. A short description of the results and a visualization, if appropriate, accompanies each question. Questions that cannot be aggregated or are protected information are not included.

The survey garnered responses throughout the Greater Houston region. Figure A.1 shows the spatial distribution respondents for 68 surveys. The initial target area, around TX/RX Labs, received the most responses and is the only area with a marked density of responses.
FIGURE A.1  
Survey Results Density Map

FIGURE A.2  
Survey Response by Week
Each survey respondent was automatically marked with a timestamp when they completed the survey. Figure A.2 shows the span of survey results beginning in the week of April 7 through the final day, August 15. Generally, the spikes in survey responses on a week to week basis originated from partner organizations disseminating the survey to their respective email distribution lists. The survey spanned across 19 weeks, however only 13 weeks received responses.

Section 1—General Business Information
At the start of the survey respondents were asked to fill out general business information. This information, with the exception of their self-description, is omitted because it contains personally identifiable information.

Question 5: How would you describe your business? (e.g., food and beverage manufacturer, textile production, chemical manufacturer, wood product manufacturer, etc.)

Responses: 69

The business descriptions were pulled from every respondent’s survey. The descriptions were tokenized by the anonymized id for every respondent. The words were then filtered to remove “stop words”. Figure A.3 displays the words respondents used most to describe their business.

Section 2—Over 25 workers
At the end of the first section, respondents were asked to identify as a “small manufacturer,” defined in this study as a business employing 25 or fewer workers. Respondents with over 25 workers were asked additional questions while the remainder of respondents were redirected to the third section.

Question 7: Does your business employ more than 25 workers?

Responses: 69

Question 8: On average, how many workers do you employ per year?

Responses: 4

Employee number ranges from 30 to 300.

Question 9: How does your employee count fluctuate throughout the year?

Responses: 4

No insights could be determined from these responses.

Section 3—Current Resources and Challenges
This section asked primary owners or chief executives about their future plans for their businesses, the current challenges impacting growth and development, as well as, hiring and training needs for production employees.

Question 10: In the next one to three years, do you expect your business to be in a larger space or facility?

Responses: 67
**Question 11:** If you responded yes to the above, why do you need new space? If no, please leave blank.

Responses: 31

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**Figure A.6** displays the top words used to describe why new space is needed. Consecutive words used in these descriptions were paired to create bigrams. Bigrams did not yield a significant pair of words used, however the pairs of words used suggest small manufacturers are growing out of space: “customer base”, “3D printer”, “additional machinery”, “business growth”, “capabilities increase”, “clientele growth”, “demand growth”, “expanded operations”, “expanding customers”, “future employees”, “future projects”, “increase production”, increase volume. These pair words suggest small manufactures need space for growing their businesses and to scale production with additional equipment.

**Question 12:** In the next one to three years, do you plan to keep your business in Houston?

Options:

1. Yes, I plan to stay in Houston, in the same space or facility
2. Yes, I plan to stay, but will move to a new space or location
3. No, I plan to leave the city for opportunities elsewhere
4. Not sure or don’t know
5. Other

Responses: 67

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**Figure A.7** Pie Chart—SUMs staying in Houston

**Figure A.8** Pie Chart—Houston growth opportunities

**Question 13:** In general, how do you view the growth opportunities for similar small urban manufacturers in Houston?

Responses: 67

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**Question 14:** From the following list, please identify the five most pressing challenges that impact your business. You may select up to five.

Options:

1. Access to capital
2. Affordable space for my business
3. Competition
4. Customer service demands
5. Crime and safety
6. Navigating government regulations
7. Navigating government business incentives
8. De-industrialization
Section 4—Hiring and Training Your Production Employees

In this section, respondents were told that for the purposes of the study, production employees are defined as those who do everything related to the manufacturing of products (e.g., those engaged in fabrication, assembly and related activities, material handling, warehousing and shipping, maintenance services, etc.).

Question 15: Are you having trouble finding qualified production employees in Houston for your business?

Options:
1. Yes
2. No

Responses: 65
**Question 16:** Do you have machines or equipment but can’t find qualified, skilled labor to operate them?

**Answer:** 28.36% Yes, 71.64% No

**Figure A.11** Trouble finding qualified employees but we have the right equipment

**Question 17:** How do you typically find new production employees? Please select up to three.

- 1. Non-profit or government-operated workforce/job-training programs
- 2. Private staffing companies/services
- 3. Referrals from existing employees
- 4. Referrals from friends or network
- 5. Referrals from academic institutions
- 6. Independent job postings (e.g., Craigslist, etc.)
- 7. Union
- 8. Workforce apprenticeship
- 9. Walk-in referral
- 10. Other

Responses: 64

**Question 18:** When looking to hire new production employees, what skills, trainings, or credentials do you value most in hiring? If none, please leave blank.

Responses: 36

**Figure A.12** How SUMs find production employees

**Figure A.13** Skills valued, word cloud
The word cloud in figure A.13 displays the most used words when respondents described what skills they looked for in hiring. The unigrams are not very informative since they only show that skills and experience are valued. Bigrams show that small urban manufacturers generally value soft skills and previous experience in trade.

**Question 19:** Why do you value these skills, trainings, or credentials when hiring new production employees?

Responses: 35

All the words in Figure A.14 are used the same amount of times; however they are the most used words when respondents described why they value the skills from question 18. Bigrams and trigrams did not yield any significant finding. However, the general theme is flexibility in learning/adaptability and a positive attitude helps promote a good work flow.

**Question 20:** For your current production employees, how do you provide upskilling or training? Please select all that apply.

Options:
1. Internal training
2. In-house apprenticeship
3. External training service providers
4. External workforce apprentice program
5. External unions
6. Other

Responses: 62

**Question 21:** Are you utilizing any federal-, state-, or city-funded programs to cover some of the cost of training your production employees? (e.g. Texas Workforce)

Responses: 67
Question 23: Does your business have an online presence?

Options:

1. Yes, I have my own website and domain name
2. I don’t have a website, but I use an online store front (e.g. Etsy or Shopify)
3. I don’t have a website, but my business has a social media page describing my business/products
4. I don’t have a website or social media presence
5. I would like to increase my online presence, but do not currently have the capacity to do so

Responses: 67

Question 24: Would you like external support in marketing and branding your products to expand your current customer base?

Responses: 67

Question 25: Do you have any additional information that you would like to provide to us today related to the challenges you face in operating a small urban manufacturing business in Houston? If no, please leave blank.

Responses: 19

Figure A.19 shows the top words they used to cover any additional information related to challenges they face operating their business in Houston. Generally, the respondents wanted more access to resources to facilitate connections between available resources, capital, and other small manufacturers.
Section 5—connections to local business support services

This section asked respondents to consider the services and support they have received from Houston-area organizations to address any of the challenges they identified in the previous section.

Question 26: From the following list, please select the reasons for which you have sought or continue to seek free or affordable services to support your business. Please select all that apply.

Options:

1. Affordable space for my business
2. Access to capital/financing
3. Finding qualified employees
4. Finding retailers
5. Reaching new customers
6. Planning for the future of my business
7. Competition
8. Customer service demands
9. Technology limitations (e-commerce, logistics, tracking products and sales, scaling operations, etc.)
10. I don’t know how or where to access free or affordable services for my business
11. Other

Responses: 67

Question 27: Which of the following Houston-area organizations have you worked with to support your business? Please select all that apply or select none if you have not worked with any organization.

Options:

1. TMAC Gulf Coast
2. TXRX Labs
3. BakerRipley
4. University of Houston Libraries Makerspace
5. Station Houston
6. Liu Idea Lab for Innovation and Entrepreneurship at Rice University
7. RED Labs at the University of Houston
8. Houston Technology Center
9. Greater Houston Partnership (GHP)
10. Accenture Houston Innovation Hub
Question 28: What services did these organizations provide your business?

Options:
1. Workforce placements
2. Land use and real estate development
3. Marketing
4. Local sourcing
5. Retail placement
6. Government navigation
7. Finance and accounting
8. IT/Systems
9. Supply Chain
10. Business plan development
11. Fabrication
12. None, I have not used these services
13. Other

Responses: 66
Question 29: At any point, have you used a “makerspace,” incubator, or product accelerator as part of your business: for your training, for small-scale/limited-run fabrication, for hourly access to specialized equipment, etc.?

Responses: 67

Question 30: If you answered yes to the above question, which ones have you used? If no, please continue to the next question.

Responses: 12

Question 31: If you have not worked with any of the above support service organizations, are there any reasons why you have chosen not to do so? If not, please leave blank.

Responses: 23

The words used in this response were tokenized by the unique id of the respondent, assigned a sentiment from the NRC sentiment lexicon. Text analysis does not yield any significant results. The majority of the respondents were not aware of makerspaces or offered a negative response towards the availability, helpfulness, and cost of
working with makerspaces. In a quick sentiment analysis, 14 respondents expressed positive emotions and 8 expressed negative emotions in their response.

The sentiment analysis is not conclusive towards the actual sentiment of small urban manufacturers towards service organizations because of the low sample size and limited nature of responses.

**Section 6—Hurricane Harvey Impact**

This section asked respondents to reflect back on their business’ experience during Hurricane Harvey in August 2017. The section first asked if they were impacted or not, those who were not impacted were redirected to section seven, while the remainder were asked additional questions regarding their direct or indirect impact from Hurricane Harvey.

**Question 32:** Was your business impacted by Hurricane Harvey?

Responses: 67

**Question 33:** Would you like assistance related to disaster recovery and preparing for future disasters?

Responses: 67

**FIGURE A.25 Hurricane Harvey Impact**

- Yes: 35.82%
- No: 64.18%

**FIGURE A.26 SUMs desire for disaster assistance**

- Yes: 29.85%
- No: 70.15%

Questions 34 through 39 asked respondents to estimate the financial impact in the following categories, caused directly or indirectly by business interruption from Hurricane Harvey.

**Question 40:** How long did it take to recover your business to pre-hurricane status?

Options:
1. Zero to one week
2. One week to two months
3. Two to six months
4. Over six months
5. My business still has not fully recovered

Responses: 22

**FIGURE A.27 Summary of Harvey impact**

<table>
<thead>
<tr>
<th></th>
<th>Equipment Related Damage</th>
<th>Facility Related Damage</th>
<th>Inventory Related Damage</th>
<th>Office Related Damage</th>
<th>Personnel Impact</th>
<th>Supply Chain Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Min</strong></td>
<td>$3,000.00</td>
<td>$16.00</td>
<td>$800.00</td>
<td>$144.00</td>
<td>$16.00</td>
<td>$64.00</td>
</tr>
<tr>
<td><strong>Max</strong></td>
<td>$100,000.00</td>
<td>$600,000.00</td>
<td>$2,000,000.00</td>
<td>$300,000.00</td>
<td>$400,000.00</td>
<td>$300,000.00</td>
</tr>
<tr>
<td><strong>Average Loss</strong></td>
<td>$39,666.67</td>
<td>$117,335.11</td>
<td>$284,475.00</td>
<td>$68,967.64</td>
<td>$100,004.18</td>
<td>$91,012.80</td>
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<tr>
<td><strong>n</strong></td>
<td>3</td>
<td>9</td>
<td>8</td>
<td>11</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total Loss</strong></td>
<td>$119,000.00</td>
<td>$1,056,016.00</td>
<td>$2,275,800.00</td>
<td>$758,644.00</td>
<td>$1,100,046.00</td>
<td>$455,064.00</td>
</tr>
</tbody>
</table>
Section 7—More about the owners
This section asked respondents to fill out information about the primary owner or chief executive of the business.

**Question 42:** On December 31, 2018, how many people owned this business?

Options:
1. One person
2. Two to four people
3. Five to ten people
4. Eleven or more people
5. Business is owned by a parent company, estate, trust, or other entity
6. I don’t know

Responses: 66

**Question 43:** On December 31, 2018, was this business owned by a government or tribal entity?

Responses: 65

**Question 44:** How did you initially acquire this business?

Options:
1. Founded or started
2. Inherited
3. Purchased
4. Received transfer of ownership or gift
5. Other

Responses: 65
Question 45: In 2018, which of the following best describes your role as the primary owner in this business? Please check all that apply.

Options:
1. Managing day-to-day operations
2. Providing services and/or producing goods
3. Financial control with the authority to sign loans, leases, and contracts
4. None of these functions
5. Other

Responses: 65

Question 46: In 2018, what was the average number of hours per week that you spent managing or working in this business?

Responses: 62

Question 47: In 2018, was this business your main source of income?

Responses: 63

Question 48: What is your sex?

Responses: 63

Question 49: Are you of Hispanic, Latino, or Spanish origin?

Responses: 61
**Question 50:** What is your race? Please check all that apply.

Options:
1. White
2. Black or African American
3. Native American
4. Asian
5. Mixed Race
6. Other

Responses: 58

**Race of owner**

- White: 81.03%
- Black or African American: 6.90%
- Native American: 5.17%
- Asian: 6.90%
- Mixed Race: 6.90%

**Question 51:** Have you ever served in any branch of the U.S. Armed Forces, including the Coast Guard, the National Guard, or a Reserve component of any service branch?

Responses: 65

**Veteran owners**

- Yes: 12.31%
- No: 87.69%

**Section 7—More about the business**

This section asked respondents to provide a baseline of socioeconomic information on their businesses.

**Question 52:** In what year did you begin operating your business? (YYYY)

Responses: 62

**Year operations started for the business**
**Question 53:** Do you rent or own your business space?

Responses: 65

**Figure A.40** SUMs rent vs. owning their space

Questions 54 and 55 asked respondents to input their total revenue in 2017 and 2018.

**Figure A.41** SUMs Revenue, 2017 and 2018

<table>
<thead>
<tr>
<th></th>
<th>Revenue 2017</th>
<th>Revenue 2018</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>min</td>
<td>$ —</td>
<td>$ 7,500.00</td>
<td></td>
</tr>
<tr>
<td>max</td>
<td>$ 2,000,000.00</td>
<td>$ 105,000,000</td>
<td></td>
</tr>
<tr>
<td>average</td>
<td>$ 2,177,944.18</td>
<td>$ 7,457,728.32</td>
<td>56.74%</td>
</tr>
<tr>
<td>n</td>
<td>20</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>total</td>
<td>$ 47,914,772.00</td>
<td>$ 1,056,016.00</td>
<td>242.42%</td>
</tr>
</tbody>
</table>

**Question 56:** Do you outsource any of your production?

Responses: 60

**Figure A.42** Outsourced production

**Question 57:** If you responded yes to the above, what do you outsource specifically? If no, please leave blank.

Responses: 30

**Figure A.43** Outsourced production, word cloud

Figure A.43 shows the top words used in the responses for the products outsourced by SUMs. While the single words are not entirely insightful, the n-grams show that power coating, 3D printing/design, things having to do with metal, and CNC (milling plasma and routing) are the primary services outsourced by respondents.

**Question 58:** Does your business hold patents, trademarks, or copyrights that are essential to your present operation?

Responses: 61

**Figure A.44** Patents and trademarks held by SUMs
Section 8—More about production employees
This section asked survey respondents to reflect on the number of employees they employed in different categories. In the following tables we provide the smallest number (min), the largest number (max), the average, the total responses (n), and the overall total of production employees in each category.

Questions 59 through 61 asked respondents how many full-time (W2), part-time (W2), and contract (1099) workers they employed.

Questions 62 through 68 asked respondents how many workers of each demographic category they employed.

Questions 69 and 70 asked respondents how many of their production employees live within two miles of their business location and how many of their production employees use public transit to reach their business location.

Employment type for production employees

<table>
<thead>
<tr>
<th></th>
<th>Employee FT</th>
<th>Employee PT</th>
<th>Employee 1099</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Max</td>
<td>25</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Average</td>
<td>7.3</td>
<td>2.0</td>
<td>3.5</td>
</tr>
<tr>
<td>n</td>
<td>27</td>
<td>9</td>
<td>22</td>
</tr>
<tr>
<td>Total Employees</td>
<td>196</td>
<td>18</td>
<td>78</td>
</tr>
</tbody>
</table>

Demographics of production employees

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>White</th>
<th>Black</th>
<th>Asian</th>
<th>Hispanic</th>
<th>Other Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Max</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>2</td>
<td>25</td>
<td>22</td>
</tr>
<tr>
<td>Average</td>
<td>5.9</td>
<td>4.2</td>
<td>4.3</td>
<td>4.0</td>
<td>1.7</td>
<td>5.5</td>
<td>10.0</td>
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<tr>
<td>n</td>
<td>34</td>
<td>26</td>
<td>26</td>
<td>10</td>
<td>7</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Total Employees</td>
<td>202</td>
<td>109</td>
<td>112</td>
<td>40</td>
<td>12</td>
<td>110</td>
<td>30</td>
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</tbody>
</table>

Local employees and transit dependent employees

<table>
<thead>
<tr>
<th></th>
<th>Local Employees</th>
<th>Transit Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Max</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Average</td>
<td>4.6</td>
<td>5.2</td>
</tr>
<tr>
<td>n</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>Total Employees</td>
<td>97</td>
<td>31</td>
</tr>
</tbody>
</table>
Section 9—Market for SUMs products
The final section asked respondents to provide information for their product market and customer base.

Questions 71 through 74 asked respondents to provide the estimated percentage their products are generally distributed, in the local (neighborhood, city, or metropolitan area), statewide, national, or international market.

Notably, 6 firms (10%) cater entirely in the local market, while 3 (5%) cater entirely in the national market and 3 (5%) cater entirely to the international market.

Question 75: In 2018, which of the following were your customers? Please select any category from the list below that you would consider a customer for your products.

Options:
1. Direct to consumer
2. Designers/engineers
3. Vendor to manufacturer
4. Retailers
5. Wholesalers/distributors
6. Government (non-military)
7. Government (military)
8. Other

Responses: 60
We would like to thank all our partner organizations who were instrumental in making this survey on small manufacturers possible. TX/RX Labs and Houston LISC supported the study financially and provided industry expertise. BeehiveFund/TMAC Gulf Coast provided technical expertise, a manufacturing inventory for the region, and helped distribute the survey to their members. Additional organizations helped distribute the survey, including Fresh Arts.
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- Becky and Ralph O’Connor *

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