

The Maker Economy in Action: Entrepreneurship and Supportive Ecosystems in Chicago, New York and Portland

A research monograph funded by the Ewing Marion Kauffman Foundation's program on metropolitan entrepreneurship



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I. Understanding the Maker Economy

“A new type of producer society [is] taking shape [that] ... has the potential to transform how we think and talk about American manufacturing—as well as its role in the U.S. economy.”

- (Stangler and Maxwell, DIY Producer Society, 2012)

“Makers are currently serving the ‘long tail’ of demand with unique products that embody a range of customization and/or localization...over time, we could see customized products making up an increasing portion of the market.”

- (Maker Media & Deloitte Center for the Edge, Impact of the Maker Movement: Notes from the Maker Impact Summit, 2013)

“The maker movement is centered in cities. And this new, hyperlocal manufacturing environment holds potential not only for individual hobbyists but also for community-wide advances in local entrepreneurship and job creation. Cities have a great opportunity to catalyze this movement as a way to improve our local economies, diversify workforce opportunities, and support the creative economy.”

– (How Cities Can Grow the Maker Movement, National League of Cities, 2016)

The maker movement has generated interest from hobbyists, entrepreneurs, and policymakers, and understandably so. As a source of practical learning tools and as an affiliation for businesspeople, the movement promises to embed a set of liberating technological advancements in networks of inventors, artisans and entrepreneurs dedicated to the places where they live. To many, the maker movement represents a new paradigm for how people work, play and consume. To many others, it signifies an opportunity to rebuild our collective infrastructure for innovation, production, and broad-based economic prosperity in the wake of decades of public and private disinvestment from the U.S. manufacturing sector.

Broad and sustained enthusiasm for the maker movement arises from its origins in, and contributions to, significant changes in technology, business organization, production, and consumption:

- The development and maturation of rapid-prototyping production technologies plays a key role. The accessibility of 3D printers, personalized computer-numerically-controlled (CNC) machine tools, and printed circuit boards has reduced dramatically the barriers to market entry for makers.
- The proliferation of digital technologies, especially Internet and social media platforms, allows makers to refine their craft and take goods to new consumer markets.
- Growing consumer demand for distinctive local, handmade, and artisan products – as well as for products that embody the potential of do-it-yourself technologies, programmable devices and the “internet of things” – drives the appeal of goods produced by maker enterprises.
- Diminished job security changes how people, especially younger people, re-evaluate the benefits and costs of traditional careers. As awareness of labor-market precariousness and the downsides of the “gig economy” grows, making provides new pathways for individuals to become self-reliant entrepreneurs.

These developments arrive as elected officials and public policy makers are demonstrating growing support for innovation-led manufacturing. In the wake of the deep job losses incurred during the financial

crisis and Great Recession of 2007-2009, public policy attention and initiatives have turned towards manufacturing, both to support the trend toward “onshoring” and to ensure the expansion (or maintenance) of manufacturing production jobs that often provide better livelihoods than service-sector employment. The most ambitious of these programs, the Obama Administration’s Advanced Manufacturing Partnership, exemplifies this shift by focusing resources on product and process innovation and by taking steps to support the expansion of domestic manufacturing production.¹ In 2014, the Administration launched two additional initiatives: the Nation of Makers Initiative, through which federal agencies have announced new programs designed to reach students and potential entrepreneurs with tools, mentoring and training; and the Investing in Manufacturing Communities Partnership, through which federal economic development agencies support and encourage comprehensive planning designed to attract global manufacturer and supply chain investments to specific local areas.²

But policy support for making extends beyond the federal level. Groups such as the Urban Manufacturing Alliance and local “Maker Cities” efforts support a proliferation of initiatives around the country that aim to rebuild domestic supply chains and stimulate consumer demand for locally- and regionally-made products.³ Likewise, the steady post-recession rebound in U.S. manufacturing employment lends support to aspirations for a revitalized economy that combines middle-wage jobs with opportunities to build innovative, dynamic enterprises. In public policy, making has come to embody the potential for local economic development that can occur when individual innovators can easily access low-cost production capacity, streamlined marketing and distribution channels, and communities of peers and co-enthusiasts on the internet and in their own neighborhoods.

Filling the Knowledge Gap

Despite growing interest in making, evidence on the motivations and activities of maker businesses, and on the ecosystems in which they operate, remains limited. This research, funded by the **Ewing Marion Kauffman Foundation** through its Urban and Metropolitan Entrepreneurship research program, fills an important gap. This work fills an important gap: it accounts for makers’ motives, goals, and challenges they face in moving from ideas to consumer products. It also reveals the workings of the varied organizations and policies that create and sustain maker-entrepreneurial ecosystems at the urban and regional scale. By shifting focus from making’s seemingly boundless potential to the basic practices of this emergent form of entrepreneurship, this monograph builds important new knowledge:

- First, drawing on data from interviews with nearly 100 maker businesses, it provides unique and detailed information about who makers are, what differentiates makers from traditional entrepreneurs, and what challenges face the large subset of makers who are attempting or will attempt to become manufacturers.
- Second, it documents makers’ interactions with the local communities, resources, institutions and networks central to their work. Drawing on interviews with more than 40 distinct maker-supporting

¹ President’s Council on Science and Technology, 2014; Subcommittee for Advanced Manufacturing of the National Science and Technology Council, 2016

² White House, Nation of Makers Initiative: <https://www.whitehouse.gov/nation-of-makers>; Investing in Manufacturing Communities Partnership <https://www.eda.gov/challenges/imcp/>.

³ Clark 2014, Hirschberg, Dougherty & Kadanoff 2016

institutions in three cities, it provides detailed information on the production ecosystems that constitute and support the maker economy; on the roles that these institutions and actors play; and on how and why those maker ecosystems vary geographically.

Detailed information on makers and their supporting ecosystems helps to clarify the role that public policy can play in supporting makers and maximizing the maker economy's benefit to regions, cities and communities.

Three urban maker economies

The firms we interviewed are based in three major cities: New York City, New York, Chicago, Illinois and Portland, Oregon. This regional dimension deepens the impact of our research, as makers build their businesses out of distinctive local opportunities and resources. Interviewing large cohorts of makers in each city made it possible to establish systematically how these entrepreneurs draw on the place-specific design, production, financing and marketing resources available to them. Our aggregate assessment of making is based on a combined picture of the ecosystems in three cities where the maker movement is strong and growing.

Road map

This research monograph is divided into four main sections. Section Two details our research design and methods and characterizes, using summary statistics, the maker firms and support institutions we interviewed. Section Three summarizes our core findings. Finally, Section Four explores the future research and policy implications of the findings. Our research uncovers three distinct types of maker-entrepreneur: micro-makers, emerging place-based manufacturers, and global innovators. Each type requires a distinctive set of policies to maximize their potential to generate local economic growth and employment opportunities. Further, makers need grounded, dynamic and locally-specific infrastructure programs, policies and approaches that patch place-specific holes in local maker entrepreneurial ecosystems.

II. Research Design and Methods

A. Definitions: Who counts as a maker?

Existing definitions of making reflect the breadth of interest in the subject. The movement's most enthusiastic proponents, such as Dale Dougherty and Chris Anderson, emphasize making's status as an ethical or value affiliation and as an educational opportunity, arguing that the term 'maker' describes each one of us, no matter how we live our lives or what our goals might be.⁴ When advocates of making argue for the movement's economic impact, they suggest that the accessibility of technology might make all of us into entrepreneurs. Tim Bjarin, writing in *Time*, argues that making "has the potential to turn more and more people into makers instead of just consumers, and I know from history that when you give makers the right tools and inspiration, they have the potential to change the world."⁵

⁴ Dougherty 2012; Anderson, 2012; Roy 2015.

⁵ Bjarin, 2014.

Following popular interest in making, these definitions are more aspirational than practical. Because our research takes as its subject the practical questions of how makers build revenue-generating businesses and help local economies to grow, and how (and why) public policy would ideally support them, we confined our research to a sub-set of makers seeking to integrate the design of new goods and products with their production for sale:

Maker firms integrate design and production in creating goods for sale. For maker-entrepreneurs, production is essential to, and informs, the creative process.

This definition of making has two distinct advantages. First, it ties making directly to the business and economic outcomes of interest to policymakers, i.e., innovation and employment. Second, it offers a set of criteria for identifying units of analysis for a study of urban and metropolitan entrepreneurship.

Most production businesses feature division of labor among workers, with some more actively engaged in design and conceptualization and others more in production. In maker enterprises, however, we see a tighter integration between the two than in traditional manufacturing, and a greater recognition of the value that is created, and the skill deployed, in the production process.⁶ Maker enterprises do not need to engage in the full production process in-house for this to be the case; even when makers contract out specialized manufacturing, their activities key on the relationship between design and production. In other words, the relationship between design and production may be spread across enterprises, but the latter is not subordinate to the former. Where this occurs in a local or regional context, the result is a “working region” where innovation and production take place in an iterative, integrated and socially embedded way.⁷

Although the maker movement has been embraced by a wide spectrum of economic actors – from musicians to software coders – we focus in this report on makers whose products require the inputs and techniques of manufacturing. This includes a wide range of products, including food, apparel and accessories, furniture, decorative objects for the home, connected devices, and robots. This sectoral diversity can also be expressed in terms of three main product types (Figure 2.1): durable craft goods or “bags;” artisanal food and beverages or “bites;” and products that combine materials and design knowledge with expertise in software and computer-programmable machinery (“bots”). Across these product areas, entrepreneurs are experimenting with advanced manufacturing processes such as 3-D printing and CNC machining. But makers of durable craft goods and food (on the one hand) and of hardware (on the other) occupy distinct niches in the capital and consumer markets: Crafts and food makers appeal to a “small-is-beautiful” ethos among consumers, while hardware entrepreneurs harness new trends in machine technology and robotics, and appeal to the aesthetics of hacker culture. The common thread connecting maker-entrepreneurs, whether artisans or hardware start-ups, is integration and feedback between the design and production processes.

⁶ See Anderson, 2012; Roy, 2015.

⁷ Clark, 2013.

Figure 2.1

Typology of Maker-Entrepreneurs

Product Type	Description	# of Firms Interviewed			
		Chicago	NYC	Portland	Total
“Bags”	Durable and/or household craft goods, such as apparel, furniture, and jewelry.	14	18	20	52
“Bites”	Food and beverage products, often produced through artisanal/craft production.	3	13	5	20
“Bots”	Technology-based and/or -embedded objects, such as robots, Internet-connected devices and “wearable” technology.	9	8	5	22
Total		26	39	30	95

B. Identifying and interviewing makers

Because many makers are either new businesses, small businesses or sole proprietors without employees, they are largely invisible to business databases like Reference USA or Dun & Bradstreet, or the state unemployment insurance databases on which basic economic and employment statistics are based. Even if these databases did capture makers reliably, our defining characteristic of makers – the integration of design and production activities – is not easily observed in secondary data. Similarly, there are no available records of whether an individual or business identifies herself or itself as a “maker” or part of the maker movement. We looked instead for individuals and businesses that were developing and marketing new and novel products and that either currently were engaged or recently had engaged in the manufacture of those products.

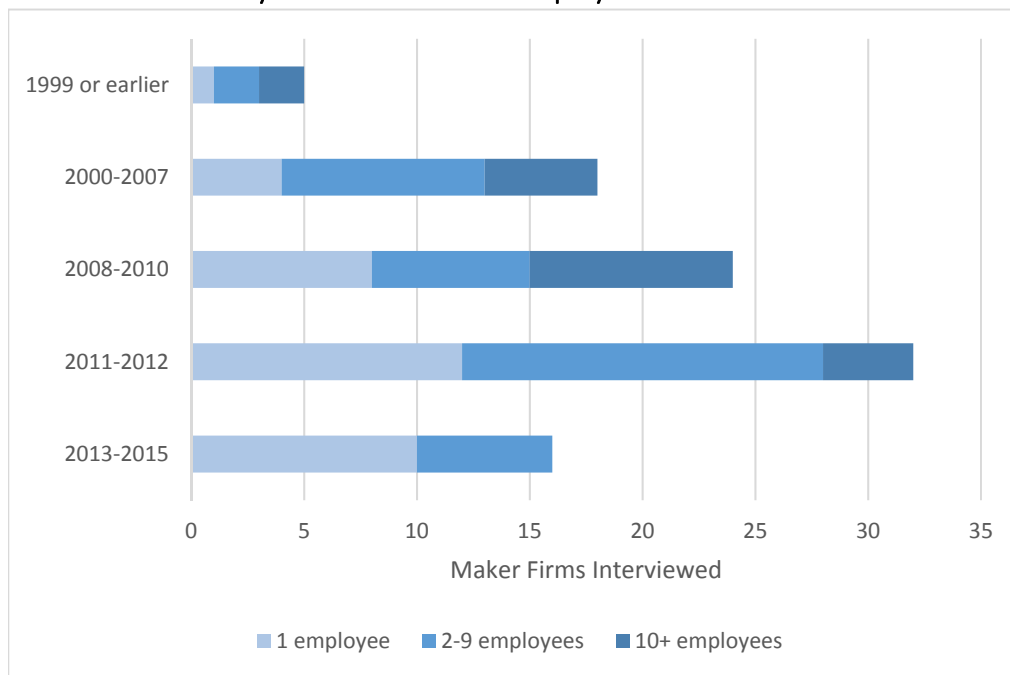
Using a set of decision rules developed by members of the research team (see Appendix A), each of the three sites developed a local database:

- The New York City team drew primarily on the “Made in NYC” database developed by the Pratt Center for Community Development. This was augmented through web research and through the researchers’ attendance at events including a “New York’s Next Top Makers” meetup (sponsored by the city’s Economic Development Corporation) and an open studio night at the hacker space NYC Resistor.⁸
- The Portland team combined member data obtained from the Portland Made Collective (a local membership organization representing a diverse set of artisans, makers and local manufacturers) with an online inventory of more than 700 artisans and makers in the Portland region. This inventory was based on extensive analysis of maker- and artisan-related websites, including local boutiques and maker-serving organizations.
- The Chicago team combined data from Makerbiz and the local organization Catalyze with an online inventory built from websites such as Facebook and Etsy.

⁸ Among the five New York City boroughs, the underlying distribution is 65% in Brooklyn, 28% in Manhattan and 7% in Queens.

Members of the research team agreed on two shared inclusion criteria. First, the maker needed to be a *commercial enterprise* and not simply an experimenter or crafter. This encompassed both makers engaged full-time in managing maker enterprises and those whose firms were side businesses or sources of secondary income. Second, makers needed to make *physical objects* – i.e., they needed to be a manufacturer or a craft producer with a physical end-product. We generally excluded artistic and cultural makers (except for those making tangible products like glass or pottery), and digital makers, including software designers and digital media producers. Although our working definition emphasizes the integration of design and production activities, we did include makers who, in scaling up their enterprises, had transitioned from in-house to outsourced production. Finally, although we did not set a specific size threshold, the companies in our sample were, with only two exceptions, businesses with 25 employees or fewer. Fifty percent were sole proprietorships; the average firm had 4.5 employees and just 20 percent had more than 10. Ninety-five percent of the firms in our sample had been founded since 2000, with fifty-one percent founded after 2010 (Figure 2.2).

Figure 2.2
Maker Businesses by Year Founded and Employment Level



At each site, researchers adopted a modified variant of a stratified sampling methodology to select interview candidates. However, because no site had a database with complete information on the characteristics of maker businesses, the population parameters were not readily knowable. Thus, the site teams sought to develop a broadly representative sample from among the makers in their databases, working iteratively to capture maker types and characteristics believed to be underrepresented in previous waves of interviews. However, the representativeness of the final interview sample relative to the larger universe of makers is impossible to assess at this time.

The research team collaboratively developed a semi-structured interview protocol, which focused around the following broad themes:

- Founder and company background;
- Production methods and process;
- Sales and market geography;
- Support ecosystem;
- Maker identity and engagement;
- Future of company.

We conducted a total of 95 maker interviews across the three cities between May 2015 and April 2016. Nearly all occurred in-person, most taking place at the maker’s workspace, and typically lasted 45 to 60 minutes. Where the interviewee consented, interviews were audio-recorded, and detailed interview notes were developed, supplemented with verbatim quotes where available.

Interview notes were uploaded into the web-based qualitative analysis software Dedoose. Each site coded its interviews thematically based on a codebook developed collaboratively by the research team (Appendix B). To ensure consistency and reliability across sites, we tested a sample of interview excerpts between the original site coding and coders from the other two sites. These tests showed general agreement across sites.

C. Identifying and Interviewing “Maker-Enabling Entrepreneurs”

To gain a broader perspective on makers’ interactions with maker communities, entrepreneurs and local producers, we also interviewed firms and organizations – public, private, and non-profit sector – that work with makers, enabling them to get started, grow and succeed. Because many of them are entrepreneurial ventures in themselves, we dubbed this group “maker-enabling entrepreneurs” (MEEs).

We identified MEEs inductively. We began by gathering information through online and other data sources about organizations targeting maker businesses. This was often relatively easy to obtain, especially for established, prominent organizations. We also attempted to learn from makers themselves with whom they worked both currently and in the past. By starting from makers and then identifying MEEs, we hoped to avoid interviewing only makers with connections to MEEs (e.g., makerspaces and other support organizations), since the extent to which makers are connected to, and benefit from, the local support infrastructure represented an important research question for us.

In interviewing MEEs, we asked about their:

- Organizational/founder history and background;
- Activities and functions
- “Value proposition;” and
- Assessment of the overall local maker ecosystem.

We identified six different functions performed by MEEs – technology access and prototyping; real estate and affordable workspace; business technical assistance; finance and capital access; sales and marketing platforms; and networking and community-building (Figure 2.3). In practice, most of the MEEs we interviewed performed multiple functions, and there were common functional hybrids, which we discuss

in in section III.B. We conducted a total of 41 MEE interviews across the three sites between May 2015 and April 2016. As with our maker interviews, we developed a thematic codebook and coded the interview summaries using Dedoose.

Figure 2.3

Functional Roles of Maker-Enabling Entrepreneurs

FUNCTION	DESCRIPTION	EXAMPLES
TECH ACCESS/ PROTOTYPING	“Makerspaces” where maker-entrepreneurs share affordable access to capital-intensive manufacturing equipment, such as laser cutters, 3-D printers and CNC lathes, allowing them to experiment with designs and prototypes and run small batches of their products. Often membership-based and open to the public, with classes where makers learn how to use technology.	ADX Portland Manufacture NYC Catalyze Chicago
REAL ESTATE/ AFFORDABLE WORKSPACE	Shared spaces in which maker-entrepreneurs can rent workspaces flexibly and inexpensively. Can operate as incubators with focused business assistance and technology access, mission-driven real estate ventures, or as maker-run “collectives” with informal knowledge exchange and mentoring among makers.	Organic Food Incubator, NYC Industrial Council of Nearwest Chicago Tillamook Station, Portland
BUSINESS TECHNICAL ASSISTANCE	Support for maker-entrepreneurs with business challenges as input sourcing, personnel management, branding, and product distribution. Established business assistance organizations and newly created ventures offer the services of experienced manufacturing professionals and business generalists.	Evergreen Exchange, NYC MakerBiz, Chicago Crowd Supply, Portland
FINANCE/ CAPITAL ACCESS	Support for maker-entrepreneurs in connecting with localized networks of deal-makers and investors of risk capital. Includes both venture/growth capital for startup and early-stage businesses, and working capital for established businesses.	New York City Partnership Fund Sandbox Industries, Chicago Craft3, Portland
SALES/ MARKETING PLATFORM	Platforms and venues for maker-entrepreneurs to market their goods and connect with customers locally and globally, including online marketing sites, retail establishments, and fulfillment services.	Etsy, NYC Wolfbait & B-Girls, Chicago Made Here Pdx, Portland
NETWORKING, COMMUNITY- BUILDING, AND ADVOCACY	Support for “soft infrastructure” of peer networks, brand identity and attachment to place. Also advocacy for maker-entrepreneurs in local policy arenas, taking up such concerns as industrial land use and services for emerging manufacturers.	New York’s Next Top Makers (NYC Economic Development Corporation) Portland Made Collective

III. Findings

A. Maker-entrepreneurs

- *Makers generally begin with a focus on products, not markets.*

In popular use, entrepreneurship is synonymous with risk-taking, with the identification of new markets, and with the pursuit of prospects for out-matching competitors in those markets.⁹ But maker-entrepreneurs begin with a focus on products rather than markets. Most of the makers in our sample came from art and design backgrounds, and those who did not had often been trained as engineers, who typically specialize in solving narrowly defined problems. (Table 3A.1) Furthermore, the firms that maker-entrepreneurs build from the products they create often emerge from deeply held values, whether defined in terms of attachment to place, a response to changing norms of work, a sense of social and ecological responsibility, or new ways of relating with the material world. Most makers' businesses started as craft hobbies, design ideas or problem-solving exercises not directly yoked to future plans for business growth and expansion.

Makers' backgrounds and their value orientations influence their potential for entrepreneurship in several ways. First, the majority of makers identifies making as an end in and of itself. Firms in the electronics and machinery sectors focus on the pleasure and ease of relying on open source tools and technology, while for firms in apparel, food and household goods, craft and artisanship are more prominent.

Table 3A.1
Makers by Founder Educational Background

Educational background	Makers	% of Total
Art and design	39	41%
Science & engineering	18	19%
Business and law	17	18%
Social science & humanities	11	12%
Other fields	10	11%
Total	95	

I had always loved making toys (in art school, I had incorporated them into sculptures) – and had been making them anyway for my son ... so I decided to start a toy-making business...I think of myself as a craftsman.

- Toy company, New York City

I...pretty consciously, had this romantic vision in my head of like “I want to be like the swordsmith in the small Catalan village where I can just have a decent living because I make something cool and beautiful and I make them all myself and maybe I’ll have assistants at one point” - but you know, that was definitely the vision that I had.

- Specialty acoustical equipment company, Portland

Others turned to making out of a desire to see their daily labor generate tangible, physical outcomes and embody the values of community:

⁹ Eisenmann, 2013.

I think working as a carpenter in Seattle for a couple of years got me into a much more practical place in terms of day-to-day, what I was going to be doing, or 'making' as we're talking about it.

- Building materials company, Chicago

Being part of a community is important. We all want to be a part of a tribe. Seeing a group of people making things – it makes me proud to be a part of it. Having been in bigger business, I realized that in America, we don't make things anymore. There has got to be a group of people like us to help grow the economy, and to make good use of people's time and energy and money.

- Preserved fruits and vegetables company, New York City

Second, many of the makers we interviewed placed importance on producing in a particular city, neighborhood or community. They expressed attachment to these places and took pride in their commitment to them:

[Making is] about place, it's place specific with this benefit of being made here and that to some people that means, 'oh cool American made,' and to some people that means, 'oh cool I like Portland I know what that means.' The specificity makes it more charming.

- Electronic equipment company, Portland

Where does the Chicago commitment come from? My Dad is from the South Side. I went to Marshall Field's growing up... It's the same philosophy as a microbrewery, getting to know a product that's of a place. I want to bring a small part of how countries are known for particular products to Chicago, and also bring some manufacturing back here.

- Accessories firm, Chicago

These attachments to place make the experience of contributing to local economies especially resonant for makers:

Also because I was unemployed in 2009, I have a big appreciation for getting a paycheck, so I have a lot of pride in hiring people and being able to boost the economy.

- Fashion designer and producer, Chicago

Most applique work has been exported to Asia over the years because of the high labor costs associated with it. We are happy to pay extra to do this in house I understand the local multiplier effect that comes from paying someone to do the work in house.

- Specialty textile producer, Portland

- *A sizable minority of maker-entrepreneurs aspires to remain small-scale.*

As a result of being both product- and values-driven at their inception, many makers enter entrepreneurship either reluctantly or as an afterthought. While three-quarters of the makers in our sample expressed a desire to expand or sell their businesses, 23% of makers indicated a preference for maintaining their business at its current size. Many of the firms in this sizable minority articulated concern

about growing too quickly. At a practical level, they noted concerns that rapid growth would outpace their skills and resources. For these *micro-makers*, focusing on business growth diminishes time spent on the design and craft that originally drew them to making:

I don't want to grow so much that I need to hire employees. I'm trying to use social media more and be more informal about showing my work. Other than that, there's no five-year plan...I rarely think of myself as a small business owner. I'm really an artist – but I recognize that in order to succeed in NYC, you need to think of yourself as a business. I'm trying to embrace it without letting it overtake my identity as an artist. Some ceramic artists will just make a prototype and then contract to a large factory. I'm not sure that I would NEVER do that, but it just doesn't sound appealing to me.

- Ceramicist, New York City

- *Among maker-entrepreneurs who choose to grow, many become local manufacturers; this group faces significant challenges in scaling up.*

While many makers are ambivalent about growing – as one interviewee put it, about “going a little to the right on the ‘custom to mass’ axis” – most find a practical need to scale up their activities into full-time businesses. Thus, many of the makers in our sample eventually found themselves in the position of becoming *emerging local manufacturers*, incorporating finance, marketing, sourcing, and human resources management into enterprises that had been consumed primarily by design, invention and craft. Seventy-six percent of the makers we interviewed are producing for national or international markets (Table 3A.2), and 74% would like to grow or sell their companies (Table 3A.3).

Table 3A.2
Makers by Market Geography

Market Geography	Makers	% of Total
Local	10	11%
Regional	13	14%
National	37	39%
International	35	37%
Total	95	

In this context, and because their enterprises center around the production of physical objects, they face a set of production-related challenges that entrepreneurs in other sectors typically do not. Their products and processes typically require some degree of re-engineering in order to take place at scale. We observed four specific challenges to scaling up:

Table 3A.3
Makers by Growth Trend and Intention

Recent Growth	Makers	% of Total
Growing	55	58%
Stable	37	39%
Declining	1	1%
Other or not applicable	2	2%
Growth Intention		
Grow	63	66%
Maintain	23	24%
Sell	8	8%
Other	1	1%
Total	95	

- Production runs: Mass-market goods in the U.S. compete to varying degrees on price, which mass manufacturers hold down by leveraging large production runs and economies of scale. As they develop one-of-a-kind prototypes into items producible in batches, makers must find a way to either access cost-effective manufacturing for shorter product runs, or to develop products for which consumers are willing to pay more.

That was a major change, moving from one-off to something that has to be reproducible and cost effective at a larger scale. ...Lots of trial and error... I've been through way more iterations of this device than a more experienced person might have been.

- Temperature control device manufacturer, Chicago

- Distribution. Within the confines of local and regional markets, makers can draw on consumer preferences for local goods and on relatively informal distribution methods. However, expanding requires the development of different types of product appeal, access to distribution networks, and familiarity with sector-specific conventions of wholesaling and retailing:

Grocery stores' margins are so slim that in order to put [new products] on sale, you have to pay them. This is also why you have to buy ads in their weekly coupon papers... [We also] spend a lot of time befriending the sales reps at... distributors; [we] want them to know about [our] products.

- Condiment manufacturer, Portland

- Supply chains. Major manufacturing firms treat supply chains as proprietary knowledge, a practice that makes finding basic inputs and assuring quality standards time-consuming for makers operating on their own. Many interviewees noted that suppliers were difficult to find locally. Many contract manufacturers in U.S. metropolitan areas specialize either in high-end custom work or in very high-volume production; they have neither the interest nor the capacity to work with small-batch producers.

It is hard to find suppliers/vendors that are close by. Most of them are on the outskirts and suburbs -- it's cheaper out there. [We] tried closer ones, but they weren't good fits. The older shops are "trapped in their ways"... [we were] looking for people that were excited for a challenging part/order, but most shops gave the impression that they didn't want to do it.

- Wood products company, Portland

- Real estate. Declining inventories of industrial land in large cities make the acquisition of suitable operating space especially difficult for makers. Even when industrial land is available, existing spaces are often designed for large firms and high-volume production, which eclipse makers' more modest needs. As a result, makers work out of highly priced and sub-optimal space whose acquisition and maintenance stretch already-thin resources.

The building where we rent in East Williamsburg is shifting. Most "noisy" companies have gone, and there are more clothing designers and photographers. We are on a month-to-month lease and the landlord has made it clear that he doesn't want us.

- Specialty beverage producer, New York City

Production-related challenges render makers' scale-up strategies and goals distinctive from those of other entrepreneurs. Furthermore, while the act of making emerges from a drive to specialize in a particular craft, skill or product, scaling up a maker enterprise also requires makers to become business generalists, applying knowledge about finance, production and markets:

The business side is where [we] could use the most help. [We] are coming from the making side of things, and do fine with the business side, but things like writing contracts or accounts payable/receivable can be challenging.

- Decorative glass products company, Portland

- *A third group of maker-entrepreneurs, most typically those in the hardware and electronics sector, scales up by outsourcing production.*

A strong link between an animating idea (whether for a beautiful object or a solution to a technical problem) and a physical production process is common to maker firms at the beginning of their life cycles. For some, however, the problem of scale-up eventually leads to a choice to bifurcate design and manufacturing spatially. The primary local activity for this group in their cities of origin is now design and development, not manufacturing. *Global innovators* operate analogously to large manufacturers, maintaining a small core of local design and management activities while outsourcing production:

At the beginning, we were doing what you would call final assembly - We would get finished circuit boards and then from another supplier we would order the plastic parts that we needed and we would assemble everything here— then it expanded. We would really have just manufactured this stuff in the U.S. but it was legitimately really hard at that point to do this. You had really high end guys who wanted to do like specialty stuff or you had people doing the cheapest possible stuff. There was not expertise at doing stuff nimbly and inexpensively...

- Connected device firm, New York City

In summary, we found that variation among maker-entrepreneurs on the question of both whether to grow and *how* to grow (by expanding in place or by separating conception from execution, design from production) produces three distinct types of “maker orientations”:

- o “Micro-makers” would rather forego business growth in favor of retaining a smaller scale and orientation toward making, often as sole proprietors;
- o Emerging local manufacturers intend to grow, and to do so while maintaining most or all of their production activities in-house;
- o Global innovators focus on new product design, retaining internal capacities for prototyping and early-stage production, but achieving scale through outsourcing to specialized, contract manufacturers.

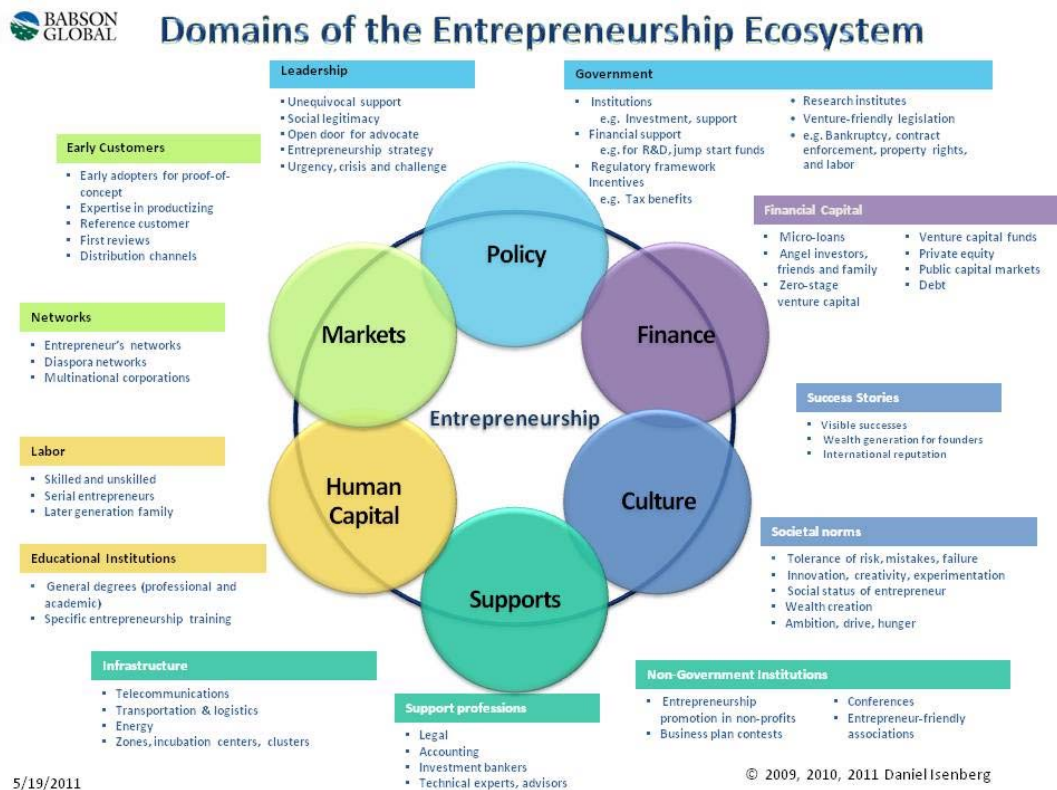
We discuss the policy implications of this variation in Section IV.

B) Maker-entrepreneurial ecosystems

The maker-specific entrepreneurial ecosystems we encountered in Portland, Chicago and New York have much in common with the “textbook” entrepreneurial ecosystems described by other researchers. For example, they feature connections among entrepreneurs who constantly observe each other’s progress and provide feedback about each other’s businesses. They also rely on coordination and integration by sponsors and support organizations, whether governmental or extra-governmental.¹⁰ Yet because makers produce and distribute material objects, ensuring sustainability and encouraging growth for these firms in a given local context calls for institutions capable of responding to expressly production-related challenges.

Figure 3B.1

Entrepreneurial Ecosystem



Source: Isenberg 2011, in Mason and Brown 2014.

- *Maker ecosystems are built around efforts to overcome the challenges of production.*

Entrepreneurship scholarship has long observed that local environments condition innovators’ ability to form and grow firms. An ecosystem approach fits well with the growing consensus in the literature that supporting entrepreneurs requires much more than simply subsidizing or providing undersupplied inputs

¹⁰ Motoyama & Knowlton, 2016.

like training, incubation spaces, and financing. Local-level actors in government and the non-profit sector must also attend to the institutional resources and networks that strengthen buyer-supplier ties and build relationships in social space.¹¹ Maker-enabling entrepreneurs tend to be either private for-profit or private non-profit ventures (Table 3B.1). Some of these institutions are focused on developing hard infrastructure – supply chains and industrial real estate – while others attend to the soft infrastructure of makers’ peer networks, brand identity and attachment to place.¹² Nearly three-fourths (73%) specifically target maker businesses, while the remaining 27 percent work with makers in the context of general business and entrepreneurship service provision (Table 3B.2)

Table 3B.1

Maker-Enabling Entrepreneurs by Primary Function and Sector

Primary Function	For-profit	Non-profit	Public sector	Total
Tech access and prototyping	3	8	0	11
Sales and marketing platform	10	0	0	10
Real estate/affordable space	3	4	2	9
Business technical assistance	3	2	1	6
Finance and capital access	1	3	0	4
Networking, community, advocacy	0	1	0	1
Total	20	18	3	41

Table 3B.2

Maker-Enabling Entrepreneurs by Target Maker Audience and City

Target maker audience	Chicago	NYC	Portland	Total	% of Total
"Bags" (craft/artisan production)	4	12	10	26	63%
"Bots" (hardware)	5	3	3	11	27%
"Bites" (food and beverage)	1	2	1	4	10%
Total	10	17	14	41	100%

There is a great deal of functional hybridity among maker-enabling entrepreneurs, with institutions providing several types of infrastructure at once. This was particularly true with respect to business assistance and networking, community, and advocacy functions, which represented the primary function for less than one in five (17%) MEEs, but the secondary functions for nearly three-fourths (72%) of them (Table 3B.3). For example, Control-H PDX Hackerspace is a Portland member-based shared production facility that also serves as a community gathering space. Catalyze in Chicago provides space, tools and access to community along with connections to capital investors and contract manufacturers. New York’s

¹¹ Auerswald, 2015; Mason & Brown, 2014; Motoyama, Konczal, Bell-Masterson & Morelix, 2014; Motoyama & Knowlton, 2016.

¹² Marotta, Schrock and Heying, 2016.

Evergreen Exchange offers training and technical assistance to early-stage food businesses while advocating for policy supportive of the local manufacturing sector.

Table 3B.3

Maker-Enabling Entrepreneurs by Primary and Secondary Functions

Primary Function	Primary Function	% of Total	Secondary Function	% of Total
Tech access and prototyping	11	27%	3	9%
Sales and marketing platform	10	24%	1	3%
Real estate/affordable space	9	22%	2	6%
Business technical assistance	6	15%	13	39%
Finance and capital access	4	10%	1	3%
Networking, community, advocacy	1	2%	11	33%
(no secondary function identified)			8	24%
Total	41		41	

In all three cities, we found intermediaries dedicated to helping makers turn designs or recipes into functional products and deliver them to consumers. For example, the Brooklyn Fashion and Design Accelerator features laboratories in which entrepreneurs can perfect manufacturing techniques and experiment with integrating sustainable best practices in textile and garment design and production. In Portland, the firm Crowd Supply first helps makers generate crowd-funding for first runs of their products and then provides them with ongoing assistance as they plan and operationalize manufacturing processes. Its founder, Josh Lifton, says:

The point of Crowd Supply has always been to make physical products’ launches successful, not just in the amount of money they raise, but also in actually delivering the product...Crowd Supply is about the nuts and bolts of getting the product out the door.

- *Maker ecosystems grow and expand through entrepreneurship and “self-supply.”*

It is worth noting here that Crowd Supply is a for-profit entrepreneurial venture in its own right. In this sense, it affirms findings by other entrepreneurship researchers that industrial clusters are to a degree self-created by firms.¹³ Crowd Supply and similar for-profit intermediaries, rather than rely on the public sector to address needs in the ecosystem, have proactively assumed market niches. Another example is New York City’s American Design Club, which represents and markets the work of artisan makers at trade shows. Etsy, which is headquartered in New York City but serves makers throughout the world, not only serves makers’ need for marketing and distribution channels but helped to fuel the movement’s rise in the late 2000s. Maker economies are propelled more strongly by other firms and non-profit organizations than by the public sector. Opportunistic and agile, many maker-enabling entrepreneurs recognize the

¹³ Feldman, Francis & Bercovitz 2005.

commercial opportunities inherent in helping start-up makers get to scale, find financing and reach customers.

- *Like makers themselves, maker-serving organizations often have clearly stated value propositions.*

Many of the institutions of the maker movement, like many maker-identified entrepreneurs, see themselves as agents of larger transformations in work, business and society. Inherent in the maker ethos are several interrelated aspirations or “value propositions.” These include celebrating the distinctiveness of places;¹⁴ creating jobs; validating a craft ethic; and contributing long-term to local and regional economies through the diffusion of technology, knowledge and skill.

For example, many private and non-profit sector entrepreneurs have established retail stores and marketing platforms that capitalize on local makers’ desire to embody place in their products and encourage consumers’ interest in locally produced goods. Made Here PDX, a store located across the street from the iconic Powell’s bookstore in downtown Portland, stocks 180 different brands of locally made goods on consignment, from jewelry and apparel to cookware and caramel corn. Made In NYC, a project of the Pratt Center for Community Development (which also advocates more broadly for the city’s manufacturing sector) uses the internet and social media to build the market for local production – among customers looking to buy local and among other manufacturers looking for local suppliers. Wolfbait & B-Girls retails clothing, accessories and merchandise from more than 170 Chicago artisans at its storefront in the Logan Square neighborhood, while maintaining an active online presence on Facebook, Instagram and Twitter.¹⁵

Maker-enabling entrepreneurs often mesh the desire to affirm the distinctiveness of a place with broader aspirations around social and economic sustainability. The founder of Supportland, a company that coordinates a rewards program for consumers who buy products and services from businesses in Portland, speaks animatedly about the social benefits of local manufacturing’s smaller environmental footprint and high economic multiplier effect. Low-cost real estate and supportive infrastructure at facilities like New York’s Brooklyn Navy Yard, Beam & Anchor in Portland, and The Plant in Chicago have attracted makers and traditional manufacturing companies alike. Chicago’s largest incubator, the Industrial Council of Nearwest Chicago (ICNC), is creating a dedicated program for food and beverage entrepreneurs in response to growing demand for local food and escalating rents in surrounding industrial areas. Multi-tenant industrial spaces often sponsor formal or informal job training and placement programs for residents of surrounding neighborhoods.

- *Maker ecosystems thrive in dense urban environments.*

Cities themselves, in their density and diversity, are natural sites for maker ecosystems. While commercial and industrial space, taxes, and business services usually cost more in cities, those high costs are offset by institutional thickness and by the presence of early adopters, consumers with disposable income, and socially conscious consumers striving to support local wealth accumulation and environmental stewardship. Urban locations, particularly in the one-time industrial centers of New York, Chicago and

¹⁴ See Heying, 2010; Roy, 2015.

¹⁵ The role that social media plays in cultivating place identity is just beginning to be explored. See Marotta, Cummings and Heying 2016.

Portland, also help makers build the knowledge and relationships that enable them to undertake the production of manufactured goods or to navigate the complex world of contract manufacturers. The presence of peer producers is critically important. Organizations that succeed in helping maker firms capitalize on proximity to other makers and manufacturers are key to local ecosystems' success. As the President and CEO of the Brooklyn Navy Yard Development Corporation explains:

Collaborations happen all the time...We have woodworkers and metal workers who have different expertise and equipment, but someone is building a table that requires metal – and their woodworker literally goes down the hall. They know all of their neighbors and who can bend the metal this way and not that way – whatever it is that they need. Our artists actively partner with our industrial businesses. We have a company that specializes in sandblasting the surfaces of metal or glass – they can etch extraordinary stuff in these materials. They can etch 3-D images that look nearly photograph quality into glass – they partner with everyone here.

- *The “soft” infrastructure of makerspaces is often more important than the “hard” infrastructure they offer.*

Discussions of the maker movement focus heavily on the role played by makerspaces, and understandably so. As places in which hobbyists, fledgling firms and more experienced entrepreneurs have the chance to access shared equipment and interact with one another, makerspaces such as Portland's ADX, Chicago's Catalyze and New York City's NYC Resistor are important institutions. It is important from a policy perspective, however, to recognize that the “soft infrastructure” that makerspaces offer is just as important, if not more so, than the hard infrastructure of real estate and tools. As ADX founder Kelley Roy states,

You can't just get a bunch of 3D printers and laser cutters and have a makerspace... It has to have a community, a diversity of tools, the sense of creative exploration...The maker movement emphasizes working together...

Bill Fienup (who has also launched two hardware companies) speaks to the social learning and partnership-building functions of Catalyze:

As we built this initially, we thought sharing the tools was going to be best benefit, but what we saw was that the community was so much more important. Being able to sit next to an electrical engineer is amazing and an industrial developer, and an iOS developer. Just having all those skills, those are the skills I needed to build this but didn't have.

It is important to recognize from a policy perspective, however, that makerspaces are not heavily utilized by maker enterprises, especially once they have fully commercialized. Affordable real estate that allows maker businesses to survive in expensive markets is more important.

Fifteen percent of the firms we interviewed are currently involved with makerspaces, while another twelve percent had used them in the past. But a full 74 percent had not interacted with makerspaces at

all, a finding that suggests that many maker-entrepreneurs find crucial soft infrastructure elsewhere in their local environments, whether via meetups, in online communities, or in multi-tenant environments that do not advertise themselves as makerspaces per se (Table 3B.4).

C) *Maker cities and regions*

Local maker ecosystems reflect and build upon bases of knowledge and skill historically resident in urban and regional economies. Economic geographers have identified the importance of path dependence and place-based technical and technological specialization in regional development. Research demonstrates that regions possessing a wide variety of technologically related industries tend to have higher growth rates,¹⁶ suggesting that such “related variety” among industry sectors is linked to coherent endowments of overlapping technological knowledge.¹⁷

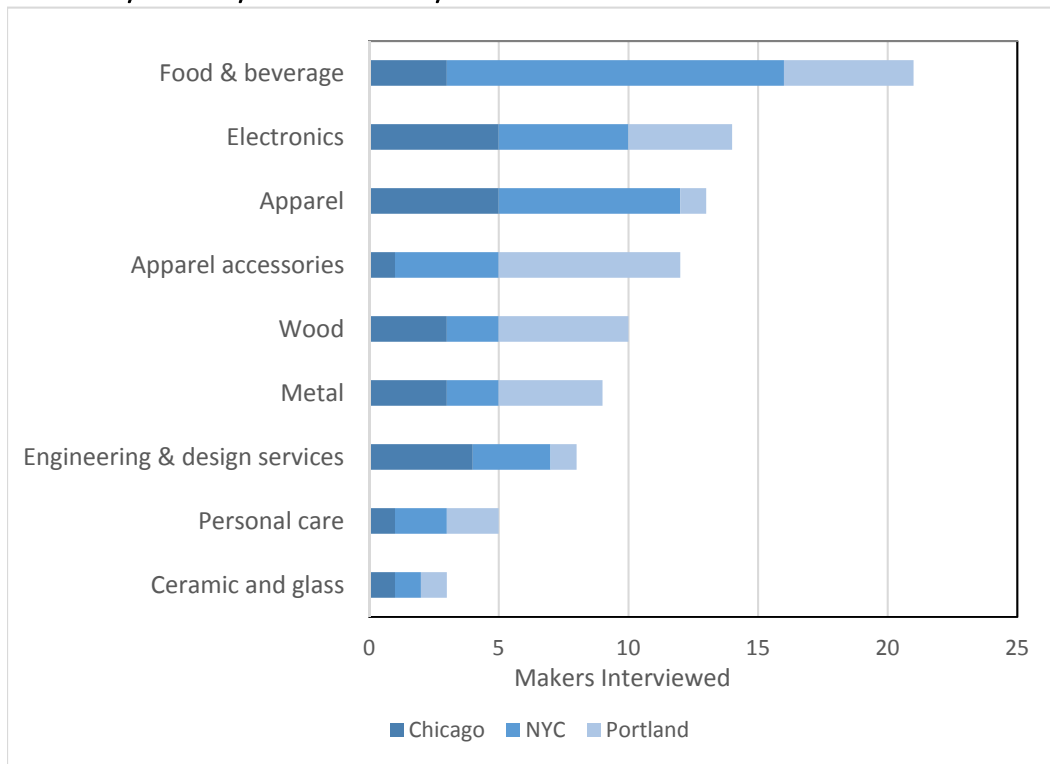
Table 3B.4

Makers by Maker/Shared Space Utilization

Makerspace	Makers	% of Total
Currently in makerspace	14	15%
Used makerspace in past	11	12%
Never used makerspace	70	74%
Shared Space (incl. Makerspace)		
Currently in shared space	22	23%
Used shared space in past	5	5%
Never used shared space	68	72%
Total	95	

Figure 3C.1

Makers by Industry Sector and City



¹⁶ Boschma et al 2012, Drucker, 2011

¹⁷ Kogler, Rigby & Tucker, 2013

Table 3C.1

Maker-Enabling Entrepreneurs by Primary Function and City

Primary Function	Chicago	NYC	Portland	Total
Tech access and prototyping	5	3	3	11
Sales and marketing platform	1	3	6	10
Real estate/affordable space	1	7	1	9
Business technical assistance	1	3	2	6
Finance and capital access	2	1	1	4
Networking, community, advocacy	0	0	1	1
Total	10	17	14	41

When a region's distinct yet related knowledge bases come into contact, this enables its inventors and its firms to create commercialize new products at a greater rate than regions whose "knowledge cores" exhibit less overlap.

The findings of this study substantiate that significant ecosystem variation among "maker cities" in the United States derives from geographically embedded cultural, institutional, and industrial legacies. In New York City, there are two maker-enabling entrepreneurs dedicated to the fashion sector and one to the food sector, as well as many that draw from the city's rich arts culture. Portland's MEEs draw inspiration from that city's reputation for environmentally "green" and socially responsible business. Chicago MEEs draw on sector-specific legacy assets in machine tooling and metals, recombining newer technologies with existing local manufacturing capacity (Table 3C.1). Ecosystem institutions in each city target the dominant maker-entrepreneur populations (Table 3C.2).

CHICAGO

Once seen as the prototypical city of twentieth-century U.S. manufacturing¹⁸, the diversified Chicago economy of today retains a larger share of manufacturing activity than do other large cities.¹⁹ More than in New York or Los Angeles, Chicago's large corporations and advanced services firms retain connections to the production and sale of physical goods. Thus, while Chicago retains one of the largest bases of high-tech occupational employment per-capita in the U.S., its high-tech employees typically apply technology to goods and production processes, rather than producing software applications (Chapple et al 2004). Directly and indirectly, this production infrastructure provides makers with essential business skills and entrepreneurship connections.

Chicago's diversified, post-industrial economy provide makers with work, training, skills and connections. A majority of the makers in the Chicago sample either worked at a Chicago manufacturing or design firm, or used past employment in those firms to develop production skills, such as the ability to engineer product design for easy assembly, familiarity with advanced materials and logistics, and experience in

¹⁸ Berry and Gillard, 1977

¹⁹ Doussard, Peck and Theodore 2009

identifying and navigating supply chains. These practical skills represent the foundations of Chicago's maker ecosystem.

Befitting this focus on incumbent firms, products and production capacity, Chicago's maker ecosystem consists primarily of entities focused on translating product ideas into production. Pumping Station One, an early makerspace run in a low-rent industrial facility on the Northwest Side, initially provided makers and aspiring makers familiarity with additive manufacturing and production techniques, as well as personal connections with other makers and maker-entrepreneurs. Formed long ago, these relationships prove important for the breadth of the connections they developed. Chicago's contemporary makerspaces, by contrast, retain narrower foci. Catalyze, a for-profit maker-supporting incubator near the Loop, emphasizes electronics. Hyde Park's Fab Lab, supported by the University of Chicago, directs its services to university students and neighborhood residents. Other maker-supporting institutions, including ISML Fab Lab, Blue 1647, South Side Hackerspace and the Harold Washington Library Maker Lab, provide a range of production options to aspiring makers.

Collectively, these maker-enabling entrepreneurs emphasize business skills, development and professional connections. Given this focus on production and business growth, rather than basic education, participants in, and graduates of, Chicago's makerspaces generally draw on collegiate or on-the-job training to design and build marketable products. The maker ecosystem fits makers of this background ably, but provides fewer opportunities for artisans or individuals with less industrial design knowledge to build a maker business.

NEW YORK CITY

New York City's economy is known for distinct yet related specializations in fashion, interior design, the fine and performing arts, specialty food, and media/advertising. The city's art, fashion and interior design sectors are backwardly linked to a strong cohort of artisan makers who produce display cases and frames for museums, sets and props for theaters and custom cabinetry and furniture for architects and their clients. Garment firms, though much fewer in number than in the past, continue to produce in small batches for designers. Food is also a notable sector for maker entrepreneurship in New York City; entrepreneurs have tapped into affluent consumers' demand for aesthetically unique, healthful, and minimally-processed products and have taken advantage of low technological barriers to entry.²⁰

As digital manufacturing becomes more common, makers in the interior goods and garment sectors are increasingly working with the tools of digital manufacturing: computer-numerically controlled machines like laser cutters and CNC lathes, and 3-D printers. At the same time, New York City's hardware sector is developing in its own right. Maria Gotsch, President and CEO of the Partnership Fund for NYC (which has invested in several hardware sector projects), emphasizes the generative differences between Boston and Silicon Valley's hardware industries, where most start-ups have commercialized core technologies developed at universities, and those in New York City:

“Till recently, the university sector in New York City has not been connected to the entrepreneurial energy of the tech sector. Our sector grew up in applied technology. You

²⁰ Food makers experiment with recipes at home or in incubator kitchens, and produce marketing materials and labels on their computers (see Wolf-Powers and Levers, 2016).

had all this internet-based technology which was drawing on the media sector's content production and computer programming expertise and being deployed in new ways in traditional markets like advertising, information and finance. It was tied to expertise and strengths that were here -- media and advertising -- plus the large consumer market."

Gradually, due to technological breakthroughs that enabled relatively low-cost access to devices like microcontrollers and programmable circuit boards, entrepreneurs who were both artistic and computer-savvy began to team up with engineers to create products, operating at the intersection of software and hardware. Collaboration between digital manufacturing experts and designers in traditional industries have led to hybrid products, such as athletic clothing and jewelry that contains sensors and communicates with the wearer. Finally, many of the firms New York City's hardware technology sector have created devices for the "maker" market itself. Examples include MakerBot, which built one of the first 3-D printers affordable to consumers; Shapeways, which 3D prints objects on demand for hundreds of designers; and BotFactory, which makes machines that produce customized printed circuit boards.

As in the other two cities, there some bifurcation in New York between the world of hardware ("bots") and the world of artisanal manufacturing ("bags" and "bites"),²¹ as their associated entrepreneurs occupy distinct niches in the capital and consumer markets and draw on different social networks, public sector resources, and producer services. Nevertheless, the two clusters overlap, sharing the large pools of customers and talent that the city offers.²² A lynchpin is the city's art and design schools, which yield graduates equally adept at digital design and at working with materials. Several interviewees remarked on the relative shortage of electrical and mechanical engineers in the ecosystem, which has limited the growth of the hardware sector; but efforts like the Brooklyn Navy Yard's New Lab project and the public sector's FutureWorks initiative are striving to incubate companies on the tech side of the maker equation.

PORTLAND

Portland has historically been a center for metalworking, and for wood products. These industries, with their strong link to craft and artisanal manufacturing traditions, form the base of the city's maker culture, which has also been significantly influenced in the past two decades by waves of young-college educated migrants.²³ Millennial arrivals, in search of low cost of living and high quality of life, have formed and contributed to thriving outdoor, biking, arts and culture, and culinary scenes, which provide branding opportunities and markets for makers' products. Portland's artisanal roots lie at the base of the city's reputation for an open, entrepreneurial DIY culture where collaboration is a norm. This culture influences high-technology industries in the city; for example, Portland has become a global center of the open source software community.

Portland's maker community is characterized by strong collaboration and leadership from within, through MEEs like ADX Portland, Portland Made Collective, Made Here Pdx and Hand-Eye Supply, and established

²¹ The city's Economic Development Corporation, for example, sponsors a suite of programs that associate making exclusively with advanced manufacturing.

²² While the worlds are largely separate, makers in different product and market categories sometimes draw on the same resources and energy. For example, a Brooklyn accessory designer rented time on a laser cutter at the hackerspace NYC Resistor while building a prototype of her product; NYC Resistor was also the birthplace of MakerBot's 3D printer.

²³ Jurjevich and Schrock, 2012.

maker businesses like Spooltown. There has been a comparatively weak and indirect role for local government in supporting and promoting the maker community. Efforts through the Portland Development Commission have been fragmentary and uneven. Portland State University represents a key institution through its business accelerator and engineering programs, but the impacts remain nascent.

Portland's makers cluster in the Central Eastside Industrial District (CEID), just across the Willamette River from downtown Portland.²⁴ Historically the city's warehouse and produce row district, CEID's central location and affordable rents have nurtured an organic ecosystem of makers, especially within food and beverage sectors like craft brewers and coffee roasters. The clustering allows for informal collaboration and the shaping of a collective aesthetic and Portland brand, as well as access to both customers and workers from close-in neighborhoods. Growing interest in the district from developers of creative office uses threatens to displace makers, eroding long-term planning efforts to sustain CEID as an industrial sanctuary and compelling planners toward new tools toward promote industrial land preservation.

A distinguishing feature of Portland is its well-developed infrastructure for local retail in support of the maker economy. This includes established venues like Portland Saturday Market and the local farmer's market scene; boutiques like Crafty Wonderland, Tender Loving Empire and Made Here Pdx; and buy local efforts like Supportland and the Portland Made Collective's annual Gifted events. The West End, Hawthorne, and Alberta Arts Districts serve as key centers for maker-oriented retail businesses; in neither of the other two cities did we observe such a close symbiosis between maker production and maker retail. The persistence of in-person interactions and relationships within Portland's maker ecosystem (despite the importance of on-line tools and media) is in many ways anchored by independent retailers.

Portland also has its share of high-tech, "inventor" makers, who thrive in an environment that is co-created by the DIY-oriented maker movement and by electronics giants like Intel, software companies like Puppet and Jive, and design-oriented athletic and outdoor companies like Nike and Adidas. The relationships of inventor makers to the artisanal and craft segments of the maker community are complementary but somewhat underdeveloped. Portland has a vibrant startup/entrepreneurial support network focused primarily on tech sectors (e.g., Oregon Angel Fund, Starve Ups), and the Oregon Museum of Science and Industry has taken the lead in hosting the city's annual maker faires, but these efforts are only loosely connected to the city's artisan maker infrastructure.

²⁴ Marotta, Cummings and Heying 2016.

Table 3C.2

Maker-Enabling Entrepreneurs by Function and City

PRIMARY FUNCTION	CHICAGO	NEW YORK CITY	PORTLAND
TECH ACCESS/PROTOTYPING	Catalyze Chicago • Chicago Industrial Arts and Design Center • Illinois Institute of Technology Idea Shop • MAKE! Chicago • Pumping Station: One • South Side Hackerspace Chicago • Workshop 88	Brooklyn Fashion and Design Incubator • Bronx Cooperative Development Inc. • Manufacture NY • Staten Island Makerspace • NYC Resistor	ADX • Control-H/ PDX Hackerspace • Shop People • Portland Apparel Lab • PCC Makerspace • PSU Lab for Interconnected Devices
REAL ESTATE/AFFORDABLE WORKSPACE	Fulton-Carroll Business Incubator • Macy's Chicago Fashion Incubator • Morgan MFG • The Plant	Brooklyn Fireproof • Brooklyn Navy Yard • Fourth Arts Block • Greenpoint Manufacturing and Design Center • Organic Food Incubator	Beam & Anchor • Grand Marketplace • The Make House • The Makery • The Plant • Tillamook Station • PSU Business Accelerator • Green Anchors
BUSINESS TECHNICAL ASSISTANCE	MakerBiz	Distillate Collective • Evergreen Exchange	Kitchen Cru • Starve Ups • Hatch Oregon • Oregon MEP
FINANCE/CAPITAL ACCESS	Sandbox Industries	NYC Partnership Fund	Crowd Supply • Craft3
SALES/MARKETING PLATFORM	Built in Chicago • Local Goods Chicago • Made in Chicago • Small Manufacturing Alliance • Wolfbait & B-Girls	American Design Club • Etsy • Purible • Made in NYC	Hand-Eye Supply • Beam & Anchor • Grand Marketplace • Crafty Wonderland • Made Here PDX • Parcel Portland • Portland Saturday Market • Portland Supply Co. • Tender Loving Empire • Supportland
NETWORKING/COMMUNITY-BUILDING, ADVOCACY	Catalyze Chicago • South Side Hackerspace Chicago	Gowanus Studio Space • Manhattan Maker Space • NYC EDC Next Top Makers • NYC Resistor • Made in NYC • Evergreen Exchange	Curiosity Club • Dorkbot Pdx • Makers Pdx • WeMake Pdx • Portland Made Collective • Built Oregon

Blue = nonprofit; green = public; black = private.

IV. Implications for policy

Makers benefit from standard entrepreneurship policies, sometimes directly and sometimes indirectly. Entrepreneurs thrive in diverse places where they can connect to and “collide” with one another – whether through networking events sponsored by economic development agencies or through meet-ups and gatherings sponsored by associations of their peers.²⁵ They also thrive where localized networks of deal-makers and angel investors make risk capital available on favorable terms,²⁶ though the role of Kickstarter in funding maker businesses suggests that makers may be redefining the terms of early-stage investment.²⁷

What makes maker-entrepreneurs different in terms of their relationship to the public policy environment is their connection to the re-emergence of the U.S. manufacturing sector, and their importance in shaping both the perception and the reality of that re-emergence. Making embodies a pathway from individual innovation to local economic development. By working with material objects, by taking advantage of unprecedented access to low-cost production capacity, and by using the internet to access open-source design resources, online marketing and fulfillment options, and virtual communities, makers can move from innovation in the abstract to economic growth and production in the particular.

However, as our research findings show, many maker-entrepreneurs start with skills, and with the impulse to use those skills in service of craft or invention, rather than with the business skills and plans they will need to develop growing companies. For those makers wishing to make the leap to scaled production, assistance in business skill formation is especially important

Our research highlights the heterogeneity of makers, and thus the varying means and ends of their potential contributions to regional economic development. In their early stages, makers draw on shared equipment, social networks and business advice, whether informally from one another or more formally through public, private non-profit, and private for-profit institutions.²⁸ As they mature, they encounter distinct challenges that hinge on their founders’ ambitions, their ownership structure, and nature of the supply chains for the inputs they use. Dealing capably with this unevenness in what makers do requires especially thoughtful policy approaches:

1) Micro-makers

Nearly one-quarter of the makers we interviewed have no desire to grow or sell their businesses. They have an impact on the regions in which they work, but more because they influence their peers, promote household prosperity and contribute to quality of place than because they employ many

²⁵ Motoyama and Knowlton, 2016, Stangler and Bell-Masterson, 2015

²⁶ Feldman and Zoller, 2012

²⁷ The common use of Kickstarter to raise seed capital for maker businesses suggests that the presence of traditional “dealmakers” in a local environment is less crucial today than it was in the past. However, the testimony of a number of maker-enabling institutions we interviewed leads us to conclude that succeeding with a Kickstarter campaign – and delivering a product to Kickstarter investors once funded – requires that entrepreneurs draw heavily on their local connections for publicity, advice, components and even product assembly.

²⁸ It does seem relevant to policy that makers often to build their own collaborative social infrastructure, perhaps obviating the need (at least in larger cities) for large-scale public sector interventions targeting these communities.

people or spend hundreds of thousands of dollars annually on inputs. Our findings point to two areas where policymakers can intervene effectively:

- **Facilitating access to peer mentoring.** Micro-makers are likely to value making as an end in itself, and as a source of identity and social purpose. These businesses are well-served across their life cycles by community institutions, including makerspaces.
- **Initiating and supporting efforts to promote financial security for entrepreneurs in the gig economy.** Micro-makers can benefit profoundly from the broadening of the social safety net for people who are self-employed. Universal health insurance has recently been made more accessible through the Affordable Care Act, but similar benefits pools can be established that help entrepreneurs weather shocks and downturns and enable them to more easily save for retirement. The micro-makers we interviewed also expressed a need for free or low-cost resources that help them to comply with regulations, enforce contracts, keep current with skills and technology trends, and engage in personal and business financial planning. Many of these policy supports appear in Etsy's "Five Proposals to Support the Emerging Maker Economy," which describes these interventions in greater detail.²⁹

2) Emerging place-based manufacturers

Nearly two-thirds (64%) of the businesses in our sample were either growing or attempting to grow. These businesses represent a cohort of actual and potential manufacturing firms. Yet unlike global innovators (see below) they intend to maintain some or all their production capacity – certainly final assembly – in or close to their place of origin. Our data suggest that public policy can help maker-entrepreneurs mature into manufacturing enterprises by: As the President and CEO of the Brooklyn Navy Yard Development Corporation articulates it:

"I really think of makers as part of the continuum toward manufacturing, and that goes to our mission. Real estate is very expensive. What we find is that makers are drawing from the strengths of NYs economy, the explosion of creative design happening here – drawing on those things but also making a physical product... The home run for us is when a maker goes from a maker to a manufacturer."

Our data suggest that the policy sector can help maker-entrepreneurs mature into manufacturing enterprises, by:

- **Ensuring broad-based access to scale-up resources.** As noted above, moving from prototype to batch production involves a set of capacities that few makers initially possess. This presents opportunities for other entrepreneurs (whether in the private, non-profit or for-profit sectors), who can help aspiring makers to prototype, commercialize, market and distribute products. Makerspaces are often part of the infrastructure that initially helps place-based manufacturers to launch, but they tend to fade in importance as firms scale up. Ultimately, makers maintain a larger interest in graduating from makerspaces than operating within them. In policy terms, this means complementing a focus on the narrowly defined services makerspaces can provide with

²⁹ https://blog.etsy.com/news/files/2014/06/MakerEconomyPaper_0617.pdf.

support for affordable production space, debt relief, workforce development and other services that lie beyond the capacity of organizations targeted to the needs of start-up firms.

- **Providing high-quality municipal services.** Just as commercial businesses rely on safe, clean business districts where people and goods can move freely, so do manufacturers. The emerging place-based manufacturers in our study placed value on high-quality transportation and sanitation services in the industrial areas where they have set up shop. They also looked for consistency and transparency in the enforcement of environmental and other small business regulations, including zoning enforcement to ensure that manufacturing is not priced out by more lucrative uses.
- **Sponsoring or facilitating place-centered marketing.** Makers who are scaling their businesses often have little time for marketing and customer development. “Made In _____” campaigns, whether sponsored by city governments or by trade or advocacy organizations, build demand and generate orders.³⁰
- **Helping firms build connections to input suppliers and contract manufacturers.** When emerging place-based manufacturers source inputs locally or use contract manufacturers in their cities and regions, their economic multiplier effect is amplified. Public or mission-driven referral services and exchanges can add this value.³¹
- **Maintaining a stable real estate environment.** Some interviewees in this category pointed to an irony of growing enthusiasm for the maker movement: increased instability in the real estate climate. Where the term “maker” has come to encompass firms that are commercial rather than industrial, it accelerates a process by which office-based enterprises employing professionals crowd out production-based enterprises. Firms and advocates point to a need in many of the most vibrant maker cities for an acceleration in non-profit multi-tenant industrial development.³²
- **Promote debt-minimizing educational opportunities.** A surprising number of the makers in our sample pointed to the absence of student debt, or limited student debt, as a major factor that allowed them to make the leap into entrepreneurship.

3) Global innovators

About 15 percent of our sample started similarly to the other two types, with an idea for a material product and a desire to produce it themselves. But while they perhaps relied originally on shared tools and space or local distribution outlets, their primary local activity is now design and development, not manufacturing. To manufacture products, these makers use outsourcing and

³⁰ See Urban Manufacturing Alliance 2013 (<http://urbanmfg.org/uma-content/uploads/2013/05/UMA-Local-Branding-Toolkit-Final1.pdf>)

³¹ See Urban Manufacturing Alliance 2015 (<https://vimeo.com/136939100>)

³² See Urban Manufacturing Alliance 2014 (<http://urbanmfg.org/uma-content/uploads/2013/03/NonProfitRealEstateDevelopmentToolkitFINAL.pdf>)

contracts with external firms, usually in Asia. These maker companies typically have venture capital funding, have been acquired, or are looking to be acquired.³³

Many of the makers who fall into this category are hardware makers (from the “bots” cell in Figure 2.1), for two reasons. First, the pressure on cost and price for hardware (particularly consumer goods) is much greater than for the items created by artisan makers. Part of what consumers pay for in an artisan-made item is the connection it brings them with the individuals who designed and created it, and with the place in which it was created. Consumers of artisan items are often also placing value on ecological and social sustainability. Thus, cost is secondary to quality and symbolism for these products. Hardware-based maker goods, by contrast, compete, in terms of both quality and cost, with goods made by larger manufacturers. Second, Asia has a well-developed electronics supply chain with which many U.S. business consultants and venture capital investors are familiar. Producing in Asia or elsewhere does not affect the consumer appeal of these products, whose value has to do with the cleverness and utility of their design and function rather than with a craft component.

Global innovators need what all urban creative and professional businesses need: transparent and consistent local regulations, responsiveness from departments in charge of providing basic infrastructure, and amenity-rich residential neighborhoods to attract highly mobile professional talent. But public policy for this type of enterprise is not, ultimately, maker-specific; it is standard business climate policy. Policy makers should welcome and support global innovators – firms that started as makers but which are now properly classified as research and development operations. They are unquestionably vital components of urban maker entrepreneurial ecosystems. Nevertheless, enthusiasm for global innovators should not be permitted to obscure the needs, or the potential, of makers who are creating production jobs.

Public policy can influence the balance in any given city among micro-makers, emerging manufacturers and global innovators through broad support for vibrant urban and regional manufacturing economies. As Clark and Berger demonstrate,³⁴ local producers have simple needs that local policies fill. In addition to high-quality public services, place-centered marketing and affordable real estate, makers – and in particular, emerging place-based manufacturers – need knowledge. Many new and valuable products are not produced in the U.S. simply because innovators remain unaware of local manufacturing capacity and infrastructure. Nationally, thriving manufacturing regions make this hidden knowledge explicit, by mapping supply chain and production networks, cataloguing industrial real estate, and providing dedicated personnel to intermeditate between aspiring manufacturers and their suppliers, customers, workers and landlords. Policies, offices, and inventories that make it easier for manufacturers to produce locally also make it easier for makers to move from design to business growth.

³³ A notable phenomenon in the universe of hardware startups is the emergence of investment firms, founded by successful hardware entrepreneurs or larger companies, that help new hardware makers incubate, prototype and commercialize new products while providing them with start-up financing and taking an equity stake. Examples include Y Combinator, Bolt, and Highway 1. Firms incubated in this way typically go directly to contract manufacturing after developing a prototype in a hands-on setting.

³⁴ Clark, 2013; Berger, 2013.

V. Conclusion

In the past two years, and especially in the context of renewed efforts to boost U.S. manufacturing since the 2007-09 recession, the maker movement has captured the imaginations of policy makers and commanded attention and resources at the White House and in city halls across the nation. But there has been a shortage of systematic research about the entrepreneurs whose activity forms the basis of aspirations for a resurgence of local economic growth through making. This study investigates the firms and institutions that lie at the heart of the maker movement's promise as a driver of economic growth and job creation, addressing the practical question of how makers build revenue-generating businesses and develop local economies. As such, it generates important new knowledge for economic development policy makers.

Makers who become entrepreneurs discover how to link their passion for craft and invention to newly accessible manufacturing tools and to new trends in consumer demand. Maker-entrepreneurs are driven by a focus on products rather than markets. They were educated as artists, designers and engineers rather than as businesspeople. Most maker businesses started as hobbies or problem-solving exercises and were not directly connected to plans for commercialization and growth. Nevertheless, makers are creating viable businesses as sole proprietors and as employers. As employers, they are typically relatively small, but in some cases having scaled up to employ ten people or more (this was the case with 21% of our total sample, or 20 of 95 firms).

While not all maker-entrepreneurs are interested in scaling, maker-entrepreneurial ecosystems center on helping those who do want to scale overcome the challenges of product prototyping, commercialization, marketing and distribution. Some maker-enabling entrepreneurs focus on developing hard infrastructure – supply chains and production space – while others attend to the soft infrastructure of makers' peer networks, brand identity and attachment to place. In each city, there are hybrid institutions that combine hard and soft infrastructure functions, supporting maker businesses well into their lifecycles with community, technical advice, physical space and political advocacy. Makerspaces are often part of the infrastructure that initially helps place-based manufacturers to launch, but they tend to fade in importance as firms scale up. Once firms are seeking to operate at scale, they need affordable industrial real estate in order to continue innovating.

If there is one major finding from this study, it is that makers have heterogeneous potential to stimulate regional economic development. This reality requires particularly thoughtful policy approaches. The impact of *micro-makers* lies in promoting household prosperity and quality of place, and in enabling creative people to contribute to the economy outside of the boundaries of traditional corporate enterprises. From a policy perspective, this group needs access to peer mentoring (which they often obtain through informal networks) and institutions that broaden the social safety net for people who are self-employed. *Global innovators* are firms whose principals began as maker-entrepreneurs, but whose primary local activity is now design and development, not manufacturing. This group needs the suite of services and supports that economic development practitioners generally provide to creative and professional businesses: transparent and consistent local regulations, functional services, and urban amenities. Finally, *emerging place-based manufacturers* have expanded or hope to expand while maintaining some or all of their production capacity in or close to their places of origin. Firms in this group are in a particularly good position to benefit from place-centered marketing, strong connections to

input suppliers and contract manufacturers, help with the unique challenges of scaling up production, and actions to promote affordable space and stable real estate environments. When emerging place-based manufacturers source inputs locally or use contract manufacturers in their cities and regions, their economic multiplier effect is amplified.

This study, a first-of-its-kind in its direct investigation of maker-entrepreneurs, provides evidence about firms and production ecosystems in three cities where the maker movement is strong and growing. Unsurprisingly, we find that cities' maker ecosystems are varied, drawing on unique, historically rooted bases of knowledge and skill in regions' economies. Studies of other "maker cities" will continue to fill the knowledge gaps we have begun filling here. In particular, studies are needed of cities and regions where entrepreneurs and policy makers are attempting to build maker ecosystems without the advantages of density, concentrations of human capital, and historical industrial diversity that are undeniably present in each of the cities profiled for this report. Research that informs public policy – both entrepreneurship policy and manufacturing policy in the context of local and regional economic development strategy – is particularly important as mayors and city councils across the U.S. begin promoting the maker movement in their cities.

Another area in which knowledge is needed relates to the potential for maker enterprises to become a source of employment for traditionally excluded and marginalized residents of urban areas. Renewed interest in and attention to manufacturing policy in the United States—whether manifested in the President's announcement of a manufacturing revitalization strategy or in local governments' embrace of the "maker" movement—is premised in part on the presumed role of the sector in creating new blue collar jobs with middle class earnings profiles. But the current demography of the business side of the maker movement – dominated by college-educated workers and aimed at affluent consumers – suggests that the inclusion of disadvantaged populations is not automatically occurring. Efforts to link the local development potential of maker-entrepreneurship with opportunities for middle class job creation are worthy of further study in this context.

Works Cited

- Anderson, Chris. 2012. *Makers: The New Industrial Revolution*. New York: Random House.
- Auerswald, Philip. 2015. "Enabling Entrepreneurial Ecosystems: Insights from Ecology to Inform Effective Entrepreneurship Policy." Ewing Marion Kauffman Foundation.
http://www.kauffman.org/~media/kauffman_org/research%20reports%20and%20covers/2015/10/enabling_entrepreneurial_ecosystems.pdf
- Bajarin, Tim. 2014. "Why the Maker Movement Is Important to America's Future." *Time.com*, May 19.
<http://time.com/104210/maker-faire-maker-movement/>
- Berger, Suzanne. 2013. *Making in America: From Innovation to Market*. Cambridge, MA: The MIT Press.
- Berry, Brian J.L., and Quentin Gillard. 1977. *The Changing Shape of Metropolitan America: Commuting patterns, urban fields, and decentralization processes, 1960-1970*. Cambridge, MA: Ballinger Publishing Company.
- Boschma, Ron, Asier Minondo, and Mikel Navarro. 2012. "Related Variety and Regional Growth in Spain*." *Papers in Regional Science* 91 (2): 241–56. doi:10.1111/j.1435-5957.2011.00387.x.
- Clark, Jennifer. 2013. *Working Regions: Reconnecting Innovation and Production in the Knowledge Economy*. New York: Routledge.
- _____. 2014. Manufacturing by design: The rise of regional intermediaries and the re-emergence of collective action, *Cambridge J Regions Econ Soc*, 7(3), 433-448.
- Dougherty, Dale. 2012. "The Maker Movement." *Innovations* 7 (3): 11–14.
- Doussard, Marc, Jamie Peck, and Nik Theodore. 2009. "After Deindustrialization: Uneven Growth and Economic Inequality in 'Postindustrial' Chicago." *Economic Geography* 85 (2): 183–207.
- Drucker, Joshua. 2011. "Regional Industrial Structure Concentration in the United States: Trends and Implications." *Economic Geography* 87 (4): 421–52. doi:10.1111/j.1944-8287.2011.01129.x.
- Eisenmann, Thomas. 2013. "Entrepreneurship: A Working Definition." *Harvard Business Review*. January 10. <https://hbr.org/2013/01/what-is-entrepreneurship>.
- Feldman, Maryann, Johanna Francis, and Janet Bercovitz. 2005. "Creating a Cluster While Building a Firm: Entrepreneurs and the Formation of Industrial Clusters." *Regional Studies* 39 (1): 129–41. doi:10.1080/0034340052000320888.
- Feldman, Maryann, and Ted D. Zoller. 2012. "Dealmakers in Place: Social Capital Connections in Regional Entrepreneurial Economies." *Regional Studies* 46 (1): 23–37. doi:10.1080/00343404.2011.607808.
- Heying, Charles. 2010. *Brew to Bikes: Portland's Artisan Economy*. Portland, OR: Ooligan Press.

- Hirschberg, Peter, Dale Dougherty and Marcia Kadanoff. 2016. *Maker City: A Practical Guide to Reinvention in American Cities*. <https://makercitybook.com/>.
- Isenberg, Daniel. 2011. "The Entrepreneurship Ecosystem Strategy as a New Paradigm for economy policy: principles for cultivating entrepreneurship." Babson Entrepreneurship Ecosystem Project, Babson College, Babson Park: MA.
- Jurjevich, Jason R., and Greg Schrock. 2012. "Is Portland Really the Place Where Young People Go to Retire? Migration Patterns of the Young and College-Educated, 1980-2010." Working Paper. Portland, OR: Portland State University, Population Research Center. http://pdxscholar.library.pdx.edu/prc_pub/5
- Kogler, Dieter F., David L. Rigby, and Isaac Tucker. 2013. "Mapping Knowledge Space and Technological Relatedness in US Cities." *European Planning Studies* 21 (9): 1374-1391.
- Maker Media & Deloitte Center for the Edge. 2013. "Impact of the Maker Movement: Notes from the Maker Impact Summit." Sebastopol, CA: Maker Media.
- Marotta, Steve, Austin Cummings, and Charles Heying. 2016. "Where Is Portland Made? The Complex Relationship between Social Media and Place in the Artisan Economy of Portland, Oregon (USA)." *M/C Journal* 19 (3). <http://journal.media-culture.org.au/index.php/mcjournal/article/view/1083> .
- Mason, Colin, and Ross Brown. 2013. "Entrepreneurial Ecosystems and Growth Oriented Entrepreneurship." The Hague, Netherlands. <http://www.oecd.org/cfe/leed/entrepreneurial-ecosystems.pdf>.
- Motoyama, Yasuyuki, Jared Konczal, Jordan Bell-Masterson, and Arnobio Morelix. 2014. "Think Locally, Act Locally: Building a Robust Entrepreneurial Ecosystem." SSRN Scholarly Paper ID 2425675. Rochester, NY: Social Science Research Network. <http://papers.ssrn.com/abstract=2425675>.
- Motoyama, Yasuyuki, and Karren Knowlton. 2016. From resource munificence to ecosystem integration: the case of government sponsorship in St. Louis. *Entrepreneurship and Regional Development*. 28 (5-6): 448-470. doi: 10.1080/08985626.2016.1186749
- National League of Cities. 2016. "How Cities Can Grow the Maker Movement." Washington, DC: National League of Cities, Center for City Solutions and Applied Research.
- National Science and Technology Council. 2016. "Advanced Manufacturing: A Snapshot of Priority Technology Areas Across the Federal Government." Washington, DC: National Science and Technology Council, Subcommittee for Advanced Manufacturing. <https://www.whitehouse.gov/sites/whitehouse.gov/files/images/Blog/NSTC%20SAM%20technology%20areas%20snapshot.pdf>
- President's Council of Advisers on Science and Technology. 2014. "Accelerating U.S. Advanced Manufacturing." Washington, DC: The White House, Executive Office of the President. https://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/amp20_report_final.pdf.

Roy, Kelley. 2015. *Portland Made: The Makers of Portland's Manufacturing Renaissance*. Portland, OR: Self Published.

Stangler, Dane, and Jordan Bell-Masterson. 2015. "Measuring an Entrepreneurial Ecosystem." Kauffman Foundation Research Series on City, Metro and Regional Entrepreneurship. Ewing Marion Kauffman Foundation.
http://www.kauffman.org/~media/kauffman_org/research%20reports%20and%20covers/2015/03/measuring_an_entrepreneurial_ecosystem.pdf.

Stangler, Dane, and Kate Maxwell. 2012. "DIY Producer Society." *Innovations* 7 (3): 3–10.

Wolf-Powers, Laura, and Annie Levers. 2016. "Planning, Social Infrastructure, and the Maker Movement: The View from New York City." *Carolina Planning Journal* 41.

Appendices

Appendix A

TRACKING PORTLAND'S ARTISANS/MAKERS: SOME NOTES AND OBSERVATIONS ON DATABASE CURATION METHODOLOGY

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In preparation for upcoming research that shares our methodology for creating an artisan/maker database for the city of Portland, we have decided to describe the shape that the process has taken, the faults we have found, and what has worked for us. Technically, the database is not complicated; it is an Excel spreadsheet, but could easily be done in any other database or spreadsheet software. Therefore, we will not focus extensively on the software/technical aspect of the database outside of a description of what it looks like and how we set it up. This follows below.

DATABASE CHARACTERISTICS

The database was created in Excel. We created columns that categorize what we feel is the most important identifying information, with special consideration to a survey we are planning for the academic year 2014-15. The columns we created are: **name of artisan/maker enterprise; name of owner/operator; year founded; product category** (general); **product description** (a more precise description of the good produced); **email; address and/or city; phone number; web address; source code** (explained below); **additional web pages** (explained below); and **notes**.

It may go without saying, but the Chicago and New York databases can be set up in such a way to reflect and gather the most relevant information for the research projects' requirements.

- The source code is a way for us to keep track of our process of finding artisans. We assigned a letter to a variety of sources (what we have been calling "rabbit holes"); the letter then is added to the database for future reference. A copy of our source code will be in the appendix to this document.
- Additional web pages could be an important Facebook page, an interview with the artisan from the media, an especially poignant bio or about page on the enterprise's website, an Etsy page, or any other web-based page with information about the maker/artisan. Since we are taking an "ecological" approach, we wanted to track other relevant artisan and maker-oriented aspects of the Portland artisan economy. This led to the creation of 7 other worksheets in the Excel document: a shop list, a miscellaneous resource list (described below), a makerspaces list, a "web ecology" list (described below), a digital agencies list (for example the

creative/branding agencies that facilitate artisan/maker enterprise development), and then 2 worksheets that locate these enterprises in a research database with detailed information (more below).

- The miscellaneous resource list contains a variety of resources that artisans and makers use. For example, an artisan working in the fashion/apparel industry might: use apprentices from a sewing school (Portland has quite a few of these); belong to the Portland Etsy team; participate in a local shopping rewards system (which is most often Supportland here in Portland); and so forth. The miscellaneous list, then, collects info (website, contact if relevant, notes, etc.) on these resources.
- The web ecology worksheet collects relevant data on the various web-based (usually not local) resources that artisans and makers frequently use. This includes webspace categories such as e-commerce (Etsy, Big Cartel), DIY web design sites (Wix, Squarespace), social media (Facebook, Instagram), crowdfunding sites (Kickstarter, IndieGoGo), blogging sites (Wordpress, Tumblr), and so on.
- We used Reference USA (suggested by our trusty librarian) to compare our information with and created two new worksheets. The first sheet is a simple yes/no answer to whether the enterprise shows up on Reference USA or not; the second sheet imports the information of the enterprises that do appear in Reference USA. The reason we feel this step is important is that we have argued that these small artisan enterprises are relatively invisible to traditional economic analyses. We have found this argument to be correct as applied to the Reference USA database; as of now, Reference USA only lists about 15% of the enterprises that we have identified in Portland.

This is a brief description of the characteristics of the database itself. However, the database is meant to be a living document that reflects the ephemeral nature of the artisan economy. Therefore, the document undergoes continuous changes: enterprises are constantly added and removed, new identifiers and categories are added, and so on.

CURATING THE DATABASE

Who's in and who's out? Problems with definitions

This has been one of the most difficult questions to answer, particularly in relation to two nebulous definitions that we have put at the center of our research: how *exactly* do we define **artisan/maker**, and how *exactly* do we define **local**? The definition of maker/artisan is important for obvious reasons, and the definition of local is important because we need to figure out what “local” means in relation to the city’s economy; that is, what are the elements that support Portland’s artisan economy, and how do these elements interact on a “local” level? **Local**: There are so many issues with defining what local means that Dr. Heying has crafted a graduate-level seminar exploring the problem. Among the top issues: the “local trap” (see: Mark Purcell’s work on the topic), mobility/demographics, gentrification/neighborhood change (who’s

local?), supply chain issues (where are inputs from), market locations (if made local, is it also sold local?), and so on.

Artisan/maker: In attempting to define what a maker is, we are hoping to find a way to better analyze the economic impacts of making/artisan enterprises on Portland's overall local economy. We have oscillated between a Potter Stewart-esque "you know it when you see it" definition to a "anyone that makes things" definition. Both definitions, however, are problematic for our purposes; going with the first could lead to an arbitrarily subjective result, while going with the second could lead to overstating the impact of makers on the overall economy. Our response to the problem of definitions has been a general rejection of the "yes/no" approach to defining. Instead, we have opted for a **curatorial approach**, allowing debates to take place instead of referring to some sort of cheat sheet that could never consider all the idiosyncrasies of a maker/artisan enterprise.

That said, there are some trends that have emerged from the process of curating the database. None of these trends should be taken as etched in stone, rather as guidelines or horizons that we are working toward. In thinking about the database as a living document, we are proposing a methodology for the curation of the database that is as malleable as the ecology of the artisan economy is presenting itself to be.

Our basic strategies on inclusion/exclusion

We have tended towards inclusion over exclusion; if we think there is a likelihood that an enterprise should be included, we include them. Our criteria have been to include in the database those who have been ambitious and recently active. This means they have developed a **website** for their enterprise, probably have a **Facebook page** (with recent posts! Is their enterprise still in existence if they haven't posted anything for 2 years?), and/or have some sort of **blog** (again, with recent activity) or **Twitter account**. They also probably have some sort of **online shop**, such as an Etsy or Big Cartel account. Enterprises tend to rely on social media and a general Internet presence, so without one it is too difficult to know if they are still in business. An **email address** is a necessity for inclusion, although I also include those that only have a "contact form" on their website. This is generally a pain (because you cannot use mail merge with contact forms), but a lot of artisans rely on this feature, especially when using a stock website builder like WordPress' or Squarespace's website building tools.

Etsy is one of the most difficult sites to weed through for artisans in terms of who is included and who is excluded; it is often a fine line between the two. For example, who on Etsy is an artisan "enterprise" and who is just a hobbyist? Are pure hobbyists out, even if they have an established history of popularity or strong sales on Etsy? A general rule that I have developed regarding Etsy is that without a presence outside of Etsy (Facebook, an enterprise-related blog, or preferably a website), I do not include them. In other words, only having an Etsy site is not enough to be listed on the database. That said, some Etsy-only artisans have an incredible amount of sales, so a few are included in the database. Etsy artisans do not tend to list their email addresses (possibly by some sort of Etsy policy), so finding contact info can be frustrating.

More problems with "local": the problem of physical geography as a limiter

In interviews with artisans I have frequently brought up the idea of “Portland Made” in asking about who gets to claim that label. Do people in Vancouver, WA get to claim to be “Portland made”? What about the immediate Oregon suburbs such as Beaverton? Here is a small sample of answers that I have gotten:

- Some artisans are strictly Portland-only; for example, Tique Box only works with artisans that work in Portland (not the suburbs or anywhere else near Portland)
- Some artisans recognize that Portland’s popularity is making rents more expensive, so for financial reasons there should be a consideration for those that have moved to less expensive parts of the metro area to deflect the cost of rent
- One artisan interview put the geographical distance in terms of convenience, as in the distance one would travel a few times a day. For example, they argued that not many (if any) artisans would make multiple trips to Salem from Portland every day

Our technique has relied on a constant judgment call: if the artisan enterprise is an integral part of the Portland ecology of makers and artisans, and seems enthusiastic about fostering and being stewards of the Portland making scene, they are included. Artisans and makers outside of the Portland metro (which we take to be roughly Hillsboro to Gresham, Vancouver [WA] to Lake Oswego) are generally not included. Anything as far as Salem, which is technically part of the Portland MSA, is never included.

A helpful criterion to consider is where the goods/products are actually made. For example, Perch Furniture – a Portland furniture company – takes orders and sells their furniture in their Portland showroom, but their goods are made in California. Another example is TreeHouse, a digital services enterprise that is based in Portland but originated in England and has almost all of its employees in Florida. It is an ongoing judgment debate about whether or not these enterprises end up in the database.

With all these caveats about distance and geography stated, it should be noted that the power of Portland’s brand virtually eliminates artisans from claiming to be from anywhere in the region besides Portland. While it seems that most are actually located somewhere in Portland – probably to take advantage of the walkable/bikeable ecology of maker-related (enabling) resources – it seems to be the case that even artisans located in the immediate suburbs claim to be “Portland made” to capitalize on the power of that brand. ‘Beaverton made’ obviously does not carry the same weight as ‘Portland made.’ It would be our assumption that this would hold true in other metro areas; ‘Chicago Made’ probably carries more weight than ‘Naperville Made.’ A last caution on mobility and geography: Given the fact that artisans can sell online (on Etsy, Big Cartel, Shopify, etc.), their physical location may change quite frequently. I have read many bio/about pages on websites in which an artisan discusses their geographic promiscuity; they may begin a business while in college in California, then move to Seattle only to be lured by Portland, get popular in Portland and then decide that they want to try Brooklyn or Los Angeles for a while. By the time that we see a press page (an interview in the Portland Mercury, for example) that calls an artisan “Portland-based,” the artisan could have already relocated. An example of this is Btwn Wind+Water. The artisan that started this apparel company did so in

Portland, but has relocated to Los Angeles since the time I logged the enterprise's information. It takes constantly going back through Facebook and Twitter posts to make these discoveries.

Curating via Google: the Internet as a tool in the search for local artisan enterprises

The Internet is basically a system of 'rabbit holes' that intersect a thousand times without any seemingly logical pattern, kind of like the road system in the metro-Boston area. We use the term rabbit holes to describe the oft-times bizarre progression of mouse clicks that leads us to an artisan enterprise. We have taken to labeling the rabbit hole (the aforementioned code scheme) in order to document, remember, and hopefully be able to recreate the pathway that led us to a particular enterprise.

The key technique for us in using the Internet to search for artisans has been to find inventory lists. There are two places to start such a query. The first place is with the artisan website. Many artisans and makers list the local boutiques and shops that sell their goods (often referred to as "stockists"); after finding the website for the shop, check to see if there is a page that lists the brands and artisans they stock. The second place to start is at the shop's website (if already known). Once presented with a list of artisan goods, it is simply a matter of searching the artisan enterprise name and making a decision about whether the enterprise fits the database's criteria. This technique informed a good chunk of the database.

Other lists that often link to artisans/makers and their enterprises are: blogs, online magazines (especially review pages), gift guides (large newspapers often times have these online), craft fair websites, advocacy organizations, guilds and/or collectives, makerspaces/collaborative workspaces (often these include tenant lists), trade schools and/or university specialty program sites (e.g. OSU's fermentation science program), museum collection lists, crowdfunding sites (many Kickstarter projects either become enterprises or effectively grow an enterprise into visibility), and service sites (Houzz or Custom Made, for example). We have utilized all of these types of sites in our curation process.

A note of caution about blogs: Blogs, like artisan enterprises, are constantly flitting in and out of existence and/or maintenance; therefore, it is an important determination of the part of the researcher that the blog is currently live and maintained. There are many blogs that are just left to linger in the blogosphere when their owners stop maintaining them. These can sometimes still be of use, but they can also lead to dead ends and dated information.

In determining if an enterprise is still in operation, social media sites like Facebook, Instagram, and Twitter are quite helpful. In addition to being one of the most useful and reliable ways to collect contact info on artisan enterprises (particularly Facebook here), reading the most recent posts helps the researcher determine the status of the enterprise. As an example, I was entering one artisan enterprise (Green House Framing) into the database when I read through their Facebook posts, realizing that the most recent post (on a date which was not outside of what I would expect for a currently operating enterprise) was a "goodbye" post, and that the enterprise was in the process of closing.

Searching for artisans the old fashioned way – getting out into the community

My original goal was to achieve saturation online – i.e. the point at which I started seeing the same artisans over and over in my online investigations – and then hit the streets and talk to shopkeepers, people at bars and restaurants, friends, and strangers. Three months into my database construction project, I have yet to reach online saturation. I can still count on vetting and adding 20-30 artisans to the database every day. With this in mind, my revised strategy has been to hit the streets when I can't take sitting at my desk any longer.

Some of the strategies that I use when I physically search:

- The most obvious place to start is in commercial districts. Commercial districts are ubiquitous around Portland, but every city has them. These are the places where there are craft-related stores, artisan food places (bakeries, cookie shops, coffee shops, food carts, restaurants), boutiques, local bookstores, etc – shops that sell locally-made goods.
- Anytime I come across a shop that sells locally made goods, I log the shop's info in the database. I do this because a lot of them have inventory lists online.

Many shopkeepers are willing to talk about locally made goods; I have received plenty of advice from shopkeepers about where to hunt for artisans. Shopkeepers are also uniquely situated between the producer/artisan and the consumer, so they play the role of mediator. As an example, one interviewee (Beth from Urban Retrospectives) discussed how she had originally not included the phrase “made in Portland” on her goods, which were sold in the downtown Portland boutiques frequented by tourists. The shopkeeper suggested that Beth should start printing “made in Portland” on her products. She did so, and her sales increased as a result.

- “Windshield surveys” are also helpful; some shops are located outside of commercial districts, so driving around and simply paying attention to the signage and aesthetic of isolated shops can yield good results.
- Going to local coffee shops helps as well: a lot of great ideas circulate in local coffee shops; maybe coffee shops are the new garages. As an example, we recently met an angel investor named “Starbucker.” This investor got his name from his technique of finding investments by eavesdropping at different coffee shops (thus “Starbucker”). There is nothing stopping researchers from doing exactly the same thing.
- Attending events: We have been to craft fairs, enterprise launch parties, random meetings between enterprises, presentations, etc. There are always great connections to be made at these events.
- I carry business cards around with me, and pass them out liberally. Any shopkeeper that I talk to, artisans that I happen across, and so forth; I have gotten a handful of helpful emails as a result.

CONCLUSION

As mentioned above, we are always in the process of tuning these methods; we would love to hear any feedback, advice, or criticism. Additionally, what works in Portland may not work in

other cities. We would be interested in knowing what does and what doesn't work in New York or Chicago.

It should be noted that many of our resources are not Portland-specific. For example, the comic book store locator uses zip codes to find local comic and zine stores. Additionally, we expect the "web ecology" section to be fairly universally used in the US. We expect that many entrepreneurs rely on these resources (social media, e-commerce, etc.) quite extensively; these resources are obviously not locally bound to any one geography. In fact, one of our start-up research questions was about how to understand localism in relation to the artisan/maker economy. The global reach of these web ecology resources is one of the more interesting conundrums of localism as it is perceived by making/artisan communities.

Finally, please find the coding for our "rabbit holes" below. We are quite interested in learning new techniques for locating artisans/makers, so please contact us with any new techniques or suggestions.

APPENDIX

Code Legend: Sources ('rabbit holes') are in **bold**

- **I**: Inventory List from a local boutique/store
 - Store name appears after the hyphen (e.g. "I – Communion" means the source was Communion's Inventory list)
 - I is also used when an artisan is discovered vis-à-vis a reference on another artisan's webpage
- **BL**: Blog, online magazine, or other trade reference
- **MS**: Makerspace/hackerspace
 - Makerspace name will appear after the hyphen (e.g. "MS – ADX Portland")
- **WM**: Word of Mouth/Personal Reference
 - Used this code broadly, including meeting business owners in person at events or meetings.
- **S**: Service List (e.g. Tique Box)
 - Service name will appear after hyphen (e.g. "S – Tique Box")
- **CF**: Craft Fair (e.g. Renegade)
- **G**: Guild
 - Guild name will appear after hyphen (e.g. "G – Oregon Brewers Guild")
- **PK**: Previous Knowledge of product/enterprise
- **GG**: General Googling (e.g. googling "Portland Furniture Makers")
- **CW**: Collaborative Workspace (e.g. Ford Building); artisans might come from online list of tenants or even from visiting the workspace in person
 - Workspace name will appear after the hyphen (e.g. "CW – Ford Building")
- **MS**: Makerspace (e.g. ADX Portland)
- **PS**: Portland Made Survey results suggestions
- **E**: Education Facility; could be a trade school, a college of arts, or a workshop facility
 - Facility's name will appear after the hyphen (e.g. "E – Barista Coffee School")
- **O**: Observation; walking around, shopping, snooping, etc.

- **M:** Museum or Collection list
 - o Museum's name will appear after the hyphen (e.g. "M – Museum of Contemporary Craft")
- **SS:** Site Search; this is when a search is performed on a page that yields results in a list form. Prominent examples are Big Cartel, Houzz, Kickstarter, and IndieGoGo.
 - o Host site's name will appear after the hyphen (e.g. "SS – Houzz")
- **PM:** Print Media; examples are magazines, brochures, advertisements, flyers, and so on
 - o Media name will appear after the hyphen (e.g. "PM – The Pearl Magazine")

Appendix B

Maker Interview Codebook

- Company Background
 - Motivations to Become Maker
 - Education/Professional Background
 - Maker Firm Evolution
 - Start-up Financing
- Production Methods & Process
 - Production Challenges Faced
 - Production Choices
 - Use of technology
 - Use of labor
 - Supply Chain
- Sales & Market Geography
 - Strategies for Reaching Market
 - Social media
 - Challenges Reaching Market
 - Influential Market Trends
- Support Ecosystem
 - Benefits of Support Infrastructure
 - Use of Support Infrastructure
 - Maker-specific
 - Entrepreneurship/small business support
 - Other support
 - Connections with other Makers
 - Collaboration with other Makers
 - Competition with other Makers
 - Barriers/Limits of Support Infrastructure
- Maker Identity and Engagement
 - Policy/Planning Engagement
 - Value Orientation
 - Makers Self-Identity
 - Identity as Entrepreneur
 - Identity as Maker
 - Identity as Artisan/Craftsperson
 - Identity as Manufacturer
 - Identity as Designer
 - Definition of "Maker"
 - Attachment to Place
- Future of Company
 - Growth Intention
 - Future Challenges
- Verbatim quote

MEE Interview Codebook

- Background/Company Info
 - Startup/Operational Challenges
 - Organization/Funding Structure
 - Ecosystem Gap Identification
 - Professional/Educational Background
 - Motivation
 - Startup Financing/Funding
- Company Function/Network Position
 - Importance of Location
 - Role in Maker Ecosystem
 - Challenges working with Makers
 - Benefits to Makers
 - Interactions with Makers
 - Informal
 - Formal
 - MEE Collaboration
 - Collaboration with other MEEs
 - Collaboration with Public Sector
 - Collaboration Challenges
 - Range/Reach of MEE
 - Role/Use of Technology
 - Social Media/Internet-based
 - Production Technologies (eg, 3D printing, etc.)
- Big Picture Questions
 - Maker-specific Challenges
 - Business/Operations Related
 - Community/Milieu Related
 - Policy Related
 - Future Considerations
 - Definition of Maker/Maker Movement
 - Maker Ecosystem Observations
 - Policy/Planning Related
 - Community/Milieu
 - Technology
 - City/Place-specific Observations
 - Place Branding
 - Real Estate/Space
- Verbatim quote