The Economic and Financial Feasibility of Food Innovation Centers

By

Alison Crowley

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Georgetown University
Washington, DC (2010)

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Signature redacted

Department of Urban Studies and Planning and Center for Real Estate

May 21, 2015

Signature redacted

Dr. Andrea Chegut
Center for Real Estate
Thesis Supervisor

Signature redacted

Professor Dennis Frenchman
Chair, MCP Committee
Department of Urban Studies and Planning

Signature redacted

Professor Albert Saiz
Chair, MSRED Committee
Interdepartmental Degree Program in Real Estate Development
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ABSTRACT

A Food Innovation Center (FIC) is an enclosed commercial space comprising a mix of complementary uses pertaining to locally-operated food growing, production, processing, testing, distribution, and sale. These uses include indoor vertical farms, commercial shared-use kitchens for start-up food businesses, rooftop greenhouses, food halls with local, artisanal vendors, and food-related R&D space, among others.

While literature exists on the demand for locally produced food, there is still a gap in the industry’s knowledge about the financing environment, development costs, and overall rate of success that FICs experience. The research presented in this thesis is intended to provide an overview of existing Food Innovation Centers via data on acquisition, construction, operations, and returns of individual projects. Does the FIC product innovation add value to urban industrial real estate, and is the FIC a feasible model, financially and economically, for industrial development?

Survey analysis of 62 FICs and six in-depth case studies show that FICs are more prominently featured in commercial rather than industrial space and operate on a business model in which a developer owns the property but leases to individual tenants operating one of the FIC business components. Financing largely comes from the philanthropic sector, and some of the most ambitious FICs have partnered with municipalities to identify publicly owned land for a nominal ground lease to the city or below-market acquisition.

Overall, the FIC product type is still under development, and more must be learned about the lease structures within the FIC to generate more robust underwriting standards that will better attract commercial investment. The most proprietary component of FICs are indoor vertical farms, for which the technology supporting the farm systems is still very much in the nascent R&D phase and not yet prepared for commercial diffusion.

FICs do, however, have the ability to impact urban residents who lack access to healthy food. Through procurement, distribution, and wholesaling operations that can take place at FICs, regional small farmers can more easily get their produce into an urban area for distribution to residents. Incubator kitchens can provide cost-effective means for urban residents to test their own business models in the food and beverage manufacturing industry, and the roles that FICs play in hosting public events increases the connection between consumers and the food they eat. FICs generate economic growth through their ability to launch small businesses and create stronger and more direct supply chains between farmers, producers, wholesalers, food and beverage providers, and ultimately the consumer.

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Introduction

This thesis will explore the confluence of urban food manufacturing and industrial re-use through the lens of the real estate developer. Specifically, I will examine the economic and financial feasibility of the development of Food Innovation Centers. A Food Innovation Center (FIC) is an enclosed commercial space, in either new construction or adaptive re-use, comprising a mix of complementary uses pertaining to locally-operated food growing, production, processing, testing, distribution, and sale.

FICs are an expanding product type at the nexus of the urban agriculture and commercial real estate sectors of the economy. There are many variations, but a certain fundamental holds true for the projects: a desire to engage local farmers, manufacturers, and entrepreneurs in the process of creating and sustaining a regional food system.

Interest in FICs continues to grow, not only from the real estate development community, but also from the design community, from conventional and community-oriented investors, to municipalities, customers, and the food business entrepreneurs themselves. Not only in the United States, the concept has taken hold abroad as well, in particular in western Europe and Asia, where industrial revitalization in the former and experimental vertical farming in the latter have been the primary motivations for innovation.

In the design community, nationally and globally recognized firms like Perkins + Will and OMA Architects have published master plans completely centered on the development of urban food manufacturing space, speaking to the desire of stakeholders to recognize transformative development through food. Design competitions have also featured food: the Philadelphia Center for Architecture awarded its 2015 Better Philadelphia Challenge first prize to a team of graduate architect and planning students who re-envisioned a 292-acre island in the Delaware River as the “Delaware Valley Foodworx.” Their proposal included food distribution warehouses, an agricultural college, a seed bank, a farmers market, and at its centerpiece, a vertical farm.1

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Conventional and community-oriented financing continues to connect with FICs at a slow but growing pace. In particular, vertical farming, a nascent industry with financial promise, began to attract investment in 2014 and 2015. AeroFarms, a vertical farm started in 2004, announced in March 2015 that it would partner with the RBH Group, Goldman Sachs Urban Investment Group, and Prudential Financial, as well as the City of Newark and the New Jersey Economic Development Authority to invest $30 million into the conversion of a 69,000 former steel factory into a vertical farm. The facility, soon to be the largest vertical farm in the United States, was under construction as of March 2015. Significantly, this project represents one of the first instances in which a conventional, market-rate investor has taken on an industrial rehabilitation project for vertical farming.

Other vertical farms continue to announce acquisitions and expansions for their businesses as well: in February 2015, hydroponic indoor farming company Urban Organics announced the acquisition of an 80,000 SF former brewery in St. Paul, MN, while Green Spirit Farms, one of the larger vertical farm producers in the country, secured the acquisition of a 300,000 SF industrial facility in Lackawanna County, PA. These developments illustrate the growing interest in vertical farming as a viable business model, especially in urban and industrial areas where traditional agriculture may not be feasible.
County, Pennsylvania, for a $27 million investment in a new vertical farm.¹⁴

Municipalities have been key players in making these projects happen. Vertical Harvest, a three-story vertical greenhouse under construction in Jackson, Wyoming, represents a $3.7 million investment made possible by the donation of publicly owned land to a non-profit operator and a nominal $1 annual rent to the city. Vertical Harvest leveraged these cost savings to secure $750,000 in debt financing by backing loans with private investors’ collateral.⁵ Whether municipalities offer to ground lease or sell sites for less than market value, the sheer scale of underutilized city-owned land has inspired many local governments to work with interested developers and entrepreneurs to make these food-related projects happen. Some cities, like Philadelphia and Detroit, have made utilizing vacant land for food production purposes a key tenant of their blighted land remediation plans, while others have implemented zoning and land use policies friendly toward mixed-use commercial and light manufacturing.

At the federal level, programs such as New Market Tax Credits and the Healthy Food Financing Initiative provide financing and local and state-level initiatives work to identify grants and loans to make available to developers pursuing innovative food projects.

Examples of this include the Pennsylvania Governor’s Action Team, a collaboration of the PA Department of Community and Economic Development, which helped organize and finance the Green Spirit Farms transaction in Lackawanna County.

Image 2: Rendering of Vertical Harvest, a greenhouse to be built on the back side of a parking garage in Jackson, WY.

Most significantly, interest from entrepreneurs continues to grow, both from the development community and from the actual small and mid-sized food production and manufacturing community as well. Developers are taking note of the increasing wave of interest in locally grown, manufactured, produced, distilled, and brewed goods, and food-based entrepreneurs continue to emerge as an


¹⁵Penny McBride and Nona Yehia, telephone interview with Vertical Harvest founders, February 16, 2015.
important part of America's manufacturing renaissance. Brought together, the Food Innovation Center movement represents a new way of thinking about food production. FICs represent opportunity in the economic language of innovation districts and regional growth clusters, in the financing language of return on investment, and in the cultural language of broadening access to locally sourced and produced food throughout America.

While literature exists on the demand for food produced in such an environment, there is still a gap in the industry's knowledge about the financing environment, development costs, and overall rate of success that FICs experience. This lack of information is to the detriment of the developers, business owners, or city officials who may consider developing a Food Innovation Center in their own city.

The research presented in this thesis is intended to provide an overview of existing Food Innovation Centers via data on acquisition, construction, operations, and returns of individual projects. Is the FIC a feasible model, financially and economically, for industrial development? Additionally, does the FIC effectively address issues of food access and transparency that confront urban stakeholders? These research questions will guide the thesis.

Results
In the survey analysis of 62 FICs and six in-depth case studies, FICs are more prominently featured in commercial rather than industrial space and operate on a business model in which a developer owns the property but leases to individual tenants operating one of the FIC business components. FICs operate on average at least three separate business components, and some surveyed operated as many as 12. Data on construction costs for building owners shows that industrial rehabilitation may be less financially feasible than demolition and new construction on industrial sites, or alternatively, less financially feasible than rehabilitating a commercial space instead.

Financing for FIC development largely comes from the philanthropic sector, and some of the most ambitious FICs have partnered with municipalities to identify publicly owned land for a nominal ground lease to the city or below-market acquisition. Commercial investment in FICs focuses more specifically on indoor vertical farms rather than any of the alternative FIC uses, and those FICs that operate primarily as shared-use kitchens typically earn less than $5,000 in annual net operating income. All of the FICs surveyed who provided income data earned on average $161,415 annually.

Overall, the FIC product type is still under development, and more must be learned about the lease structures within the FIC to generate more robust underwriting standards that will better attract commercial investment. The most proprietary component of FICs are indoor vertical farms, for which the technology supporting the farm systems is still very much in the nascent R&D phase and not yet prepared for commercial diffusion.
FICs do, however, have the ability to impact urban residents who lack access to healthy food. Through procurement, distribution, and wholesaling operations that can take place at FICs, regional small farmers can more easily get their produce into an urban area for distribution to residents. Incubator kitchens can provide cost-effective means for urban residents to test their own business models in the food and beverage manufacturing industry, and the roles that FICs play in hosting public events and cooking demonstrations as well as providing space for food trucks to serve meals increases the connection between consumers and the food they eat. FICs generate economic growth through their ability to launch small businesses and create stronger and more direct supply chains between farmers, producers, wholesalers, food and beverage providers, and ultimately the consumer.

Organization

This thesis is organized as follows. In Chapter 2, I do a literature review to assess the policy and planning issues that FICs are best prepared to address from the perspective of the urban resident and real estate developer. In Chapter 3, I continue the literature review to understand current research on the component business operations of a FIC and existing FIC proposals. In this chapter, I seek to understand the relevant development costs and financial feasibility associated with each of the FIC's business operations.

In Chapter 4, I analyze a quantitative survey distributed to 190 companies that I identified as Food Innovation Centers based on the operational definition provided in Chapter 2. The survey requested information on location, firm ownership structure, building ownership structure, building typology, development costs, business operations, operational costs, and net operating income. The data collected is used to produce descriptive statistics on a representative sample of FICs in the United States.

In Chapter 5, I conduct in-depth interviews with developers of six Food Innovation Centers. These interviews document details related to the acquisition, construction, financing, and operations of these projects. The interview method addressed some of the complexity in financing and business operations not easily captured in the survey responses. Using the case studies, I draw a series of takeaways relevant to the feasibility of FIC development from the real estate developer's perspective.

Finally, in Chapter 6, I conclude with a review of the research conducted and how this research applies to the issues identified in earlier chapters. I respond to the question of the economic and financial feasibility of Food Innovation Centers through the lenses of agricultural innovation, economic clustering, and rent premiums. I end with a summary of the best practice model for developing a Food Innovation Center.
Food and Industry in America

Urbanized areas, particularly urban industrial cores or inner cities, are confronted with a variety of issues: growing income inequality, disappearing middle class job opportunities, lack of workforce and lower income housing, and disparate access to healthy, affordable food, among many others. Entrepreneurs operating in these environments have identified innovative solutions that challenge the political and financial status quo, from developing co-working spaces for start-up companies, to sending mobile food trucks carrying fresh produce into the poorest urban communities, to democratizing access to capital for small business owners through microfinance lending, and a myriad of other means.

Among all of these challenges, at least two revolutions are underway in the American city: the increasing scrutiny of our food supply, including where it comes from, how it’s made, and who it reaches, as well as increasing innovation within a changing industrial and manufacturing sector. The attention and reflection paid to both issues in today’s policy environment represents a unique and timely opportunity for the real estate development community. For developers pursuing projects in infill, urban locations, food and industry have the potential to provide substantial returns in the form of an emerging product: the Food Innovation Center.

The US Department of Agriculture describes a food value chain as the following:

“Food value chains are collaborative business networks comprising food producers, processors, distributors, marketers, and buyers who jointly plan and coordinate their activities to achieve common financial goals while advancing an agreed-upon set of social or environmental values, such as farmland preservation, sustainable agriculture, small farm viability, or healthy food access.”

Food Innovation Centers harness the value chain in one physical product. They are not a completely new concept, but a singular definition for the product does not exist. Variously called food

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hubs, food innovation districts and food innovation campuses, and food ports, the basic concept of a FIC capitalizes on the same agglomeration synergies that characterize technology-based innovation districts, but does so for the food and beverage manufacturing and production sector. For the purposes of this research, the FIC typology is defined as the following:

A Food Innovation Center is an enclosed commercial space, in either new construction or adaptive re-use, comprising a mix of complementary uses pertaining to locally-operated food growing, production, processing, testing, distribution, and sale.

The FIC product provides the physical infrastructure for small and mid-sized farms and food manufacturers and entrepreneurs to operate and grow their businesses by sharing the burden of capital expenses across multiple users. FICs strengthen regional agricultural systems by creating a closed-loop system of production that serves the needs of both producers and consumers, and also have the potential to put back into productive use the industrial building stock in distressed urban areas.

Background: Food and Industry

Food Access

The world’s population of 7.2 billion in 2013 could increase by as much as one billion people in the next twelve years and an additional 1.5 billion by 2050. The majority of that growth will take place in rapidly urbanizing developing countries. In the United States, despite less dramatic shifts in overall population, cities continue to see greater growth than surrounding suburbs and rural communities. Urban areas account for 80.7 percent of the US population, up from 79 percent in 2000, and the nation’s urban population grew by 12.1 percent between 2000 and 2010, outpacing the overall 9.7 percent national growth rate. Between 2012 and 2013, cities with populations exceeding 100,000 residents collectively added an additional 857,000 residents, accounting for an increase of one percent, while all other areas of the country reported just a 0.6 percent growth rate in total.

Food access, however, does not seem to be keeping pace with the numbers moving into cities, and lack of access to fresh food is more problematic for low-income urban neighborhoods than high-income ones. The US Department of Agriculture tracks census tracts known as “food deserts,” defined as a tract in which a substantial share of

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residents living in low-income areas also have low levels of access to a large supermarket or an affordable food retail outlet. Access is based on whether 33 percent or more of the tract residents live more than one mile from a supermarket or large grocery store. In New York, where the urban population grew by 0.7 percent between 2012 and 2013, none of the Census tracts in Manhattan identify as a food desert, while nine Census tracts in the Bronx, a substantially lower income borough of the city, qualify.\textsuperscript{10}

These statistics appear to repeat themselves in every major metropolitan area of the United States. In Washington, DC, where population increased by 2.1 percent between 2012 and 2013,\textsuperscript{11} residents of the two poorest wards of the city, Wards 7 and 8, who comprise only 25 percent of the city’s overall population, comprised 53 percent of the total number of residents living in food deserts in that city.\textsuperscript{12} In Los Angeles, neighborhoods in high-income areas had 2.3 times as many supermarkets per household as those in low-income neighborhoods.\textsuperscript{13} Again, the USDA shows that lower income communities in urban areas have fewer supermarket-grade food options than their wealthier neighbors.

This disparity has very real economic implications. In the United States, where energy and transportation costs account for eight percent of the price of domestically produced food,\textsuperscript{14} volatility in oil prices can severely affect weekly spending if food prices spike. Although US oil prices in February 2015 at $49.56 per barrel were 53 percent lower in real value than seven years earlier in February 2008, they rose as high as $143.71 per barrel in June 2008 and could deviate as much again.\textsuperscript{15} For those without vehicles living in food deserts, residents may turn to either fast food or corner markets for their main consumption needs. Corner markets and bodegas frequently have fewer fresh food options and much higher price points due to the lack of economy of scale from which small business owners suffer. Indeed, the average price of a standard dry good otherwise found in a typical supermarket has an 11 percent mark-up when sold at an individually owned corner market (Broda, Leibtag, Weinstein, 2009). In both circumstances then, for residents both with and without access to a car, living in a food desert can have substantial impacts on both their health and income.

\textsuperscript{11} Maclag, “New Population Estimates Highlight Nation’s Fastest-Growing Cities.”
\textsuperscript{12} “USDA Food Deserts.”
Food Renaissance

Right next to neighborhoods plagued by lack of food access is a renaissance underway in how consumers think about food. Since the early 2000s, the exploding popularity of farmers markets, food trucks, direct producer-to-consumer marketing, and most significantly the growth of the organic food industry points to a growing consumer interest in where food comes from, how it’s produced, and who ultimately benefits from food sales. In 2008, the USDA estimated that the farm-level value of local food sales totaled about $4.8 billion, representing 1.6 percent of the overall US food market. Of the $4.8 billion direct-to-consumer sales, farmers markets accounted for $0.9 billion. Another $2.7 billion in sales were filled through local grocers, restaurants, and regional distributors, and $1.2 billion came from farms using direct and intermediated marketing channels, such as Community Supported Agriculture (CSA) subscriptions (Johnson, Aussenberg, Cowan, 2013). For the ten years between 1997 and 2007, direct-to-consumer marketing increased in all US food-producing regions and represents a small but increasingly popular alternative to mainstream supermarkets. Notably, in 2010, the USDA reported 6,132 farmers markets registered in the country. By 2015, that number grew to 8,268, a 35 percent increase. Johnson, Aussenberg, and Cowan (2013) found in an analysis for Congress on the role of local food in US farm policy that the reasons cited for the increasing popularity of local foods were the following:

“[...] [P]erceived higher product quality and freshness of local food; a desire to provide social and political support for local farmers and the local economy; farmland preservation; concerns about environmental impacts and energy use and the perception that local foods are more environmentally friendly (limited use of chemicals, energy-based fertilizers, and pesticides); perceived better food safety given shorter supply chains; sense of social justice (perceived fairer labor prices and fair price for farmers); knowing the source of the product; a commitment to establishing closer connections between consumers and agricultural producers; and, generally, a response to concerns about industrialized commercial agriculture.”

Other signs point to an increased interest in the origination and quality of the food we consume. Food trucks, typically operated by entrepreneurial chefs who lack the capital to start a brick-and-mortar restaurant, continue to multiply annually. Food truck sales in 2012 totaled approximately $650 million and were projected to grow to $2.7 billion in revenue by 2017, representing three to four percent

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mplateS&leftNav=WholesaleandFarmersMarkets&page=WFMFarmersMark
etGrowth&description=Farmers+Market+Growth.
of total US restaurant food sales.\textsuperscript{17} Many of these trucks market the fact that their ingredients are locally sourced, and many operators have contracts directly with the growers producing the food they sell.

However, the greatest sea change in the consumer’s perception of food has come from the explosive growth of the organic industry. The USDA’s National Organic Program stipulates that organic agricultural products must be produced through approved methods that exclude synthetic fertilizers, sewage sludge, irradiation, and genetic engineering.\textsuperscript{18} According to the USDA Economic Research Service, organic food sales in 2012 totaled approximately $28 billion, an 11 percent increase from 2011 and a four percent share of total food sales.\textsuperscript{19} The Organic Trade Association reported slightly higher sales for 2012, totaling $31.5 billion, with an increase of an additional $4 billion in sales by the end of 2013.\textsuperscript{20} Whole Foods, which has dominated the organic niche since it first opened in 1985 and whose name remains synonymous with the organic food industry, opened 32 stores in 10 new markets in 2013 alone.\textsuperscript{21} Despite increased competition from other organic retailers selling at slightly lower price points, Whole Foods still reported a rise in fiscal first quarter sales in February 2015, with total sales rising 10 percent to $4.67 billion, and same-store sales rising 4.5 percent. After opening nine more stores in the first quarter of 2015 alone, Whole Foods predicts that there is still enough demand in the US for organic products to warrant 1,200 more stores.\textsuperscript{22} A caveat to the increasing popularity of organic foods is the subsequent increase in the price of food; in January 2013, the wholesale price of standard organic commodities was on average 92% more expensive than their conventional counterparts.\textsuperscript{23} This price point increase even greater reflects the contrast between issues of food access in inner city urban cores and the growing local and sustainable food movement.

In short, despite the overwhelming dominance of the traditional grocery store, change is underway. The 25 largest food and beverage companies in the US collectively represented 45 percent of the industry’s $418 billion in 2014 sales, but this number was 4.3

percentage points less than five years earlier. In comparison, smaller companies focused on local and organic branding strategies saw their share of the industry increase from 32 percent to 35 percent in the same period. Consumers continue to respond positively to increasing transparency documenting where their food comes from, what the ingredients mean, and how their produce and meats were farmed. This, next to the trials of residents living in food deserts with limited access to affordable food, frames two of the most significant developments regarding food in urban America.

*America’s Industrial Economy*

While cities grapple with questions of food provision and quality, the re-emergence of manufacturing and an increased interest in “re-shoring” American industry represents another potential renaissance, and one that ties neatly into the issues of food access and transparency. This section will first discuss the areas in which industrial development is experiencing growth, and conclude with a description of the current strategies in place for increasing urban industrial manufacturing and how FICs fit into this urban strategy.

Due in large part to the growth of e-commerce, employment in the manufacturing, warehousing, and distribution industries added 279,000 jobs between 2013 and 2014. Overall US industrial production increased 5.6 percent year-over-year between the fourth quarter of 2013 and the fourth quarter of 2014. Robust industrial growth in 2014 has had dramatic effects on the country’s industrial building stock, resulting in lower vacancy rates, higher asking rents, and positive net absorption of industrial building stock in 2014. Leasing activity increased by 5.6 percent between 2013 and 2014, while asking rents increased from $5.28 per square foot to $5.54 PSF on a national average, a 4.9 percent increase. In certain sub-markets like Southern California, vacancy rates for warehouses are as low as 3.4 percent, compared to a national average of seven percent.

These market fundamentals drove increased levels of new industrial construction in 2013 and 2014. In 2014, new development included 74.5 million square feet of speculative industrial space and 67.2 million square feet of build-to-suit. This was an increase of 54 million square feet over construction activity in 2013. On the transactions side, industrial transaction volume ended 2014 at $54.2 billion, a 13.2 percent increase over the previous year. Over the last five years, the average price has increased by 48.1 percent, and the average cap rate continued to decline, dropping to seven percent in 2014. Los Angeles, Chicago, and Atlanta are three of the strongest

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urban industrial markets, where leasing activity increased as much as 51 percent between 2013 and 2014.

There is a disparity, however, between the strong numbers reported on the industrial sector overall, and the reality of industry in urban cores. Sector growth has occurred largely in the suburban and peri-urban realm of warehousing and logistics, rather than in traditional urban manufacturing. Within Los Angeles, which had the strongest industrial leasing activity in 2014, 160,332 addresses in 2012 were registered as vacant commercial addresses. In Chicago, another strong industrial market with more than 1.1 billion square feet of industrial space, 37.9 percent of commercial properties were vacant (Eppig and Brachman, 2014). While these numbers account for all commercial buildings, including office and retail, a significant portion of entirely vacant buildings are underutilized and abandoned industrial building stock in urban cores.

The underutilization of industrial building stock has captured the interest of municipalities who have begun to develop strategies for increasing urban industrial manufacturing. These strategies are more granular than the large-scale industrial growth occurring in the e-commerce and warehousing industries, and instead highlight light manufacturing and “maker spaces” as a means of revitalizing these brownfield properties.

Maker spaces are generally understood to be creative, do-it-yourself spaces with work space flexibility where users create, invent, and build through investing in communal tools and equipment that a single entrepreneurial manufacturer may not be able to purchase alone. They operate both in more traditional realms of manufacturing such as woodworking and metallurgy, as well as in the tech sphere, working on hardware and software development utilizing 3D printing, rapid prototyping, and other electronics.

A number of municipalities have explicitly identified maker spaces as an economic development priority. In the Brooklyn neighborhood of Red Hook, a planning process begun in 2013 called Bridging Gowanus resulted in a planning framework that includes a recommendation for mixed-use zoning that would only allow new residential development provided the developers include in the project compatible light manufacturing space, art/artisan work space, or nonprofit organization work space. This concept is also reflected in Detroit’s 2013 planning framework, Detroit Future City, which emphasizes mixing light industrial with residential and retail development. Beyond Brooklyn and Detroit, formerly industrial communities like Somerville, MA, Lexington, KY, Oakland, CA, and Philadelphia, PA, as well as more progressive cities like San Francisco describe adopting policies to promote maker space communities in

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recently published city plans between 2013 and 2015. Zoning updates that encourage mixed-use commercial/industrial zones, as well as codes that specifically allow for or even require light manufacturing near residential are indicative of the growing willingness of municipalities to embrace non-invasive industry.

While artisan wood-crafting and light manufacturing of niche products represent a viable evolution of the industrial sector outside of the big-box warehousing needs of e-commerce, the low level of jobs generated through these efforts cannot effectively respond to the whole issue of revitalizing American manufacturing. One of the other major sectors of industry is food manufacturing, and it is within this sector, and alongside that of artisans and craftsmen, that creative entrepreneurs can operate. In 2011, more than 30,000 food manufacturing and processing plants employed more than 11.5 million people, representing about 14 percent of all US manufacturing and one percent of all US non-farm employment. Within this sector, the Bureau of Labor Statistics tracks several sub-groups, including Fruit and Vegetable Preserving and Specialty Food Manufacturing, Sugar and Confectionery Product Manufacturing, Bakeries and Tortilla Manufacturing, and Other Food Manufacturing. All of these sub-groups continue to reflect growth year over year. Significantly, these jobs tend to accept lower-skilled workers, primarily those without postgraduate degrees, but also have higher median wages than typical low-skill positions.


potential solution to combat industrial blight, to aid in cities’ efforts to bring manufacturing back into the urban core, and to address the issues of food access and quality addressed above. For the real estate development community, a Food Innovation Center may respond to these disparate needs while generating economic value.
Food Innovation Centers

The FIC combines two emerging urban movements: urban agriculture and innovation districts. Urban agriculture is primarily understood to be the re-use of vacant lots and rooftops into productive gardening spaces. These spaces typically do not generate substantial revenue, but instead serve as community development tools by reducing blight, promoting educational awareness of how food is grown, providing a way for community members to gain new skills, and simply creating a safe public space for neighbors to gather. In situations where the economic climate of a community is such that vacant land cannot feasibly support new development, urban agriculture represents a low-cost alternative to putting that land back to some form of productive use. Some urban agriculture movements have managed to scale to the level of commercially viable food production, but the majority remain as ground or rooftop-level community gardens.3

Innovation districts, in contrast, are geographic areas where anchor institutions and companies “cluster and connect with start-ups, business incubators, and accelerators” (Katz and Wagner, 2014), primarily in the technology and life sciences sectors. They specifically aim to focus on new products, technologies, and market solutions through the convergence of young start-up companies with established, well-capitalized firms and venture capital financiers in one physical space. Innovation districts, typified by Boston’s Seaport District and Barcelona’s 22@ District, frequently are located in underutilized industrial neighborhoods with historic building stock. They empower entrepreneurs by reducing overhead costs through co-working spaces and connecting entrepreneurs with funders, and they are envisioned as “physically compact, transit-accessible, and technically-wired” (Katz and Wagner, 2014).

The Food Innovation Center draws from both of these movements by taking the innovation district approach and applying it to urban agriculture. However, because the FIC utilizes its interior space as actively as it does its exterior grounds and rooftops, the product can offer significantly more uses than just a community annually. Source: “About,” Growing Power, accessed April 20, 2015, http://www.growingpower.org.
Where one single building captures this diverse mix of uses, this thesis will refer to the project as a FIC. In an instance where the project involves multiple buildings clustered together in a campus-like setting, this thesis will use the terminology “Food Innovation District,” or FID, to distinguish the single building from the campus-like cluster. Regardless of whether the uses are housed in one FIC or spread throughout a FID, the nature of the development programming and the underlying ethos of promoting food manufacturing as a means of enhancing local food security and putting industrial building stock back to productive use remains the same.

A productive FIC will incorporate the greatest variety of these uses, particularly between farm production, incubator kitchen value-add processing, and retail. Examples of operational FICs comprise a mix of public and private spaces, where ideas and goods can be developed and produced within privately leased spaces but also shared and marketed to the public and among entrepreneurs via programmed public space. FICs can have a single developer-owner operating in a single commercial building. However, other FICs may emerge as a mix of owners consciously co-locate their businesses into the same physical area, organically creating a cluster of business development.

Table 3.1: Potential Uses Within a Food Innovation Center

<table>
<thead>
<tr>
<th>Use</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farm Production:</strong></td>
<td></td>
</tr>
<tr>
<td>Vertical farming</td>
<td>Indoor plant production utilizing a mix of natural and artificial lighting.</td>
</tr>
<tr>
<td>Rooftop gardening</td>
<td>Outdoor plant production utilizing rooftop surfaces.</td>
</tr>
<tr>
<td>Hydroponics</td>
<td>The process of growing plants in sand, gravel, or liquid without soil.</td>
</tr>
<tr>
<td>Aquaponics</td>
<td>System of aquaculture in which the waste produced by farmed fish or other aquatic animals supplies nutrients for plants grown hydroponically, which purifies the water in which the fish are grown.</td>
</tr>
<tr>
<td><strong>Value-add food processing</strong></td>
<td></td>
</tr>
<tr>
<td>Incubator kitchen</td>
<td>Shared-use commercial kitchen specifically rented at below-market rates to start-up food production businesses.</td>
</tr>
<tr>
<td>Commissary kitchen</td>
<td>Commercial kitchen in which on-site staff prepare and store foods for</td>
</tr>
</tbody>
</table>
outside clients, such as food truck owners and small restaurateurs.

**Packaging and Warehousing**

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Storage</strong></td>
<td>Storage facilities for small businesses to store batches of food prior to sale in the form of freezers, coolers, and dry storage space.</td>
</tr>
<tr>
<td><strong>Co-packing</strong></td>
<td>Services in which on-site staff process and package business owners' products according to their specifications.</td>
</tr>
</tbody>
</table>

**R&D and Testing**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food laboratory</strong></td>
<td>New product development, with on-site services such as shelf life analysis, nutrition analysis, safety testing, and allergen testing.</td>
</tr>
</tbody>
</table>

**Retail**

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farmers Market</strong></td>
<td>Direct producer-to-consumer sales of farm products and specialty processed foods.</td>
</tr>
<tr>
<td><strong>Café/Restaurant</strong></td>
<td>On-site food service establishment serving foods grown or processed in house.</td>
</tr>
</tbody>
</table>

**Educational**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Consulting</strong></td>
<td>Consulting services for small development/technical businesses on product development, assistance accounting, marketing, and other elements of business planning.</td>
</tr>
<tr>
<td><strong>Classroom component</strong></td>
<td>Demonstration and teaching space showcasing on-site processes and technologies.</td>
</tr>
</tbody>
</table>

**The Economic and Financial Feasibility of FICs**

Though many FICs currently exist in the form of incubator kitchens and small-scale growing operations utilizing indoor production technologies, it remains unclear if these initiatives will ever move beyond the grassroots to the wider realm of private sector, for-profit real estate investment and development. The leap into more conventional commercial real estate could be constrained by matters of economic supply and demand for the product as well as the financial realities of making a FIC profitable; this thesis seeks to clarify that constraint through an economic and financial analysis of existing projects.
The challenges for development of this model are many. The Initiative for a Competitive Inner City breaks these challenges down into six major categories, all of which a FIC must tackle and overcome to achieve success. These categories include the following:32

1. **Space**: FICs must find affordable spaces that aren’t too large at the start-up phase, but have growth options as business operations expand. This can be difficult in cities with limited and costly real estate.

2. **Distribution**: The economics of small volume distribution are challenging, and FICs must advise producers in navigating sophisticated channels of distribution.

3. **Costs**: Rising utility and input costs, wages, particularly in unionized areas, and tax burdens all must be accounted for in the business plan.

4. **Income density**: Consumer demand is largely pre-defined based on the population density and income levels. For FICs that target properties in low-income neighborhoods for cost reasons, the project must still generate enough demand from higher-income communities to remain sustainable.

5. **Financing**: FICs require sizable up-front investments in both the facility and capital equipment required to begin operations, but the product type is a poor fit for traditional lenders.

6. **Complexity**: FICs must contend with oversight by multiple city and federal agencies, requiring a detailed understanding of codes and regulations.

In a review of innovative food trends in North America, Pansing et al (2013) found that the top growth areas in the food sector are local and/or regional food, including local seafood, local produce, hyper-local sourcing, and farm-branded products. Despite the fact that the food sector is growing at twice the rate of the national economy, the authors found that shortcomings in business management skills, business models that don’t match early stage investor expectations, and a lack of understanding of the “unique nature of the food sector among established lenders” has caused the sector to struggle to identify financing. In a scan of all of the various food sector innovations present in the market today, the authors found that combining food start-up incubators with a retail component—one of the fundamental use mixes in a FIC—can actually generate investment-worthy returns. Co-locating start-up businesses that fulfill different roles in the food production process can be economically beneficial, as companies benefit from shared infrastructure and avoid

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time consuming permitting costs as well as diversify their revenue sources and capture the value added by related businesses.33

Similarly, companies in a food cluster can take advantage of “inner cities’ central locations, access to multi-modal transportation hubs and [...] under-utilized manufacturing and warehouse space” to develop successful food innovation centers with multiple business operation components.34

ICIC identifies food cluster growth opportunities in production, distribution, and institutional food service and commercial restaurants. Increasing the capacity of small scale, entrepreneurial food manufacturing businesses, attracting large-scale processing and production facilities, and incorporating urban agriculture could create a viable business plan for a FIC. Additionally, building the infrastructure for a thriving public/private market and expanding alternative distribution models would bring more revenue for small business owners who operate at the facility. These distribution models include connecting small producers with distributors who specialize in small buyers, brokers who coordinate logistics for large buyers, and direct delivery services.35

Overall, the FIC can resemble any number of projects, from those as small-scale as single incubator kitchens helping scale entrepreneurial food businesses, to hundred-acre redevelopment schemes capitalizing on the growing local food manufacturing industry. The majority of FICs lie somewhere in between these two extremes, and will be examined via survey and interviews in the next two chapters.

The literature studying FICs as they are defined here is limited. Much more research has been done on some of the specific operational components of the FIC, in particular on incubator kitchens, indoor vertical farming, food hubs, and anchor-led food R&D facilities. Understanding the economic and financial feasibility of the individual uses within a FIC is equally important to understanding the value of the entire space.

Components of a FIC

Kitchen Incubators

Kitchen incubators have existed in the United States since at least 1979.36 Since then, incubators—both kitchen and non-kitchen alike—have formed more than 19,000 new businesses and added more than 245,000 jobs to the economy, according to some accounts.37

In a survey of 46 shared-use kitchen incubators, Heller (2013) found that the majority operated as for-profit enterprises with annual budgets of less than $100,000. Only 19 percent of the kitchens surveyed utilized grants as a source of revenue, but only 31 percent of the businesses reported being profitable; half broke even, while 16 percent reported losing money.

Regarding their physical space, half of the respondents stated that their facility was between 1,000 and 3,000 SF, with an average rental kitchen size of 1,673 SF. Nearly three-quarters of the kitchens provide some kind of business support services; the most common forms of assistance were one-on-one coaching, help with licensing/permits/insurance, and assistance with sourcing ingredients.

The study determined seven distinct lessons relevant to incubator kitchen success based on their surveys. These facts included the ability for operators to customize the facility to fit the needs of its users; developing automated systems for scheduling kitchen rental times to avoid mismanagement and human error; offering business development courses and micro-lending to ensure client success; helping manage marketing and procurement contracts for clients; offering co-packing and distribution services on-site; partnering with regulatory agencies to ensure efficient permitting for the kitchen; and lastly, adopting multiple revenue streams for a reliable business cash flow.38

Buckley et al (2014) published a case study of an incubator kitchen located in Hart, MI. The kitchen, Starting Block, opened in 2006 and employs three part-time staff members in a building measuring 10,900 SF. The business runs a 2,500 SF commercial kitchen, 600 SF catering kitchen, around 5,450 SF of rented office space and meeting rooms, and warehouse and storage space. An initial feasibility study estimated the cost to begin operations to be $1.2 million ($220 PSF), but due to volunteer labor hours and fundraising, the Starting Block was able to start the business at one-third the


37 Annabelle Allen et al., "Rainier Beach Food Innovation Center: Kitchen Incubator Business Model for City of Seattle Community Development Planning."

projected cost. Project financing was received through the USDA Rural Development’s Rural Business Enterprise Grant, as well as through six county commissions and a grant from Michigan State University. To obtain a building, the Starting Block team formed a partnership with the City Manager of Hart and identified a facility that could be leased at a low rate from the city.

Despite cost-saving measures that allowed operations to commence on schedule, the kitchen faces a number of obstacles. Client wish lists for automated equipment, better packaging equipment, and coding software like Universal Product Code (UPC) are capital costs that the kitchen was unable to bear at the time the study was completed. Further, despite robust demand, kitchen rental fees will only cover 30 to 40 percent of the facility’s cash flow, even when fully booked; as a result, the owners must turn to entrepreneurial income streams, such as business counseling and education courses, that lie outside the business’s primary operation.

In a feasibility study for a kitchen incubator in the Rainier Beach Innovation District in Seattle, Washington, Allen et al. (2014) proposed a FIC that would consist of one or two buildings and house commissary and training kitchens, along with a café, classroom, and additional facilities for education and business training purposes. The study showed that the most common size for a kitchen incubator is between 1,000 and 3,000 SF, and based on a survey of similar projects around the country, development costs for a new construction building
would total approximately $8 million and require $100,000 in annual operating costs. The authors identify a number of income stream opportunities outside of kitchen rental fees that incubators could undertake to close the gap between costs and revenue. These include efforts by La Cocina Kitchen in San Francisco, CA, which uses cooking classes, night markets, a media dinner, gift bazaar, conferences, festivals, and an online marketplace to generate income; the Chef's Center of California in Pasadena, CA, which rents retail space to food trucks; and CropCircle Kitchen in Dorchester, MA, who has a direct partnership with a local food distributor for sourcing, warehousing, and distribution, increasing value to its clients and ultimately demanding a higher premium for shared space.  

Vertical Farms

Vertical farms exist on a very diverse spectrum, but are most traditionally viewed as one of the following physical typologies, from most conservative to most radical:

1. The traditional greenhouse, which proliferates in agriculture today and uses entirely soil-based, sunlight-based farming techniques.

2. Indoor farms utilizing greenhouse technology with ample sunlight, but incorporating some amount of artificial lighting and potentially utilizing hydroponic or aquaponic farming technology.

3. The adaptive re-use of an industrial building for indoor plant production and fish farming, which typically utilizes almost entirely artificial lighting and growing systems.

4. Vertical farm skyscraper, envisioned as the new construction of a building intended entirely for food production, of which only a few selective projects in Asia truly qualify today.

In common vernacular, and best suited to the FIC, vertical farms are defined as “multistory buildings with highly controlled environmental conditions and access that house year-round crop production in artificial environments by using hydroponics, aeroponics, and aquaponics.” To that end, farms housed within a FIC will most closely resemble the third typology on the spectrum.

In one of the most comprehensive reviews of existing literature on the subject, Specht et al (2013) utilized the term “ZFarming,” which stands for “zero-acreage farming” to define “all types of urban agriculture characterized by the non-use of farmland or open space, thereby differentiating building-related forms of urban agriculture from traditional agriculture.”

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39 Annabelle Allen et al., “Rainier Beach Food Innovation Center: Kitchen Incubator Business Model for City of Seattle Community Development Planning.”


41 For the purposes of this report, rooftop gardens and rooftop greenhouses are only considered if they are incorporated into a FIC whose interior uses also include a mix of the required uses defined in Chapter 2.
agriculture from those in parks, gardens, urban wastelands, and so on.” This includes rooftop gardens, rooftop greenhouses, edible facades, and indoor farms. The authors reviewed 96 publications on the subject, concluding that ZFarms, in all of their forms, could promise positive environmental benefits from the reduction and recycling of waste, social benefits from improving community food security, providing educational facilities, and linking consumers more directly to food production. Of the 96 academic articles studied on the subject, 27 addressed how ZFarming can be integrated into existing buildings through construction and retrofitting, while 22 discussed project feasibility and the issues of investment cost and financing.

In a follow-up review working from Specht et al (2013)'s definition, Thomaier et al (2014) identified 73 ZFarming projects located in North America, Europe, and Asia, 17 of which were specifically indoor farms. The remaining 56 projects were a combination of rooftop gardens, rooftop greenhouses, façade treatments, and other. Of the 73 projects, the majority did not include any other use besides the farm itself. The authors identified the spread of building uses shown in Table 3.2 that were combined with ZFarming projects, but did not clarify whether any of these uses were combined specifically with an indoor farm—the subject of this section—versus a rooftop garden, rooftop greenhouse, or façade treatment.

### Table 3.2: Building uses combined with ZFarming

<table>
<thead>
<tr>
<th>Building Use</th>
<th>Absolute frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>1</td>
</tr>
<tr>
<td>Transportation facilities</td>
<td>4</td>
</tr>
<tr>
<td>Industry/warehouse</td>
<td>3</td>
</tr>
<tr>
<td>Mixed-use</td>
<td>5</td>
</tr>
<tr>
<td>Retail</td>
<td>7</td>
</tr>
<tr>
<td>Community services</td>
<td>7</td>
</tr>
<tr>
<td>Office</td>
<td>7</td>
</tr>
<tr>
<td>Housing</td>
<td>9</td>
</tr>
<tr>
<td>Farming-related food business</td>
<td>10</td>
</tr>
<tr>
<td>Research/education</td>
<td>10</td>
</tr>
<tr>
<td>Hotel/restaurant</td>
<td>11</td>
</tr>
</tbody>
</table>

The authors also created five ZFarm typologies, described below. Of these five, the first two, “commercial Zfarming” and “Zfarming as innovation incubator,” are most likely to be the kind of vertical farm housed inside a Food Innovation Center.

1. **Commercial ZFarming:** An operation in which the main purpose is to be economically viable, typically operated by a start-up. The operation works either on a “retail-affiliated” or “independent” business model, the former which primarily cooperates with one specific retailer, while the latter typically
uses various distribution channels and may be more oriented toward the community and open to the public.

2. **ZFarming as innovation incubator**: Operations that are typically pioneer or demonstration projects operated by non-profit organizations or research institutions. They promote “innovative concepts of food production and sustainable ways of organizing urban life and consumption” and typically utilize hydroponics and aquaponics rather than traditional soil-based farming.

3. **Image-oriented ZFarming**: A business in which the farming operation is not the main source of revenue, but serves as an “add-on” to a food business, largely for marketing or PR purposes.
4. **Social and educational ZFarming:** A business whose main purpose is to “communicate social and education values,” largely found at educational and social institutions. An example of this could be a rooftop garden on top of a charter school, or a community-oriented garden.

5. **ZFarming for urban living quality:** Largely private farms that are incorporated into residential or commercial projects as an amenity, usually by real estate developers. These projects are typically used in an affiliated cafeteria, if commercial, or for the private use of residents, if residential.

   The work by Specht et al (2013) and Thomaier et al (2014) reflect some of the first serious analysis of peer-reviewed literature on vertical farming and breakdown of existing projects. The authors conclude that vertical farms still face a number of obstacles before they can become truly commercially viable: consumers must become comfortable with produce grown under artificial circumstances; regulatory bodies must become comfortable with the use itself during the permitting and approval process; and farm managers and the research community must continue to work toward more efficient lighting and heating systems to reduce energy waste and make the venture even more viable.

   In a feasibility study of the third typology defined at the beginning of this section, Masters students at Clemson University's Institute of Applied Ecology working for the US Environmental Protection Agency (2011) selected a former paper factory in Charleston, SC, to study the feasibility of an adaptively reused vertical farm. The analysis cited unique elements like alternative energy sources, urban watershed impact reduction, and cyberinfrastructure technology as reasons beyond increased agricultural production to pursue vertical farming. Due to the energy required to control the environmental conditions within the building, the building itself should be very environmentally friendly, utilizing any combination of solar technologies, wind turbines, methane digesters, thermal and aerodynamic ventilation, thermal mass storage, and rainwater collection systems. If implemented correctly, aeroponic systems can potentially reduce water usage by 70 percent, and hydroponic systems can reuse water to reduce waste. Applying advanced farming technologies in the vertical farm could yield crop production between four and 30 times greater than yields in conventional, horizontal agriculture.42

   However, a more extreme version of vertical farming as an urban skyscraper—a step far beyond the indoor farms in operation today—still exists largely in the realm of the conceptual. Most prominently espoused by Dr. Dickson Despommier, much of the work on this radical vision of vertical farms resides in feasibility

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41 Clemson University Institute of Applied Ecology, “Charleston Vertical Farm Design Feasibility Study.”
studies, with only limited-scope iterations of the “skyscraper farm” in existence.

To that end, Banerjee and Adenauer (2014) studied the real economics of a vertical farm that could feed 15,000 people with 2,000 calories of nutrition a day on a site measuring 0.93 hectares (2.3 acres).

The interest in the exercise lies in the possibilities of significantly increased agricultural production, particularly in crowded, urban settings. In fact, one indoor acre, if farmed correctly, can produce the equivalent of four to six outdoor acres of more, depending on the crop. Perhaps most convincingly, the authors assert:

“Vertical farms provide a paradigm shift in the way we know and do agriculture. In terms of space, abandoned urban properties, abandoned mines, or even peripheries of building can be converted into food production centres thereby eliminating the need for expensive constructions.”

To achieve the aforementioned premise for production, the authors designed a program with 37 floors; of these, 25 floors would be devoted solely to crop production; three to aquaculture; three to environmental remediation; two in the basement for waste management; one floor for cleaning, one for packaging and processing the plants and fish, and one for sales and deliveries. A building this large could produce 3,573 tons of edible fruits and vegetables annually, employ approximately forty personnel, and by using the aeroponics method of farming—in which nutrients are sprayed directly onto plants—could reduce water usage by 90 percent, fertilizer usage by 60 percent, and maximize crop yield by 45 to 75 percent. The most likely scenario for development, however, projected development costs of more than €100 million.
Like incubator kitchens, vertical farms are part of the solution to providing locally grown food to a regional eco-system, weakening consumer ties to the agricultural-industrial complex and reducing food miles and waste throughout the production process. Within a FIC, both uses can co-exist, and can do so along with the third most commonly studied FIC use, the food hub.

Food Hubs

The National Food Hub Collaboration defines a food hub as “a business or organization that actively manages the aggregation, distribution, and marketing of source-identified food products primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail, and institutional demand.” Typically located in warehouses and associated more closely with industrial land use, hubs create a central space for small regional producers to bring their produce for local distribution, eliminating some of the logistical difficulties associated with organizing individual distribution. Food hubs are functionally categorized by the market they serve, which may be a farm-to-business or farm-to-institution model, a farm-to-consumer model, or a hybrid that serves multiple end users.

Some food hubs may offer similar services that incubator kitchens offer their food entrepreneurs, such as technical assistance to increase the producers’ capacity to meet wholesale buyer requirements as well as dry and cold storage, grading, co-packing, labeling, and light processing. A few also combine retail to supplement the main distribution services at the food hub, but in general, hubs are expected to offer a combination of production, distribution, and marketing services to small and mid-sized regional growers.

In 2011, food hubs grossed nearly $1 million in annual sales, and the food manufacturing sector sees great potential for growth in the need for hubs. They created an average of seven full-time and five part-time jobs per food hub, and they serve as an important link in the food value chain, bringing producers’ unprocessed goods to a central place where it can be incorporated into an incubator kitchen setting or distributed back out to a regional network of consumers.

Food R&D

A final component of the FIC is a food R&D laboratory for product innovation and testing, a business operation typically led by university anchors with programs in agricultural research and development. Current centers exist in a number of universities around the country, the majority of which are land grant universities with a rich history in agricultural science. The labs are primarily intended to serve as an extension of faculty research and as a learning environment.

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for students; unlike the other components of the FIC, these projects are typically funded primarily by grants and endowments.

In a proposal asserting the need for a Food Product Innovation and Commercialization Center at the University of Georgia, the authors reference an unmet demand for R&D functions for small to medium sized firms who lack access to the specialized space and equipment needed to test their food product. This need is part of a larger economy, in which $5 billion are spent annually on developing and introducing new food products.\(^4\)

R&D business operations are typically more advanced than what a start-up food entrepreneur working out of an incubator kitchen would require; however, by partnering with universities and providing these services, FICs could generate substantial revenue from grants, contracts, and fees for service from more developed companies. These returns are reflected in anchor-led FICs: the Rutgers Food Innovation Center, which specializes in product testing and development, was projected when it opened to create more than $200 million in new revenue and generate $14 million in local tax revenue. Similarly, the Northeast Center for Food Entrepreneurship, a partnership between Cornell University and the University of Vermont, worked with more than 500 clients in the five years between 2000 and 2004, who collectively hired more than 1,800 full-time and part-time employees during the period studied.

Revenue generating services provided by R&D facilities can expand beyond rental fees for space and basic services such as packaging and storage; they can include assessments for marketing and business development plans, consulting services on product.

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development, packaging selection, and product identity, as well as technical services offered via fee for market research, package performance testing, shelf life and environmental testing, and sensory and consumer testing.46

Existing FIC Proposals

Outside of the individual components of a FIC studied above, advocates for FICs have published plans for projects that reflect the vision of bringing these components together in one physical setting. Three of those proposals are described below. The intention of this section is to provide additional descriptive evidence of the demand for FICs and Food Innovation Districts.

**Food Commons Hub**

One of the clearest visions for a FIC comes from the Food Commons project (2011), an initiative whose mission is to “bring agriculture back into the regional food system, taking it out of the globalized agribusiness system.”47 The project describes three interconnected parts, which all operate to create nodes of regional agriculture around the country. The three parts include a Food Commons Trust, a non-profit, quasi-public entity charged with acquiring and stewarding critical foodshed assets; a Food Commons Bank, a community-owned financial institution intended to provide capital and financing services for regional producers; and a Food Commons Hub, a “locally-owned, cooperatively integrated business enterprise that manages and builds foodshed-based physical infrastructure.”48

This third component best describes a FIC. Modeled on non-profit cooperatives, the authors describe potential business operations within the Hub, which could include a food hall, mobile food vendors, food business incubator, demonstration farm and community gardens, learning center, community meeting space, and job training center.49 Using Reed Construction Data, the authors projected development costs between $70 million and $155 million to build all of the Food Commons Hub components. Unfortunately, although the cities of Fresno, California, and Atlanta, Georgia, have formally adopted the Food Commons tenets, none have produced an actual Food Commons Hub to date.

**Los Angeles River Urban Agriculture Plan**

Similarly, Perkins + Will, a nationally recognized architecture firm, released an Urban Agriculture Plan (2015) for a 660-acre

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46 "Proposal for the Establishment of The Food Product Innovation and Commercialization Center."
48 Larry Yee et al., “The Food Commons 2.0: Imagine, Design Build.”
49 Larry Yee et al., “The Food Commons 2.0: Imagine, Design Build.”
industrial site in the Los Angeles River neighborhood, directly northeast of downtown Los Angeles, that incorporates all of the elements of a FID through the adaptive reuse of existing structures. The plan’s stated goal is to “leverage underutilized physical conditions, current food-related operations, community desires and newly implemented public policies to improve upon what exists.”

Individual properties throughout the site already operating food-related businesses were analyzed for the potential to cluster urban agriculture-related development adjacent to the existing food businesses to create synergy.

Dividing the 660 acres into four separate nodes, the authors identified the first, Node A, as a candidate for a Community Food Hub featuring renovated and newly built properties. These properties would house a “Food Hub and Commissary,” “Urban Food District,” and business space for local non-profit L.A. Prep. The Food Hub and Commissary would house a distribution center for small and mid-size local farms, as well as a food truck and cart commissary and would host weekly farmers markets and other direct producer-to-consumer sales. Adjacent to the building is envisioned a smaller cluster of buildings to form the Urban Food District, imagined to include space for vendors,

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proposed food lab and market in Node C. restaurants, and grocers to lease and sell local produce, as well as providing space for training programs for food-related careers. The last component of Node A is a rehabilitated structure to house L.A. Prep, located across the street from the Food Hub, which would house incubator kitchen space for small food-related businesses.

The Urban Agriculture Plan continues with Node B, an equally innovative re-use of existing industrial structures into the Humboldt Incubation Hub, which would feature a farmers market and rooftop gardens, but would focus on the redevelopment of the Lincoln Heights Jail. The proposal indicates that the jail, a 24,000 square foot facility currently out of use, could be adapted into an incubator space for progressive food-related projects, including aquaponics, pioneering agro-businesses, and an on-site brewery and restaurant. Other buildings throughout the site in both Nodes C and D have been identified as potential redevelopments with rooftop gardens on top and food processing within, all linked with a comprehensive transit network of bike and pedestrian paths, community gardens, and signage to brand the entire 660 acres as an active food innovation district. However, with any plan of this scope and scale, consolidating landowners and moving the project from vision to reality requires a substantial level of coordination, financing acumen, development skill, and policy support. Whether the Los Angeles River Revitalization Corporation, the non-profit charged with catalyzing development in this neighborhood, can capitalize on the Urban Agriculture Plan remains to be seen.
Food Innovation District

The Urban Agriculture Plan for Los Angeles reflects the desire to create whole districts devoted to innovative food production and manufacturing. Cantrell et al (2013) define this concept as a “food innovation district,” in which the activities co-located within the district reflect the same activities that could co-locate within a single FIC. These activities include regional food hubs, business incubators, farm-to-table retail, farmers markets, food festivals, educational and nutritional outreach and programming, urban agriculture production, community kitchens, and extensive public spaces for neighborhood and communal use. The authors refer to the “food infrastructure” required for small and mid-size farms to operate with appropriate-scale storage, packaging, processing, and other facilities. The FID can range in size from just a few buildings to “several blocks in a town center or larger township or county area covering several square miles.”

Although the terminology differs, the FIC, Food Commons Hub, Urban Agriculture Plan, and FID concepts all serve the same particular business needs and opportunities, as outlined in the Cantrell (2013) report:

1) Incubation: Moving enterprises from idea to startup and commercialization;

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2) Growth: Providing access to equipment, facilities, services, and technical assistance that enterprises need to expand in a sustainable way; and

3) Value Chain: Connecting supply chain partners to ensure and deliver products that fit consumer and community values.

Conclusion

Despite the design and policy community’s interest in FIC-like project proposals, Winrock International, a non-profit focused on economic empowerment in low-income communities, acknowledges the dearth of data on investment in food innovation, stating that “while food hubs around the country are quickly expanding, the sizes of their operations vary greatly, as do their impacts and relevance to their local food economies. [...] But there is little data on what the impact of these particular investments has been or broader research on where in the sector investment is most needed.”

To address this issue, I conducted a survey of 62 businesses operating in some capacity as a Food Innovation Center, and conducted in-depth interviews for five case studies of operational and planned FICs across the country. The survey results and case studies are analyzed in the following two chapters.

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invested but risk is reduced as the project advances toward completion. This stage is followed by the lease-up phase, in which the space is fully absorbed, and finally the stabilization phase, in which the asset is fully operational and risk levels are lowest. Figure 4.1, adapted from Geltner, Miller, Clayton and Eichholtz (734), reflects this process.

**Figure 4.1: Development Project Phases**

Notes: This chart reflects the cumulative investment over time as it relates to the changing risk level throughout the four stages of development. Risk is highest at the earliest stages of the project, but reduces over time as the project's financial and economic feasibility is proven through successful lease-up and operations.
To understand the capital costs and risk levels associated with each of these stages, the survey asked business owners to identify their up-front capital costs to assemble the site (with respect to land owners) and build out the site (with respect to both land owners and tenants) to capture the first two phases of development, and asked about rents, operating expenses, and net operating income to capture the final two operational phases of development. The survey asked 17 questions outside of administrative matters and sought to create a complete portrait of a FIC from idea to execution.

Methodology

Between January and March 2015, after finalizing a database collection process outlined below, I successfully reached out to 190 companies of varying size and scope to gather data on the business operations and development costs related to FICs. The total list of companies was derived via Internet research, first by searching for terms related to FICs to identify companies. These search terms included the following words and phrases:

- Food innovation
- Urban food manufacturing
- Vertical farms
- Indoor farms
- Incubator kitchen
- Shared kitchen
- Food hubs
- Mixed use food business

Through this effort, I found CulinaryIncubator.com, an online directory of 462 commercial kitchens and a 2013 report by Econsult Incorporated with an appendix listing 137 incubators. I combined these lists to eliminate any duplicate companies, and then searched for each company's individual website. Companies without websites were eliminated, as were those who appeared to be a restaurant or catering business that merely rented out their commercial kitchen during non-working hours, as this did not conform to the vision of a FIC. Because so many companies were identified via the CulinaryIncubator.com database, the majority of the companies surveyed were primarily incubator kitchens rather than other forms of FIC; however, through continued research, I was able to continue identifying mixed-use projects with other components, such as vertical farming and public markets, and these were included in the survey outreach.

After this process was complete, I was left with 233 potential FICs in the United States. Of the 233, I selected 18 specific FICs to request interviews from, rather than survey, in an effort to collect more business operations associated with FICs, such as vertical farming, in-house food production with commercial components, food hubs, and food R&D.
in-depth information on the firms that most closely resemble the FIC concept. I chose the 18 FICs to reach out to outside of the survey request due to the complexity of their business operations and a desire to speak directly with the business owners rather than indirectly via an electronic survey.\textsuperscript{54} I identified another 25 firms who did not have e-mail addresses listed on their website for me to reach out to electronically. I sent initial survey requests to the remaining 190 firms, with a follow-up e-mail request two weeks after the initial request if the firm had not yet responded. Of those 190, three companies contacted me to inform me they were no longer in business and 62 companies responded for a survey response rate of 33 percent. Another eight e-mails bounced back to me as no longer active (four percent), and two companies requested an interview in lieu of completing the survey (one percent).

A full list of the organizations contacted is included in Appendix B.

\textbf{Descriptive Statistics}

To draw conclusions regarding the economic and financial feasibility of FICs, I look at two main attributes of the companies surveyed: firm-level net operating income and the percent of operating expenses covered by revenue. These characteristics reflect the success of the business operations associated with a FIC, as well as how well those operations cover ongoing operating expenses, defined as the utilities, maintenance, overhead, and land rent associated with each project.

As noted in Figure 4.1, the lowest level of risk during the development process should occur during project stabilization. However, if the project itself cannot generate enough revenue to cover its expenses, the building’s cash flow will be less stable, and the building’s value will decline if the tenants cannot stabilize their operations. If FICs are to become commercially diffused product types, capable of attracting outside investment and low-interest debt, then they must show first that the product itself can succeed.

To address the two main attributes of NOI and the percentage of operating expenses covered by revenue, the 62 respondents are analyzed through five distinct profiles. These lenses break down the responses in order to understand what characteristics of a FIC can generate higher NOI and greater coverage of operating expenses.

1. \textbf{Location profile}: Whether the firm is located in an urban, suburban, or rural context.

2. \textbf{Operational profile}: How many business operations, based on those defined in Table 3.1, are conducted for revenue generation.

\textsuperscript{54} I was unsuccessful at contacting all of the FICs identified for more in-depth conversations, and therefore was not able to include any data on those firms, in either case study or survey form, in this thesis. This represents a weakness in the sample, as those who did not respond to interview requests also did not receive an electronic survey.
3. **Building profile**: Whether the firm owns the building within which it operates, or rents.

4. **Development Financing profile**: What sources of financing were used to finance the development and build-out of the FIC, as well as how the reported construction costs for owners and lease rates for renters varied.

5. **Firm Ownership profile**: Whether the firm operates as a private non-profit, private for-profit, or publicly owned entity. Because the problems and opportunities identified within the areas of food access and industrial re-use are primarily intended to be addressed in urban contexts with adaptively re-used buildings and a mix of business operations, these profiles will parse the economic and financial differences between projects who meet those qualifications and those who don’t.

The first half of this chapter will provide detailed descriptive statistics on each of the five profiles for analysis. I will conclude by applying those profiles to the question of firm-level NOI and percentage of operating expenses covered by revenue to draw conclusions regarding the FIC’s economic and financial feasibility.

**Location Profile**

Half of the companies who responded to the survey were located in urban areas, while 31 percent considered themselves suburban or peri-urban and 18 percent were rural. The geographic spread covered the entire country but was concentrated on the West Coast and Midwest, where California had the most representation (n = 12) and the West Coast altogether comprised over one-third of the respondents.

**Figure 4.2: Geographic Location by Density (n = 62)**

<table>
<thead>
<tr>
<th>Location</th>
<th>Abs. Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>31</td>
</tr>
<tr>
<td>Suburban</td>
<td>20</td>
</tr>
<tr>
<td>Rural</td>
<td>11</td>
</tr>
</tbody>
</table>

Notes: Half of the firms reported locating in an urban context, while 31 percent operate in suburban locations, and the remaining are rural.

**Figure 4.3: Geographic Location by Region (n = 62)**

- **West Coast**: 34%
- **Midwest**: 18%
- **Northeast**: 13%
- **Southeast**: 5%
- **Southwest**: 31%
Notes: The largest concentration of firms was on the west coast, with 34 percent reporting operations in California, Oregon, or Washington. California had the most of any single state, with 12 firms total.

Operations Profile

Firms were asked to select their primary business operations from a list of options with definitions included, and were able to select as many operations as applied to their business. The options offered were the following:

Table 4.1: Business Operations Included in Survey

<table>
<thead>
<tr>
<th>Operation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incubator kitchen</td>
<td>Commercial kitchen for food business start-ups and small business owners</td>
</tr>
<tr>
<td>Commissary kitchen</td>
<td>Commercial kitchen in which staff on-site prepare food for clients</td>
</tr>
<tr>
<td>Expanded food manufacturing</td>
<td>Expanded production, storage, distribution, and/or co-packing capacity beyond incubator kitchen</td>
</tr>
<tr>
<td>Food R&amp;D</td>
<td>Product testing and development</td>
</tr>
<tr>
<td>Indoor farming</td>
<td>Aquaponics, hydroponics, aeroponics, or vertical farming</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse farming</td>
<td>Rooftop or ground-level greenhouse farming</td>
</tr>
<tr>
<td>Food hub</td>
<td>Physical cluster of food-related businesses</td>
</tr>
<tr>
<td>Commercial component</td>
<td>Producer-to-consumer direct sales, such as market, cafe, or grocery store on site</td>
</tr>
<tr>
<td>Business assistance</td>
<td>Technical assistance and educational programming for food-related small business owners</td>
</tr>
<tr>
<td>Events programming</td>
<td>Classes, food production demonstrations, and public event space</td>
</tr>
</tbody>
</table>

Due to the nature of where many of the firms were originally sourced, the operation cited most frequently was the first, incubator kitchen (n = 55). After incubator kitchens, the most commonly cited use was events programming (n = 27), followed by commissary kitchen (n = 24). On average, firms reported 3.2 business operations in-house, indicating possible multiple revenue streams and acknowledgment of the need to diversify their business in order to remain financially viable. Seventeen firms (27 percent) reported a single business operation, which in 12 cases (70.5 percent of the single-operation businesses) was an incubator kitchen. The total frequency of operations is shown below in Figure 4.3.
Figure 4.4: Primary Business Operations by Geographic Context (n = 62)

![Bar chart showing the frequency of different business operations by geographic context]

Absolute Frequency of Business Operations by Geographic Context

Notes: 55 of the 62 firms reported incubator kitchens as one of their operations, followed by events programming (27 firms) and commissary kitchen (24 firms). Other operations included financing assistance to small businesses, food truck parking, and operating a farmers market on site.

By location, urban firms reported an average of 3.03 operations in-house, while suburban firms reported 4.05 and rural firms 2.8 on average. The average operations for suburban locations were slightly skewed by one business that reported 12 distinct business operations. Excluding this outlier, the average number of operations of suburban businesses was reduced to 3.6, substantially closer to the overall average.

Building Profile

This section will cover the distribution of owners to renters, rental lease rates, and building typology in which businesses operate. The majority of businesses rent space rather than own the building they're in. Of 62 respondents, 69 percent (n = 43) rent, while only 31 percent (n = 19) own.55 Of those who own, 32 percent (n = 6) were located in urban areas, 26 percent (n = 5) in suburban areas, and 42 percent (n = 8) were located in rural areas. Both urban and suburban businesses reported higher levels of renting than owning, while rural locations more often owned (eight owned versus three rented).

Figure 4.5: Building Ownership (n = 62)

![Bar chart showing the distribution of ownership and rental]

Absolute Frequency of Firms

Notes: The majority of firms rent, while one firm is engaged in a public-private partnership with the municipality in which they operate.

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55 One respondent reported a public-private partnership structure, in which the business operator owns the building but the property is in the city's name via a joint economic development grant. This firm was included as a building owner.
For those companies that rented (n = 43), the survey asked for the companies to state their lease terms. Of 43 companies who stated they rent space, 30 provided data on their lease terms. Annual lease rates on a PSF basis ranged from $0 per year to as high as $30 PSF. 18 of the 30 companies who provided lease information pay $10 PSF or less in rent; the average rent overall was $8.09 PSF.

Table 4.2: Lease Rates Reported by Building Renters\(^6\) (n = 27)

<table>
<thead>
<tr>
<th>Facility Size (SF)</th>
<th>Lease terms (Annualized Basis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17,000</td>
<td>$0 PSF</td>
</tr>
<tr>
<td>16,600</td>
<td>$0 PSF</td>
</tr>
<tr>
<td>8,600</td>
<td>$0 PSF</td>
</tr>
<tr>
<td>44,000</td>
<td>$0.25 PSF</td>
</tr>
<tr>
<td>11,000</td>
<td>$0.65 PSF</td>
</tr>
<tr>
<td>1,080</td>
<td>$0.74 PSF</td>
</tr>
<tr>
<td>11,000</td>
<td>$0.82 PSF</td>
</tr>
<tr>
<td>1,700</td>
<td>$0.92 PSF</td>
</tr>
<tr>
<td>1,500</td>
<td>$1.20 PSF</td>
</tr>
<tr>
<td>1,500</td>
<td>$1.67 PSF</td>
</tr>
<tr>
<td>5,000</td>
<td>$2.40 PSF</td>
</tr>
<tr>
<td>5,600</td>
<td>$2.41 PSF</td>
</tr>
<tr>
<td>4,000</td>
<td>$6 PSF NNN</td>
</tr>
<tr>
<td>5,000</td>
<td>$7.44 PSF gross</td>
</tr>
<tr>
<td>1,250</td>
<td>$8 PSF NNN</td>
</tr>
<tr>
<td>600</td>
<td>$8.33 PSF</td>
</tr>
<tr>
<td>4,800</td>
<td>$10 PSF</td>
</tr>
<tr>
<td>5,000</td>
<td>$10 PSF NNN</td>
</tr>
<tr>
<td>3,000</td>
<td>$10.40 PSF</td>
</tr>
<tr>
<td>1,450</td>
<td>$11.36 PSF NNN</td>
</tr>
<tr>
<td>1,200</td>
<td>$11.50 PSF</td>
</tr>
<tr>
<td>1,700</td>
<td>$12 PSF NNN</td>
</tr>
<tr>
<td>1,400</td>
<td>$12 PSF</td>
</tr>
<tr>
<td>9,000</td>
<td>$12 PSF gross</td>
</tr>
<tr>
<td>1,200</td>
<td>$12 PSF</td>
</tr>
<tr>
<td>3,000</td>
<td>$12 PSF</td>
</tr>
<tr>
<td></td>
<td>$12 PSF(^7)</td>
</tr>
<tr>
<td>1,325</td>
<td>$12.60 PSF NNN</td>
</tr>
<tr>
<td>3,500</td>
<td>$20 PSF</td>
</tr>
<tr>
<td>1,300</td>
<td>$22 PSF</td>
</tr>
<tr>
<td></td>
<td>$30 PSF</td>
</tr>
<tr>
<td>5,976 Avg.</td>
<td>$8.09 PSF Avg.</td>
</tr>
</tbody>
</table>

\(^6\) Where renters provided the data, lease types (gross, triple net) are noted.

\(^7\) The facility associated with this rent did not specify the size of the space being rented, but did provide rents on a PSF basis. The same is true for the $30 PSF rent listed below, which comes from the same facility that has varying rent terms. Because the facility is the same, the total number of firms offering data was 30, not 31.
Notes: PSF rents for firms ranged from $0 PSF, indicating a partnership with a municipality in which the company would not be charged any rent, to rents as high as $30 PSF. The majority of firms operate between $10-$12 PSF in rent, and the lower rents are more typically associated with industrial properties.

Most buildings in which firms operate were not originally constructed for the firm’s purposes. Of the 19 building owners, five operate in rehabilitated industrial buildings, 12 operate in some form of commercially rehabilitated structure that does not qualify as industrial, and only two operate in buildings constructed new. Of the renters, the same trends follow: 15 operate in rehabilitated industrial, 22 operate in rehabilitated commercial, and only six operate in buildings built new for the FIC and its tenants. These comparisons are reflected in Figure 4.5 below.

Notes: The majority of both renters and owners operate in rehabilitated spaces. Of those who do, 41 percent of renters and 29 percent of owners operate specifically in rehabilitated industrial buildings.

From a geographic perspective, of the 31 companies operating in urban locations, 12 (39 percent) were housed in industrial structures rehabilitated for the purpose of their business. Further, while 19 urban firms (61 percent of urban firms) do not operate in an industrial space specifically, only one urban company reported that their building was built new for their own purposes, which indicates that the majority of businesses, though not housed in industrial building stock, utilize some type of adapted commercial space.

Figure 4.7: Building Typology of Urban Firms (n = 31)

Notes: Only one urban firm reported building new for the purposes of operating their business, while the majority (30 of 31) operate in some form of rehabilitated or adapted re-use building.
Development Financing Profile

Firms that own the building in which they operate were also asked to provide the primary sources of financing used during the construction process. They were given a list of the following options with the ability to select as many as desired:

- Private bank loans – conventional, e.g. Bank of America
- Private bank loans – community-based, e.g. CDFI loan
- Private grants
- Venture capitalist lending
- Public loans
- Public grants
- Tax credits: New Market Tax Credits, historic tax credits, or other
- Family and friends
- Other

Eighteen firms who own their building provided information on their primary sources of financing. Most companies reported more than one source of financing. Overall, grants provided the majority of financing sources for companies. In more than half of the instances in which a conventional loan was used, the firm also paired that financing with additional sources, including private grants (two firms), public grants (two firms), friends and family wealth (two firms), and public loans (one firm).

Figure 4.8: Construction Financing Sources for Building Owners (n = 18)

Absolute Frequency of Financing Sources Used

Notes: A mix of public and private grants were the most commonly used source of financing for firms constructing their space to own, followed by bank loans. Half of the firms who used conventional loans paired that financing source with public and private grants and loans, and one firm utilized only personal wealth to build their space.

Although the survey specifically asked only owners to provide data on the financing sources used for construction, 17 building funded.” There is no “Other” category, as the examples listed in “Other” within the survey could be placed in one of the six categories provided.
renters responded to the question as well, an indication that as tenants, the companies were also responsible for some build-out and tenant improvement costs.\(^5\) Figure 4.8 shows both owners and renters' responses, revealing that significantly more renters utilized personal financing than owners to construct their spaces. This is likely due to the lower PSF tenant improvement costs associated with renting, compared to the much larger construction PSF building improvement costs associated with owning.

Figure 4.9: Construction Financing Sources for Renters and Owners (n = 35)\(^6\)

![Diagram showing financing sources used by renters and owners.]

Notes: Renters tended to use significantly more self-financing than owners, but this could be a result of a flaw in the survey design. Those renters who spent significant amounts of their personal wealth to improve their space may have felt more compelled to respond to the question, despite being directed at owners, than those who did not spend as relatively large an amount.

Building owners were also asked what the costs were to build out their operations. This was compared to the size of the facility itself to derive per square foot construction costs. Construction costs reflect the feasibility of developing this product as an owner-operator.

Of the 19 businesses who reported owning their space, 16 provided more detailed information about the costs associated with construction. The size of facilities ranged from kitchens as small as 879 SF to multi-function facilities as large as 70,000 SF. The average SF of projects that owned space was 12,572 SF, although this was skewed in large part by one 70,000 SF project. Removing this, the average SF decreased to 8,470 SF. Figure 4.9 shows the average construction cost by the facility size.

\(^5\) Though interesting, the data on renter construction financing is not as robust as that of building owners, as the question only specifically addressed building owners. This creates the possibility that most renters automatically skipped the question, which indicates a bias in those who did respond. It is possible that the renters who responded to the question felt their costs to improve their space were high enough to warrant answering the question as well. This is a flaw in the survey design that would be amended if offered again.

\(^6\) This number includes all of the firms who responded to the survey question regarding construction financing sources, which included 18 owners (reflected in Figure 4.7) and 17 renters (included in Figure 4.8).
Figure 4.10: Construction Costs for Building Owners (n = 15)

Notes: This figure shows that the majority of firms operate in facilities less than 5,000 SF and spent between $0 and $200 PSF on construction costs. This figure does not reflect one outlier, a 70,000 SF facility that completed construction at $29 PSF, or $2,000,000 total. Other outliers include two facilities who spent $1,000 PSF on construction, shown here.

Firm Ownership Profile

Of 62 respondents, 60 percent reported operating as private for-profits, while 20 percent were private non-profits and the remaining a mix of institutionally owned, publicly owned, and a blended public-private partnership structure.

Figure 4.11: Financial Structure of Firms (n = 62)

Notes: The majority of firms operate as private for-profit enterprises, while two are owned by educational institutions, one is a joint partnership with a municipality, and two are fully owned and operated by municipal governments.

Analysis: Firm-level Net Operating Income

Eighty-five percent of respondents (n = 53) provided information on their annual Net Operating Income, while the remaining nine responded “I’m not sure” to the survey question regarding NOI.

Taken as a whole, the distribution of net operating incomes reported by all firms was heavily right skewed, with 20 percent of all firms reporting annual income of less than $5,000. Figure 4.11 shows the total distribution of responses, including the 15 percent of firms who reported “I’m not sure.”

52
Figure 4.12: Annual Net Operating Income by Percentage of Firms Responding (n = 62)

Notes: This chart shows that fully one-fifth of firms make less than $5,000 per year, while 8 percent earn above $500,000 annually.

Firm-level net operating income is analyzed utilizing the profile breakdowns in this chapter:
1) Location profile: Urban vs. suburban vs. rural
2) Operations profile: Number of business operations
3) Building profile: Owners vs. renters
4) Development profile: Capital structure used for project financing
5) Financial profile: Private non-profits vs. private for-profits vs. publicly owned FICs.

As shown below, the characteristics that yield the highest NOI are urban firms, firms with between three and six business operations, firms that rent, firms that utilized personal wealth in the financing process, and firms that operate as private for-profit ventures.

Figure 4.13: Average NOI: By Location (n = 53)

Notes: This figure represents 27 urban firms, 16 suburban firms, and 10 rural firms.

Figure 4.14: Average NOI: By Number of Business Operations (n = 53)

Notes: This figure represents 23 firms with one to two business operations, 17 firms with three to four, 7 firms with five to six, and 6 firms with seven or more business operations.
Figure 4.15: Average NOI: By Building Ownership (n = 53)

$200,000
$150,000
$100,000
$50,000

Owners (n = 15) Renters (n = 38)

$115,500 $179,540

Notes: This figure represents 15 building owners and 38 building renters.

Figure 4.16: Average NOI: By Capital Structure (n = 47)

$250,000 $202,813 $200,000 $150,000 $131,250 $137,167 $106,250 $100,000 $50,000

Bank loans (n = 12) Public loans (n = 4) Grants (n = 15) Self-funded (n = 16)

Notes: This figure represents 12 instances in which a bank loan was used as a source of financing, four instances in which a public loan was used, 15 instances in which a grant was used, and 16 instances in which the project utilized self-financing. Most companies, whether renting or owning, combined at least two sources of financing.

Figure 4.17: Average NOI: By Firm Ownership (n = 53)

$200,000 $178,548 $171,177

Private for-profit (n = 31) Private non-profit (n = 17) Publicly owned (n = 5)

$22,001

Notes: This figure represents 31 private for-profits, 17 private non-profits, and five publicly owned firms.

What sets apart the firms who earn more than $500,000 annually from those who earn less than $5,000? Parsing the data for firms earning less than $5,000 annually (n = 12), those earning between $100,000 and $300,000 annually (n = 16), and those earning more than $500,000 (n = 5) shows generally the same relationships between NOI and the five profiles studied as well as some additional information.

From the five profiles, the data shows that wealthier firms are more predominantly urban, while firms earning less than $5,000 annually are more frequently located in rural areas. Wealthier firms operate between 3.8 and 4.8 business operations on average, while lower-earning firms operate only 2.5 business operations on average.

61 Because firms were able to select more than one financing source, the 47 individual sources of financing only reflects 33 firms’ data.
Every single one of the five firms earning more than $500,000 annually reported renting their space rather than owning it, while the lower earning firms reported similar distributions of rent versus ownership tenure. The majority of the wealthiest firms operate as private for-profit entities (80%), while lower earning firms reported similar distributions of private for-profit versus private non-profit ownership. An outlier for those firms earning less than $5,000 annually were that two of the 12 firms in this category reported operating as publicly owned and operated entities, an ownership structure that did not appear in any of the higher earning firms.

Data on the fifth profile studied, capital structure used to finance improvements, was inconclusive due to the small sample size of each group of firms. Only two of the five firms earning more than $500,000 annually reported any kind of financing, both of which were reported as self-financing. As a result, comparisons in capital structure across the three income tiers, and primarily between the highest and the lowest, would not be possible.

The figures below reflect the four profiles that provided substantial enough data for comparison.

**Figure 4.18: Income Level by Location (n = 33)**

![Income Level by Location](image)

Notes: Only the lowest performing firms reported more rural locations than suburban, and the highest performing firms were overwhelmingly urban.

**Figure 4.19: Income Level by Number of Business Operations (n = 33)**

![Income Level by Number of Business Operations](image)

Notes: Firms earning $100,000 annually and more all operate between 3-7 business operations, the average shown to reflect higher NOI.
Similarly, data on the lease terms for the building renters in each income tier was inconclusive due to small sample size. Again, only two of the five firms at the highest income level reported their lease terms, which were two extremes: $20 per square foot annually and $0.82 per square foot annually. Another firm in this income tier stated that their rent was highly subsidized, without providing a value, and the remaining two firms did not respond to the question.

Comparing rent data on the lower income tiers, those firms earning less than $5,000 annually and those earning in the median range of $100,000 to $300,000 annually does show overall lease terms trending down as NOI increases. For those firms earning less than $5,000 annually, the average lease terms for renters was $10 PSF annually (n = 9), while the average lease terms for those firms in the median income range was $7.25 PSF annually (n = 6). The distribution of both of these average rates was very wide; for the lowest income tier, rents ranged from $0.74 PSF annually to $30 PSF annually. For the middle-income earners, rents ranged from $0.26 PSF annually to $12 annually. The sample size is still small enough as to be considered inconclusive.

Figure 4.22 reflects the entire distribution of lease terms reported by firms by income level.
Analysis: Operating Expenses Covered by Revenue

Fifty-two firms provided quantitative or illustrative detail on the percent to which their revenue covered their operating costs. Of the 52 respondents, 43 provided quantitative responses. Twenty-seven firms reported that 100 percent of their operating expenses were covered by their business revenue. Like the net operating income, the percent of operating expenses covered by business revenue is analyzed utilizing the profile breakdowns in this chapter:

6) Location profile: Urban vs. suburban vs. rural
7) Operations profile: Number of business operations
8) Building profile: Owners vs. renters
9) Development profile: Capital structure used for project financing
10) Financial profile: Private non-profits vs. private for-profits vs. publicly owned FICs

The following five charts reflect this breakdown. As shown below, the firms that were most capable of covering all of their operating expenses with business revenue were firms operating in either urban or suburban context, firms with between three to six business operations, renters, firms who utilized self-financing during construction, and firms operating as private for-profits. In every case, those firms who covered the highest percentage of their operating expenses with revenue were also those firms generating the highest NOI in their category. This provides strong indication that these corporate and building ownership structures are the most financially feasible FICs and are most likely to succeed in the long run.

Notes: Only two of the five highest earning firms reported their rental rates, which ranged from less than $1 PSF to $20 PSF.

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62 Nine respondents provided detail that could not be quantified, such as responses stating that "almost all" of their operating expenses were covered by revenue, or that in the event expenses were not covered, the city in which the FIC operates would cover the difference. These responses could not be included in the analysis.
Figure 4.23: Average Percent of Operating Expenses Covered by Revenue: By Location (n = 43)

Notes: This figure represents 23 urban firms, 14 suburban firms, and 6 rural firms reporting data. Sixty-five percent of urban firms cover 100% of expenses with revenue, compared to 71 percent of suburban firms and 31 percent of rural firms.

Figure 4.24: Average Percent of Operating Expenses Covered by Revenue: By Number of Business Operations (n = 43)

Notes: This figure represents 17 businesses with 1 to 2 operations, 16 businesses with 3 to 4 operations, 5 businesses with 5 to 6 operations, and 5 businesses with 7 or more operations. Fifty-nine percent of businesses with 1 to 2 operations cover 100% of their expenses with revenue, compared to 63 percent of businesses with 3 to 4 operations, 80 percent of businesses with 5 to 6 operations, and 60 percent of businesses with 7 or more operations.

Figure 4.25: Average Percent of Operating Expenses Covered by Revenue: By Building Ownership (n = 43)

Notes: This figure represents 11 building owners and 32 building renters. Only 45 percent of building owners cover 100 percent of their expenses, compared to 63 percent of building renters.
Figure 4.26: Average Percent of Operating Expenses Covered by Revenue: By Capital Structure (n = 33)\textsuperscript{63}

<table>
<thead>
<tr>
<th>Source of Financing</th>
<th>Percentage Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank loans (n = 10)</td>
<td>73%</td>
</tr>
<tr>
<td>Public loans (n = 3)</td>
<td>75%</td>
</tr>
<tr>
<td>Grants (n = 8)</td>
<td>63%</td>
</tr>
<tr>
<td>Self-funded (n = 12)</td>
<td>100%</td>
</tr>
</tbody>
</table>

Notes: This figure represents 10 instances in which bank loans were used as a source of financing, three instances in which loans were used, eight in which grants were used, and 12 in which personal wealth, cash, or family and friends wealth was used. Of the projects utilizing bank financing, 60 percent covered all of their expenses. Of those using loans, 67 percent covered all of their expenses. Only 38 percent of projects utilizing grants covered all of their expenses, while all of the projects utilizing some form of personal wealth covered all of their expenses.

Figure 4.27: Average Percent of Operating Expenses Covered by Revenue: By Firm Ownership (n = 43)

<table>
<thead>
<tr>
<th>Firm Ownership</th>
<th>Percentage Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private non-profit (n = 12)</td>
<td>56%</td>
</tr>
<tr>
<td>Private for-profit (n = 28)</td>
<td>93%</td>
</tr>
<tr>
<td>Publicly owned (n = 3)</td>
<td>45%</td>
</tr>
</tbody>
</table>

Notes: This figure represents 12 private non-profit firms, 28 private for-profit firms, and three publicly owned firms, one of which considered itself a "public-private partnership" and another that identified as "educational." Of the private non-profits, only eight percent covered all of their operating expenses. Of the private for-profits, 89 percent covered all of their expenses, and one of the three publicly owned firms covered all of its operating expenses with revenue.

\textsuperscript{63} Because firms were able to select more than one financing source, the 33 individual sources of financing does not reflect 33 firms.
Conclusion

The FICs most likely to reflect the most feasible financial structure are those located in urban contexts, operating more than two but less than seven business operations, renting their space, putting some of their own personal wealth into the financing process, and operating as for-profits. These survey results best reflect those companies that operate shared-use incubator kitchens with additional programming. The additional programming often includes events and business assistance for start-up firms using their kitchens, commercial retail space, and the expanded food manufacturing processes necessary for small and mid-sized companies to succeed, such as long-term dry, cold, and frozen storage, co-packing, and providing distribution assistance. Additional companies who participated include a food R&D lab and several greenhouse and on-site growers with commercial components.

These findings confirm those in the Heller (2013) report on the state of the kitchen incubator sector, and provide additional color on the real estate and firm-level dynamics of businesses that operate an additional mix of uses beyond the kitchen incubator. Interestingly, despite reporting slightly more business operations on average, more owners than renters experience difficulty covering their operating expenses and also report on average less revenue than renters.

Although private for-profit and private non-profit firms reported nearly identical average net operating incomes ($178,000 annually for for-profits versus $171,000 annually for non-profits), there was a much wider distribution between those firms’ ability to cover their operating expenses with their revenue generated. Ninety-three percent of for-profit firms covered their operating expenses, while only 56 percent of non-profit firms did. This data could indicate that non-profit firms rely more heavily on philanthropic funding than do for-profit firms, which could incentivize a business model that does not prioritize generating enough profit to cover costs, but rather a mission-oriented business model. In contrast, for-profit firms may be held more accountable to debt service repayments and must operate a more conventional business model that covers costs with revenue generated.

This hypothesis appears to be supported by the data on sources of financing used for construction and build-out costs. Of the 21 for-profit firms who reported data on financing sources, there were 10 instances of private loans and 15 instances of self-financing reported. In contrast, non-profit firms reported a much higher rate of grant utilization; of the 11 non-profits who provided data on capital structure, there were 12 instances of grants used to finance construction costs, compared to only 3 instances of grants utilized by for-profit firms. This data could indicate that for-profit firms in general operate more efficient businesses than non-profits, which could also mean that for-profit firms are more likely to scale than non-profits. The figure below reflects these differences.
The relatively low NOI reported by firms (20 percent earning less than $5,000 annually) may reflect the underlying ethos of most FICs: they exist to serve an underserved community of small to mid-size food growers and manufacturers and are not inherently extremely profit generating, except in a few select circumstances. In those circumstances in which firms earned more than $500,000 in income annually, the firm achieved either extremely subsidized lease terms for their space or operated a business with a larger profit margin, such as food R&D.

The companies that are pushing the envelope of food innovation—those exploring hydroponic, indoor farming, those combining on-site food production with food sales in one location, those incorporating greenhouses with incubator kitchens and other unlikely pairing of food operations, and those legitimately trying to create a campus or district of innovative food businesses—were less likely to respond to the survey due to the highly proprietary nature of their nascent operations. These companies, and the developers creating space for them, will be the focus of the next chapter, Case Studies of Food Innovation Centers.
Case Studies of Food Innovation Centers

Data

Between December 2014 and March 2015, I conducted interviews with developers of FICs spread throughout the United States, as well as with industry stakeholders involved in the business operations associated with FICs. For the developers, I drafted interview questions that complemented the survey by ordering my inquiry to mimic the development process. Questions were designed to offer open-ended explanations from the developers rather than a set of options that were utilized in the survey format. I asked first about the decision to pursue the project, then about site identification and acquisition, financing for development, and current operational status and the costs and returns associated with the business. By supplementing the survey results with the personal stories of specific developments, I sought to strengthen and verify the results returned from the survey. A full list of the questions developed and asked during the interviews is included in Appendix C.

Methodology

From the interviews, I selected six FICs to serve as six comparative case studies. I interviewed a member of the development team or current employee of the FIC with knowledge of the development process for each project to form the basis for the case study material below. While surveys provide point-in-time data on the firm-level business operations of the FIC and the FIC's ability to cover its expenses, case studies can answer the question of how, specifically, a FIC is financed and whether the project, in either its current operational or pre-development stage, appears financially feasible and capable of attracting commercial investment.

It is clear from both the surveys and the case studies that the most common FIC business model involves developing a space and bringing in tenants to operate the FIC business operations. Desmet and Rossi-Hansberg (2012) assert that firms who acquire land with the intention to innovate on that land will obtain the benefits from innovation “since no one else can produce in that location but them.” Their argument assumes that innovations are location-specific, and if that is the case, then land owners should appropriate a large fraction of the gains from the innovations occurring on their land, even if they are not the “generators or promoters of the discoveries” themselves.

However, the survey results show that, based on the 19 FICs who own their building and operate within it, and the 43 FICs who are tenants within a building without an ownership stake in the land,
that may not be the case for this specific process innovation. In fact, business renters appeared to earn higher NOI and have an easier time covering their own operating expenses than owners. Does this mean that developers who choose to be owner-operators of FICs do worse overall than business owners who operate as tenants inside a facility marketed as a FIC?

The case studies seek to better understand why this could be the case. To balance the disparity between renters and owners reflected in the survey results, each of the case studies is told from the perspective of the developer, not the tenants operating inside the facility. The case studies are intended to provide information on the process through which the developer identified and acquired the site for the FIC, identified and assembled the financing to develop the FIC to a tenant-ready condition, and managed the operational costs associated with running a FIC.

The businesses featured are Grand Rapids Downtown Market (Grand Rapids, MI), CropCircle Kitchen's Pearl Facility (Dorchester, MA), The Plant (Chicago, IL), the West Louisville Food Port (Louisville, KY), the Baltimore Food Hub (Baltimore, MD), and the Rainier Beach Innovation District (Seattle, WA). Table 5.1 describes the breakdown of the six companies by the five profiles identified in Chapter 4: geographic context, number of business operations, building ownership, capital structure, and ownership structure. The case studies represent three projects that are currently operational—
### Table 5.1: Profiles of Case Study FICs

<table>
<thead>
<tr>
<th>Location</th>
<th>Grand Rapids Downtown Market</th>
<th>CCK Pearl</th>
<th>The Plant</th>
<th>West Louisville Food Port</th>
<th>Baltimore Food Hub</th>
<th>Rainier Beach Innovation District</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Operations</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Building Ownership</td>
<td>Own</td>
<td>Own</td>
<td>Own</td>
<td>Own</td>
<td>Own</td>
<td>Own</td>
</tr>
<tr>
<td>Capital Structure</td>
<td>Private grants</td>
<td>Bank loans, tax credits</td>
<td>Self-funded</td>
<td>Bank loans, tax credits, grants</td>
<td>Bank loans, tax credits, grants</td>
<td>TBD</td>
</tr>
<tr>
<td>Ownership Structure</td>
<td>Private non-profit</td>
<td>Private non-profit</td>
<td>Private for-profit</td>
<td>Private non-profit</td>
<td>Private non-profit</td>
<td>Publicly owned</td>
</tr>
</tbody>
</table>
Grand Rapids Downtown Market

Background

For background on the Grand Rapids Downtown Market (GRDM), I spoke with Claire Duthler, the Special Events & Leasing Manager for the Market. The GRDM is a 130,000 SF newly constructed facility in Grand Rapids, Michigan, owned and operated by a private non-profit of the same name. The project houses a 24-stall food hall with local and regional vendors, two restaurants, an incubator kitchen, dry, cold, and frozen food storage, rooftop greenhouses, event space, commercial office space, and a seasonal outdoor farmers market. The facility opened in July 2013.

Acquisition

The idea for a Downtown Market began in 2009 with Grand Action, a non-profit organization active in the city of Grand Rapids with a mission to revitalize significant public spaces. Prior to the Market, Grand Action had coordinated public-private partnerships to

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64 Claire Duthler, telephone interview, April 30, 2015.
develop the VanAndel arena and the DeVos Place convention center, as well as the rehabilitation of the city's Meijer Theater. To assess the feasibility of such a project, Grand Action retained Market Ventures, an urban planning consulting firm specializing in planning, creating, and managing innovative food-based projects. Market Ventures produced a feasibility study for Grand Action that, taking into account more than 100 interviews with restaurateurs, farmers, consumers, financiers, and others, established a robust demand for local food within Grand Rapids and the greater western Michigan region. The study established the proposed components of the Market, which are reflected in the building's programming today, and identified potential sources of financing as well as potential sites suitable to the Market.

Of the three sites that Market Ventures identified as viable, two were owned by the Grand Rapids Downtown Development Authority (DDA) and one was privately owned. The DDA is a public agency that utilizes property taxes to invest in transformative revitalization projects. The 3.5-acre DDA-owned site that was ultimately selected was that of the former Sannoveldt Produce Company, which the DDA had purchased in 2007 for $2 million as a potential location for a commuter parking lot.6 The site was ideal for its proximity to the highway and location in a developing neighborhood south of the city's downtown core. Grand Action negotiated with the DDA to ground lease the site for 99 years for a nominal annual fee of $1.

Development

The Sonneveldt site consisted of four original buildings once used as produce distribution warehouses. Market Ventures' original feasibility study proposed renovating the building and connecting them together to form an interconnected facility. However, due to major structural and environmental issues, including the presence of asbestos, as well as the need to make the project ADA-compatible, the development team decided that demolition and new construction would be less cost prohibitive than renovation. As a compromise, the site utilized salvaged material from the demolition within the non-structural elements of the new buildings.

Total development costs for the facility were approximately $32 million, or $246 PSF. Grand Action utilized state brownfield tax credits in the project, but the primary financing came from contributions by the co-chairs of Grand Action, local foundations and philanthropists committed to partnering with Grand Action, and community donations, which accounted for as much as one-third of total costs. Grand Action considered utilizing New Market Tax Credits, but declined to pursue the option. The building was given to the newly-created Grand Rapids Downtown Market, a 501(c)3

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organization, to own and operate the Market. Grand Action does not hold any ownership stake in the project today, but retains fiscal responsibility for the Market's financing as part of its mission to revitalize Grand Rapids.

**Operations**

To determine how the Market's operations would work, Grand Action established a Board of Directors for the Market, who coordinated multiple committees to build the Market's long-term strategic plan. The leasing committee was led by Chris Muller of M Retail Solutions, a broker specializing in retail in the region. M Retail Solutions led the effort to fill the 24-stall indoor market hall, establishing four key anchor needs: produce, seafood, a butcher, and a bread baker. They also identified a need for a mix of ethnicities and mix of prepared food and produce, as well as beer and wine service, desserts, and dairy.

Leasing for the market hall began in 2012, approximately 1.5 years before the Market opened. Businesses were more difficult to secure than originally anticipated; according to Duthler, business owners were wary of signing leases in the Market because they didn't fully understand the concept of the project. Because the Market is located outside of the downtown core, it's considered a destination, and vendors would need multiple sources of revenue to survive. Because of these difficulties, the Market was only 80 percent leased at the time of the grand opening; however, by May 2015, less than two years after opening, the Market now only has one stall available.
Leases for the vendors in the market hall are typically on two to four year lease terms, often with at least one renewal, and run between $29 and $35 PSF, which includes $5 for CAM and $1 for marketing for every tenant. Tenants also cover utilities; their stalls are sub-metered and those costs are billed monthly. These costs can run as low as $150 per month, for those tenants utilizing only hand sinks and little else, to as much as $1,000 per month for those utilizing cold storage, gas stoves, and other equipment. The base rent variations are due largely to location within the hall, as well as the equipment needs required by the tenant.

On top of base rent, tenants also pay a percentage rent. The percentage rent is defined as six percent of gross sales above the tenant's natural break-even point. The natural break-even point is defined as the tenant's annual rent divided by six percent. Thus, if a tenant pays $30 PSF for a 500 SF stall, their annual rent is $15,000. Any amount of sales above $250,000 annually will be subject to the percentage rent requirement. In the Market's first year of operations, only four tenants met this threshold; however, by the end of 2015, half of the tenants are expected to exceed the threshold, indicating continued growth in demand for the Market's products. The reasoning behind the percentage rent is due to the fact that common area in the vendor hall is approximately 25 to 30 percent of total floor area space; if tenants were charged the true pro-rata share of common area costs, CAM charges could be as high as $25 PSF per vendor.

Percentage rent helps compensate for the subsidized CAM charges offered to vendors. Market hall tenants are provided with a white-box space equipped with a hand sink, and while original tenants were given a small TI allowance to personalize the space, new tenants coming in are provided with a one to two month rent abatement to compensate for tenant improvements.

The Market also operates multiple other types of leases for the variety of different tenants within the building. The two restaurant spaces lease for $22 PSF plus percentage rent and utilities on a 10-year lease, while educational tenants, which include Grand Valley State University, Michigan State University extension services, and the Kent Intermediate School District, pay slightly less at $13 PSF. The Kent Intermediate School District hosts its Kent Career Tech Center in 14,000 SF of the Market's space, offering programs in culinary/hospitality and health sciences in their high school Early College Academy. Office users, which includes both of the universities, pay $18 to $21 PSF plus CAM and utilities.

Last, the Market also houses an incubator kitchen, which hosts approximately 25 businesses paying between $10 and $30 per hour depending on the equipment required. Some of the businesses wholesale their goods to the vendors in the Market Hall, while others participate in the seasonal farmers market. An incubator kitchen manager works with the users on their business plans, food sourcing,
and product distribution. The Market also provides dry, cold, and frozen storage rented by the shelf.

All of the leases from all of the different types of tenants in the Market, along with income from the Market’s event spaces and farmers market only accounts for between 50 to 60 percent of the Market’s revenue. Another 30 to 35 percent is derived from special events revenue. The Market obtained a liquor license, and thanks to this it can operate all of the bars and beverage service on the premises, which includes servicing any of the events held both in the dedicated conference and event space, as well as in the Market’s rooftop greenhouses, which can be rented out for private events. To accommodate space for events within the greenhouses, the greenhouses do not actually operate at fully growing capacity; the Market found that generating income via special events was more profitable than operating the greenhouses full-time in plant production. The last portion of revenue is generated from miscellaneous income, such as demonstration courses held in the incubator kitchen.

Currently, the Market covers all of its operating expenses from the revenue generated on-site. The team has discussed the possibility of incorporating indoor vertical farming at some point in the future, but for now, the Market is focused on finalizing both of the leases for its two restaurant spaces and continuing to grow with its current tenants.
Key Take-aways

- **Product type unfamiliarity can temper leasing efforts.** For a FIC to be successful, the tenants operating within it must have confidence in the product type. Additionally, since FICs inherently tend to be located outside of downtown cores due to rent pressure, they may require visitors to come as a destination, which requires tenants to create business models that can generate revenue through multiple sources, such as catering, prepared lunches, and wholesaling. Tenant success drives the building’s cash flow, which drives the building’s value, and thus is extremely important that the developer selects tenants with the creativity required to succeed. The fact that the Market expects to collect performance percentage rents from more than half of its vendors by the end of 2015 reflects increasing demand for the product and willingness of urban consumers to seek out the Market as a food sourcing alternative.

- **Monetize the building’s appeal to agro-tourism above and beyond tenant rents.** Food’s inherent appeal can be sold just as easily as the food itself, and the Grand Rapids Downtown Market has capitalized on that fact by generating more than one-third of its revenue from special events within the Market’s food production spaces. Monetizing the space whenever possible, from booking demonstration classes in the commercial kitchen when it is not used by food manufacturers, to hosting events in the greenhouse with an in-house liquor license, will add value to both the building and the entire FIC product type.
CropCircle Kitchen: Pearl Facility

Background

For background on the CropCircle Kitchen Pearl facility, I spoke with Jen Faigel, the Interim Executive Director at CCK. The Pearl facility is a 36,000 SF shared use kitchen commissary and culinary business incubator in Boston, Massachusetts, that began construction in June 2013 and opened to its first clients in 2014.

The 36,000 SF Pearl facility is a single-story masonry building with a partial basement that formerly housed the Bornstein & Pearl hot dog factory and was operational as a food processing facility until 2007, when the company re-located. Constructed in 1920, the building operated continuously as a food production facility, including a period as a pickle factory and an ice cream manufacturer until its eventual vacancy. The entire site is 82,000 SF over 10 adjacent parcels, and includes eight contiguous structures built over a 60-year period. The building’s net rentable area is 31,560 SF, of which 25,000 SF are separately-leased tenant spaces and 6,500 SF are shared common space.

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66 Jen Faigel, interview by Alison Crowley, Crop Circle Kitchen Pearl Facility, December 18, 2014.


**Acquisition**

The Dorchester Bay Economic Development Corporation (DBEDC), a Boston-based non-profit, purchased the Pearl facility in 2009 for $1,356,514. This amounts to $37.68 PSF for the building, or spread across the entire site, $16.54 PSF for the entire 82,000 SF site. Although DBEDC owns the building, they purchased it in partnership with CropCircle Kitchen (CCK), who signed a master lease with DBEDC and took over the day-to-day operations of the business. CropCircle Kitchen is a non-profit shared-use commercial kitchen operator and small business incubator.

**Development**

The Pearl facility’s prior—and relatively recent—use as a food manufacturing facility meant that interior renovations did not require as many structural changes as an industrial building with a non-food-related use might have needed. Despite that, substantial construction on the vacant building was required to get the space to a warm, vanilla shell for tenants. The Pearl facility’s business model involves getting the space to a basic level of occupancy, while tenants requiring additional fit-outs will be negotiated on a tenant-by-tenant basis. However, the facility’s initial construction costs included significant investment in the large shared-use kitchen that forms the central component of the project’s revenue generation, and DBEDC believed that phasing the project to be completed at different stages as tenants required would be more difficult to finance than doing all of the necessary construction up-front.

An April 2013 budget report showed total construction costs, including hard, soft, and a $3.7 million reserve contingency, of $11,830,753, or $328 PSF. The contingency included a $1,000,000 developer fee and $500,000 in developer overhead. Along with the closing costs associated with applying New Market Tax Credits to the project, which will be discussed later in this section, total project development costs were $13,812,267 with acquisition, or $384 PSF.

To finance the project, DBEDC compiled a complex stack of financing, which amounted to $7.2 million in debt and the remaining in sponsor direct funding. The financing relied on a first position loan from Boston Community Capital, a local CDFI, for $3.4
million at 12 percent interest, which dictated that no excess cash flow be distributed during a seven-year compliance period. Any excess cash flow would be required to either pay down the principal or be placed in reserve. Following this loan closing, DBEDC was able to acquire loans from the City of Boston via a HUD 108 loan at 5 percent interest, a loan from the CDFI Coastal Enterprises for $500,000, and other sources for a remaining $3.8 million.

The project also secured $3.72 million in New Market Tax Credit financing, although it incurred $625,000 in closing costs to do so. The NMTC provides an investor with a federal tax credit over a seven-year period in exchange for investing in a commercial project in a low-income census tract. This notoriously difficult-to-close financing mechanism is not used as frequently as it was originally intended, but was able to make a significant impact on the Pearl facility’s financing needs. Taken together, the debt and NMTC financing represented a 116 percent LTV ratio based on a 2012 appraisal by CBRE that valued the building at $6.4 million. An additional $830,400 was raised in equity financing, but this included a $400,000 deferred developer fee and $265,000 in contribution from DBEDC. All told, according to Faigel, investors did not yet have the confidence in the project’s intended use to get involved in the project at the early construction stages.

In a 2013 memorandum to the City of Boston Assessing Department, DBEDC noted that in contrast to the financing structure outlined for the Pearl facility, a “conventionally financed light industrial commercial project of this sort would have a loan to value ratio of 60-70%, with the balance of financing coming from private equity, and no restrictions on distribution of cash flow.”

Operations

As the master lessee, CropCircle Kitchen is responsible for all daily operations and has an obligation to pay full base rent of $17 PSF plus common area fees on approximately 13,500 SF, or $229,500 per annum.

Image 17: The incubator kitchen at the Pearl facility.

67 Jeanne Dubois, “Pearl Food Production Small Business Center, 196 Quincy Street, Dorchester MA,” Memo to John Tagliatela, Board of Review, City of Boston Assessing Department, May 10, 2013.
annually. This base rent was calculated to cover debt service plus additional payments to cover taxes, insurance, utilities, and general building maintenance. CCK was originally intended to also receive a property management fee, but this part of the relationship with DBEDC did not work out, resulting in an estimated $80,000 annual revenue loss to CCK. The space that CCK leases from DBEDC is used to run a commissary, shared-use kitchen, and storage facility. The balance of the space is leased separately by DBEDC to a mix of start-up food production businesses in need of individual commercial kitchens.

CCK generates revenue through a variety of means that covers the base rent to DBEDC, as well as approximately $10 PSF in common area maintenance fees. Revenue streams include monthly fees from members of the shared-use kitchen plus hourly rental fees, separate fees for long-term food storage, fees for cleaning food trucks, training classes on food preparation, and contracts for work in their commissary kitchen. These contracts include working for specific food trucks in need of food prep, as well as a partnership with Smart Lunches to deliver hand-made, packaged lunches to school children in the Boston region. The Smart Lunches contract alone brought in an additional $50,000 to $60,000 in bottom line revenue and allowed CCK to hire up to three new full time employees to manage the operation. CCK’s business model involves building partnerships with as many outside organizations as possible; for instance, Faigel mentioned that CCK had been in communication with the Boston Public Market (as yet unbuilt in 2015) for food storage, value-add processing, and the use of B and C-grade produce unsold at the market. CCK’s earned revenue in 2013, its year one ramp-up period, was approximately $250,000. This doubled in 2014 and is projected to surpass $1 million in earned revenue in 2016.

Although not part of the space CCK pays rent on, the Pearl facility also generates income via individually leased small commercial kitchens for businesses that have outgrown the shared-use kitchen and desire space of their own. A May 2012 appraisal conducted by CBRE to analyze the industrial food market concluded that market rent for this project would be $15 PSF triple net for the individually leased commercial kitchens, $25 per hour for the shared use kitchen, and $55 per month for dry and cold storage. These projections were used in the original pricing strategy CCK employed and assumed that tenants would be responsible for additional, specialized build-out in relation to their business beyond a white-box space. On a PSF basis, a May 2013 operating pro-forma for the building’s 31,560 leasable SF showed rates of $15 PSF for 18,020 SF of individual tenant spaces, $17 PSF for the 6,194 SF of kitchen space CCK leases from DBEDC, and $16 PSF for the 7,338 SF of storage that CCK leases. CAM charges for all tenants is $9 PSF.

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66 CBRE. “Market Study and Fair Rental Value Study: Commercial Kitchen at 184-220 Quincy Street, Dorchester, Norfolk County, Massachusetts 02121.”

Key Takeaways

- **Revenue diversification helps ensure success.** To cover its base rental fee and CAM charges, all of which amount to nearly $30 PSF for their 13,500 SF leased space, CCK had to identify a sufficient number of means to monetize both the shared-use kitchen and the commissary kitchen. For example, the organization originally thought it would be involved in farm-to-institution distribution, but discovered an unmet demand for freezer storage and pivoted to focus on helping businesses scale via long-term frozen storage. They also could not have originally anticipated the Smart Lunches contract, which now accounts for a substantial portion of their earned revenue, despite the fact that the shared-use kitchen is the organization’s mission-centered focus.

- **Without equity, community-based bank loans may be the best option for leverage.** At 12 percent interest, the Boston Community Capital loan is several hundred basis points higher than conventional construction and permanent loans on the market in 2012-2013, when the financing was secured. Both of the banks who issued loans to the project are CDFIs, and the project necessitated structuring tax credits into the deal as well.

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The Plant

Background

For background on The Plant, I spoke with Carolee Kokola, the Director of Enterprise Operations for Bubbly Dynamics LLC and The Plant. The Plant is a FIC located in Chicago, Illinois, in a 93,500 SF former meatpacking facility. The building and surrounding land for the project totals three acres, though the project is sited on 27 separate parcels that had to be acquired together. The Plant’s building was originally constructed in 1925 to house the Buehler Brothers Meat

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70 Carolee Kokola, telephone interview, March 4, 2015.
Markets, and operated for the next 82 years as a meatpacking facility. Because the building had been operational until 2007, the building’s infrastructure and environmental conditions were in relatively good repair when Bubbly Dynamics purchased the site.

**Acquisition**

John Edel, the owner of the for-profit Bubbly Dynamics LLC, purchased the building and land in 2010. Bubbly Dynamics also owns and operates the Chicago Sustainable Manufacturing Center, a manufacturing maker-space operating out of an industrially rehabilitated building. Following the success of the CSMC, Edel made the decision to purchase a second building for the purposes of operating an innovative food manufacturing hub.

Despite the building’s relatively good condition, the prior owners were marketing the building as a “strip and rip”, in which the new owner would simply gut the building, demolish it, and re-build from scratch. This pushed the price of the building down. The building was acquired outright by an Edel family member, and Bubbly Dynamics LLC pays a monthly mortgage toward the acquisition price. The building and three acres of land were acquired for $525,000 at the peak of the recession. On a PSF basis, the building cost $5.61 PSF; however, spread across the entire site, the cost was reduced even further to $4.02 PSF.

Financing the building acquisition was not nearly as straightforward as a typical commercial transaction, however; according to Kokola, the project was not able to obtain a conventional mortgage, and instead the Edel family figured out how to acquire the project via personal means. The project has also received very little public financial support beyond a grant from the city of Chicago that allowed the owners to replace the windows. The Plant intends to pursue tax increment financing in partnership with the city, but has not done so yet.

**Development**

The building’s prior use as a food manufacturing facility also meant that much of the infrastructure needed to run a successful FIC was already in place. This included heavy brick floors capable of holding large loads, floor drains, and asceptic surfaces on the walls. As a result, though the project did require a full interior gut rehabilitation, major structural components were already in place and were able to reduce build-out costs. The Plant’s staff manages the majority of the construction without needing to hire outside laborers. John Edel, as a licensed general contractor, performs the majority of the construction, and thanks to that and other in-house staff, The Plant does not utilize plumbers, electricians, and other specialists throughout the build-out process.
The interior of The Plant during construction.

The Plant's staff employs an extremely cost-effective method for constructing the space required to run the FIC. As new tenants express interest in leasing space at The Plant, the building owners work with the prospective tenants to determine their buildout needs. Spaces in the building are left in an unfinished, gutted state until a tenant signs a lease for those square feet; only then does construction begin to bring the space to the quality of a vanilla box. In this case, a "vanilla box" refers to a space with all utilities in place and to a quality that is food-grade, licensed, and inspected. Tenants are responsible for improvements to the space beyond these basic elements.

One of the most unique components of The Plant, and one that will have a major impact on operating expenses once operational, is an anaerobic digester that will be installed and render the entire building a net zero energy project. The digester was the only component of the building that was not allowed by-right via the industrial zoning designation, so The Plant had to get the project approved by the city to be considered a waste treatment facility. This is also the only component that received public support in the form of a grant from the state of Illinois for the implementation of a renewable energy system. Although the digester has not yet been installed, it will allow the building to not only operate without any utility expenses, it will also be able to take waste from other businesses and transform the waste into power, with a target of diverting 10,000 tons of food waste from landfills on an annual basis.

**Operations**

As the owner, Bubbly Dynamics LLC leases space within the building to individual tenants who together comprise the variety of uses that define a FIC. The building currently has 12 tenants, of which 11 operate as private for-profits. The only non-profit in the building is Plant Chicago NFP, the non-profit arm of Bubbly Dynamics LLC. Plant Chicago NFP operates an aquaponics farm and mushroom farm tank where the biological digestion of animal manure can occur. Source: http://www.michigan.gov/mdard/0,4610,7-125-1599_44958-179791--,00.html
within the building, as well as leads the demonstrations and marketing that take place within the building to spread educational awareness of innovative food manufacturing practices. The other tenants include the following users:

- Greens and Gills: Aquaponics farm
- Arize Kombucha: Kombucha brewer
- Patchwork Farms: Outdoor farm
- Great American Cheese Collection: Cheese distributor
- Pleasant House Bakery
- Pleasant Farms: Outdoor farm
- Skygreens: Aquaponics farm
- The Urban Canopy: Rooftop farm
- The Salty Prawn: Shrimp farm
- New Magnolia Garden Center: Outdoor farm

Joining the tenants later in 2015 is a microbrewery, who will rent 11,000 SF of ground floor space, bringing the building’s total occupancy to 60 percent. An incubator kitchen is also planned.

Spaces range as small as 300 SF for a tenant, to the incoming brewery’s 11,000 SF, and rents range from as low as $6 PSF for a mushroom farm in the basement to as high as $11 PSF depending on the location within the building, level of finish, and what costs are incurred to prepare the space for that specific tenant. All tenants pay triple net leases and are responsible for common area maintenance charges for larger spaces if those charges are more than $10 PSF. Tenants with more specialized space needs sign longer lease terms, and smaller companies generally require expansion rights or shorter terms with options to renew and expand; as a result, the building is not currently 100 percent leased due to the possibility of existing tenants requiring space in the future. All leases escalate by two percent annually, which trends slightly lower than inflation.

Despite the substantial reduction in costs associated with construction, The Plant still has difficulty covering all of its expenses with the revenue generated from tenant leases. To date, debt service and payroll are entirely covered by rent revenue, but real estate taxes “can be a sprint,” according to Kokola, indicating that the project has not yet reached a level of financial stability where all costs are comfortably covered on a monthly basis. However, The Plant projects that the rental income generated by tenants will double between 2014 and 2016 if the build-out and lease-up targets are met. Kokola also mentioned that The Plant is a “patient landlord” in terms of rent collection for newly incubated businesses, indicating that rental revenue by 2016 will more closely reflect the full potential gross revenue to be generated from both existing and future tenants. Finally, Bubbly Dynamic LLC’s ownership of the Chicago Sustainable Manufacturing Center has allowed it to leverage the revenues from the CSMC to float costs associated with The Plant while The Plant continues to complete construction and reach full occupancy.
Key Takeaways

- **Seek out buildings previously used for food manufacturing.**
  By purchasing a building that had previously operated as a food manufacturing facility, The Plant substantially reduced the costs associated with major internal improvements. This further eased the permitting and entitlement process as well. The most substantial interior improvements that needed to be made was the subdivision of the space into areas suitable to multiple tenants instead of one single owner-operator.

- **In rehabilitation, develop the project on an as-needed basis.**
  Edel's background in construction allowed him to substantially reduce the costs associated with rehabilitating the property, and his successful management of the Chicago Sustainable Manufacturing Center allowed him to leverage financial resources from his current business to allow The Plant to succeed to date. These resources have allowed The Plant to develop the building on an as-needed basis as tenant leases are signed, reducing up-front development costs and spreading those costs over time.
West Louisville Food Port

Background

For background on the West Louisville Food Port, I spoke with Caroline Heine, co-founder and project director for Seed Capital Kentucky (“SCK”), a Louisville-based non-profit committed to supporting farmers and the local food economy through technical assistance, grants, research, and other support.72 SCK is the owner and developer of a 24-acre project in an industrial section of Louisville that will become a hub of small business food production, processing, and manufacturing. Groundbreaking on the first phase of the project is anticipated for fall 2015.

The Food Port will be located on the site of a former tobacco manufacturing plant that was demolished in the early 2000s. National

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72 Caroline Heine, telephone interview, March 13, 2015.
Tobacco Company originally purchased the property in 1905 for $2.2 million, the 2015 equivalent of $58 million. However, following a major flood in 1937 that put the majority of West Louisville underwater and the construction of a highway dividing the industrial section of town from the more affluent eastern half of the city, the site and its surrounding environs quickly lost their value. The state of Kentucky purchased the property in 2010 for $1.4 million, nearly half of its original 1905 value, and the City of Louisville purchased it from the state in 2012 for $1.2 million, or $0.87 PSF for the entire 24 acres.

In 2012, SCK hired Karp Resources, consultants on food systems planning, to conduct a demand analysis for local food in the Louisville region. Karp calculated an $800 million per year economic opportunity for the City if SCK could connect supply of local food with existing demand. SCK determined that their approach to meeting unmet demand for local food would support already operational businesses by creating the physical infrastructure needed for those businesses to scale. In conversations with business owners, SCK found that many were unable to raise the capital needed to physically and believed they could benefit both from enhanced physical infrastructure for the local food-based economy, but also co-location with complementary businesses. Armed with this information, the concept of the West Louisville Food Port was born.
During their initial search for an appropriate site for the Food Port, SCK initially considered existing warehouses built in the early 1900s that could be rehabilitated using historic tax credits. However, many of the organizations interested in partnering with them required square footage that didn’t exist in an efficient way in the existing buildings, and they realized that the extent of work required for rehabilitation would have been more expensive than simply building new. After making the decision to pursue vacant land instead, SCK brought their business plan to the City, and were offered an option for the entire 24-acre parcel in September 2014 at no cost.

Image 22: An outdoor farm with public programming planned on-site.

As the owner and operator of the site, SCK is responsible for assembling the financing to move the project from plan to construction. At the outset, SCK negotiated the sale of six of the 24 acres to Star Distributed Energy, which will construct a $28 million anaerobic digesting facility on site. SCK anticipates that the cost to build a 70,000 SF facility on the remaining portion of the site will be approximately $22 million ($314 PSF), for a $50 million total development. Although financing was still being finalized in spring 2015, SCK plans for 30 to 40 percent of the financing stack to come from New Market Tax Credits, with the remaining coming from money raised from the charitable sector, federal grants, individual donations, potentially crowdsourcing, and a small amount of debt associated with the tax credits. SCK will also apply the earned revenue from the sale of the six acres to their construction financing.

Development

Acquisition in hand, SCK issued a limited RFP for architects, and ultimately hired the North American office of OMA, Rem Koolhaas’s Netherlands-based firm.73 The plan calls for all of the uses that exemplify a FIC: farming, aggregation, processing, distribution, community kitchen, storage, retail, and recycling.

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73 Because two of OMA’s principals teach at the Harvard Graduate School of Design’s architecture department, the Food Port’s master plan became the subject of an architecture course at Harvard, and as a result, OMA produced a master plan for the entire site in just five weeks, unveiling their concept in December 2014.
Operations

Once operational, SCK intends that the site will be financially self-sufficient by generating income through triple net leases with tenants. At the time of writing, SCK was waiting on schematic designs for the site to better understand their costs to construct, which would determine what rents they would charge their tenants. Images from OMA’s master plan indicate that the construction materials could be modular in nature, and SCK was in the process of determining the least expensive building materials that would meet their needs as of March 2015. SCK does anticipate that the rents will be in line with area industrial leases, and this is the only anticipated revenue stream. Current project partners include KHI Foods, a small farm based in Burlington, KY, Jefferson County Cooperative Extension, which will operate a demonstration kitchen and two-acre farm site, and The Weekly Juicery, a processor and retailer of cold-pressed fruit and vegetable juices.

Key Takeaways

- **Partner with a municipality.** The West Louisville Food Port vision may not have been possible without Seed Capital Kentucky’s ability to acquire the 24-acre site at no cost from the City of Louisville. By focusing on the economic development benefits of the project, which SCK believes will generate 200 permanent jobs and 275 temporary construction jobs, the City could justify the transfer and SCK could more realistically finance the new construction.

- **Consider new construction to suit individual tenants’ needs.** Unlike most of the other FIC projects studied here, the Food Port will be entirely new construction. However, this decision was ultimately the most cost effective due to the diverse needs of the variety of tenants envisioned for the site. Although rehabilitation has worked in similar projects with many different tenants, such as The Plant, remediation and internal reconfiguration may become cost prohibitive relative to the value the site will ultimately generate.

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74 A survey of industrial asking rents on LoopNet.com showed between $3 - $5 PSF for properties located near the West Louisville Food Port site, with commercial and office asking rents about $10 PSF higher.
Baltimore Food Hub

Background

For background on the Baltimore Food Hub, I spoke to Greg Heller, the CEO of American Communities Trust ("ACT"), a non-profit consultant to social impact real estate development projects.\footnote{Greg Heller, telephone interview, March 27, 2015.} ACT has also been engaged with the West Louisville Food Port for one and a half years as development consultants, and Heller was the lead author of the 2013 Econsult report on the state of the kitchen incubator industry.

The Baltimore Food Hub is a project under development in the Broadway East neighborhood, located north of the Johns Hopkins University's medical campus in a low-income community. The project consists of a 3.5 acre site redeveloped into a campus of food system
facilities with a mix of new construction and adaptive reuse. In 2012, the City of Baltimore released a Request for Proposals for the entire 3.5 acres, which included three historic structures built in the 1890s that hadn't received any meaningful investment in more than half a century.

**Acquisition**

ACT became aware of the City's RFP and decided to try and convene a group of food-related non-profit businesses to propose a synergistic campus where the businesses could co-locate. ACT's initial offer to the City for the land was $500,000 in cash, but after financing fell through, the final, successful bid comprised $50,000 in cash and a $450,000 forgivable mortgage tied to construction benchmarks. Across the site, this amounted to approximately $3.28 PSF for the land and buildings. ACT was the only organization to bid on the site and, unlike their role in the other real estate projects they had consulted on, they decided to serve as the master developer and owner for the project.

**Development**

Since winning the RFP in 2012, ACT has taken the Baltimore Food Hub through an extensive planning process and are preparing to break ground on the first phase of the project in spring 2015, with expected completion in fall 2016. The first phase consists of a new 13,000 SF building that will house a kitchen incubator and culinary social enterprise to be operated by Humanim, a non-profit service provider. The second phase will consist of the redevelopment of the three existing structures on site into a combination of food manufacturing and production space for small businesses, as well as shared office space for businesses operating in the food sector.

Construction costs for Phase 1 will total approximately $3,000,000, or $230 PSF, and are funded entirely by a grant from the US Economic Development Administration and matching foundation grants. Phase 2 will be substantially more expensive due to the costs of putting in entirely new infrastructural systems into the existing buildings; although not finalized yet, ACT estimates that construction will cost $333 PSF before furniture, fixtures and equipment (FF&E), which will likely add an additional $50 to $70 PSF to the costs. The financing for Phase 2 will pair federal historic tax credits with Maryland state historic tax credit equity to account for approximately 40 percent of the capital stack; the remaining financing, still in the process of execution as of March 2015, will be conventional debt. ACT anticipates that the debt will likely come from a CDFI or one of the tax credit investors.

**Operations**

Once operational, ACT plans to charge Humanim a nominal rent of $1 per year to operate the community kitchen in the new
structure, although Humanim will be responsible for paying a share of common area expenses. In order to pay the debt service on the three historic buildings when Phase 2 opens, those tenants will be subject to conventional gross commercial leases. ACT is currently in negotiation with a number of small and mid-sized food manufacturing and processing companies in need of scale-up space to rent in the historic structures. In projecting property cash flow, ACT always commits to making the project able to cover all of its expenses through revenue generated on-site by Year 4. Heller noted that this commitment to financial sustainability was also applied to the West Louisville Food Port project.

Like CCK, ACT has also reached out to many local stakeholders to partner in the project; significantly, they secured a partnership with Johns Hopkins University in which JHU committed to a $1 million per year purchase commitment from the businesses operating at the Food Hub. There currently is no retail component planned for the site, but ACT is willing to consider the possibility if the neighborhood can support it.

**Key Takeaways**

- **Pair philanthropic resources with social enterprises and conventional financing with conventional enterprises.** ACT is able to support Baltimore’s economy in two distinctive ways by employing differing financing strategies to Phase 1 and Phase 2. In Phase 1, by utilizing all grants to fund construction, ACT can afford to defer rent requirements in order to allow Humanim to operate a training kitchen that will serve Baltimore’s low-income population, which will help generate jobs. Alternatively, debt service constraints in Phase 2 will require ACT to secure market rents, but can still target small and medium-sized food businesses who currently lack the capital needed to build their own physical infrastructure to expand. Blending these two strategies in one site will help reach an even broader spectrum of Baltimore’s food-based economy.

- **Generate revenue through outside partnerships.** JHU’s commitment to purchasing $1 million worth of goods from businesses operating on-site at the Food Hub will be a very attractive feature in securing tenants for the Phase 2 spaces. By creating a network of partnerships, ACT diversifies its revenue stream and has the potential to identify new sources of revenue as new partners come on board.
Rainier Beach Innovation District

Background

For background on the Rainier Beach Innovation District, I spoke with Robert Scully, a Community Development Planner for the City of Seattle's Department of Planning and Development (DPD). Scully and the City of Seattle are working to turn an underutilized area of the Rainier Beach community in South Seattle into a food innovation district through the proposed development of 100,000 SF of new construction housing an incubator kitchen, commissary kitchen, classrooms, retail space, and community space. Unlike the other case studies conducted, the Rainier Beach project was studied from the lens of a public entity trying to incentivize development in an area where they do not have site control.

The Rainier Beach project, which is actually called a Food Innovation Center, was first conceived in 2012 during a public process.

to produce an updated neighborhood plan for Rainier Beach. The Rainier Beach community is located in South Seattle and is a predominantly low-income, minority neighborhood. The plan, completed in March 2012, outlined a vision to develop an “Innovation Zone” around a new light rail station that had just opened in an effort to create transit-oriented economic development. The area surrounding the light rail station is currently underdeveloped and zoned for light manufacturing and industrial. During the public process associated with updating the neighborhood plan, community activists expressed their desire for a food-based model for the Innovation Zone, which would be catalyzed by the new construction of a Food Innovation Center. Ultimately, the entire area dubbed the Innovation Zone would require substantial new construction over the long-term for the catalytic economic development envisioned.

To begin the planning process for the FIC, the City convened a group of stakeholders from local food banks, community colleges, and Seattle Tilth, a non-profit organic farm, to develop an initial vision and program. The City executed a short-term contract with the Jonathan Rose Companies (“JRC”), a for-profit developer with an office in Seattle, to aid them in analyzing the financial feasibility of such a project. They also engaged local graduate students to consider the economics of the FIC, and engaged VIA architecture to produce initial conceptual drawings.

Ultimately, the conceptual FIC comprised two buildings: the Community Kitchen Building and the Aggregator Building. The first, the community kitchen, would be approximately 44,550 SF over three floors, which would house an 1,100 SF incubator kitchen, two 1,500 SF training kitchens and one 1,500 SF commissary kitchen, as well as a limited service 1,000 SF café and 1,500 SF of retail space. The remaining space was envisioned to house administrative offices, childcare space, food storage, co-working offices for the food businesses operating in the kitchens, shared conference rooms, classrooms, training and demonstration space, and a computer lab. The Aggregator Building would be slightly larger, at 60,000 SF, and would comprise a 2,000 SF food bank grocery store, 5,000 SF of aggregator space, 7,000 SF of emergency feeding preparation space, and the remainder for classrooms, offices, and food storage.

Acquisition

Having established a program and vision for the project, the City was left to identify a potential site and determine a means of acquisition. Because Seattle does not have a development authority with the power to buy property and move development forward, the Department of Planning and Development is dependent on the
The full build-out of the Innovation District envisions a network of buildings anchored by the FIC.

commercial real estate market for redevelopment. They are hoping to form a public-private partnership with a local developer and invest money toward the development cost, and the ownership of the FIC would ultimately be private. As the City continued to work with Jonathan Rose to identify a site, the scope of the project was substantially reduced to just a commercial kitchen and educational training facility.

In December 2014, the City identified a potential parcel of 11,500 SF with an existing 4,184 SF commercial property currently leased to a contractor that could serve as the site of the first new project within the Innovation Zone. Based on this site, the City targeted an acquisition cost of $1.2 million ($224 PSF) with construction costs amounting to an additional $3 million. In 2014, the DPD reached out to the state legislature for funds to acquire the site and were working with the City of Seattle Office of Economic Development to begin identifying sources of private financing that could be tapped if a development partner were to come on board.

However, in a November 2014 draft pro-forma for the project, projected cash flow for the project, which included a 1,200 SF community kitchen, 600 SF of storage, and 2,384 SF of office, classroom, and common space, returned a negative cash-on-cash return of approximately 6.4 percent during all 10 years projected. The negative return, however, was based on relatively conservative revenue assumptions, which included just 15 customers utilizing the shared kitchen space on a weekly basis, and only for 8-hour and 15-hour increments each week.

The Rainier Beach Innovation District has garnered many potential partners and interested parties, but the concept is mired with challenges. Site assemblage is one of the largest hurdles; in a letter to the City dated February 2014, JRC cautioned the City that key sites around the new light rail station were already being acquired by other parties, thus challenging the cohesive nature of a City-led Innovation Zone in the first place. Further, all of the partners who have thus far expressed interest in working with the City to realize the vision of the
FIC and the Innovation Zone are dedicated but stretched for resources. These partners include the Rainier Beach Moving Forward advocacy group and the Rainier Beach Urban Farm, both of which rely entirely on volunteer capacity, Seattle Tilth, who has offered to operate the kitchen incubator program but cannot provide financial resources toward development, Renton Technical College, who have expressed a desire to utilize the classroom space if it were provided at a low cost, and small business owners operating food businesses who would be interested in co-locating at the incubator kitchen but are unable to participate in the development process.

Stymied by an inability to move the development project forward without either substantial contributions from the state or local budget or a private development partner, the project has stalled. In early 2015, the Department of Planning and Development submitted its re-zoning application to the City Council to hopefully generate greater density and use incentives to attract development. Scully admitted, however, that Rainier Beach has not seen the kind of economic turnarounds that often occur around new transportation amenities like light rail. It remains to be seen whether the initial FIC or the Innovation Zone as a whole will be realized.

**Key Takeaways**

- **Public-private partnerships are crucial to success.** Unlike the West Louisville Food Port, where Seed Capital Kentucky brought the idea of the Food Port to the City and sought their help in acquiring a site, the City of Seattle is trying to do the opposite, and attract a development partner to engage on the project. However, without substantially greater financial incentives to ease the burden of acquisition and construction, there is weaker financial incentive for the private sector to invest in this project. The City will need to identify resources it can apply to this site, in the form of direct grants or loans, or with tax credits or abatements, to create a successful partnership.

- **Identify a site with potential for multiple revenue streams.** The proposed acquisition and construction costs for the FIC are significantly higher than those presented in the other case studies. One major issue with the proposed site could be its size; with only 4,000 SF, little more can be done on-site than operating a small incubator kitchen.
Conclusion

Table 5.2 summarizes the key take-aways from each of the case studies, while Table 5.3 compares some of the key financial considerations from each case study that can be compared quantitatively to the survey results.

Table 5.2: Summary of Key Take-Aways

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Key Take-Away</th>
<th>Financial Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Rapids Downtown Market</td>
<td>Product type unfamiliarity can temper leasing efforts.</td>
<td>Monetize the building’s appeal to agro-tourism above and beyond tenant rents.</td>
</tr>
<tr>
<td>CropCircle Kitchen</td>
<td>Revenue diversification helps ensure success.</td>
<td>Without equity, community-based bank loans may be the best option for leverage.</td>
</tr>
<tr>
<td>The Plant</td>
<td>Seek out buildings previously used for food manufacturing.</td>
<td>In rehabilitation, develop the project on an as-needed basis.</td>
</tr>
<tr>
<td>West Louisville Food Port</td>
<td>Partner with a municipality.</td>
<td>Consider new construction to suit individual tenants’ needs.</td>
</tr>
<tr>
<td>Baltimore Food Hub</td>
<td>Pair philanthropic resources with social enterprises and conventional financing with conventional enterprises.</td>
<td>Generate revenue through outside partnerships.</td>
</tr>
<tr>
<td>Rainier Beach Innovation District</td>
<td>Public-private partnerships are crucial to success.</td>
<td>Conduct more rigorous analysis of costs and returns.</td>
</tr>
</tbody>
</table>
Table 5.3: Summary of Development Costs, Capital Structure, and Lease Structures

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Acquisition Cost</th>
<th>Construction Costs</th>
<th>Financing Utilized</th>
<th>Lease Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Rapids Downtown Market</td>
<td>$1 annual ground lease</td>
<td>$246 PSF (new construction)</td>
<td>Grants, tax credits</td>
<td>$25 - $30 PSF NNN</td>
</tr>
<tr>
<td>Crop Circle Kitchen</td>
<td>$38 PSF</td>
<td>$328 PSF (rehab)</td>
<td>Debt, tax credits, self-financing</td>
<td>$17 PSF NNN + $10 PSF in CAM</td>
</tr>
<tr>
<td>The Plant</td>
<td>$5.61 PSF</td>
<td>In-kind contributions (rehab)</td>
<td>Self-financing</td>
<td>$6 to $11 PSF NNN</td>
</tr>
<tr>
<td>West Louisville Food Port</td>
<td>$0 PSF</td>
<td>$314 PSF (projected new construction)</td>
<td>Grants, tax credits</td>
<td>Market-rate</td>
</tr>
<tr>
<td>Baltimore Food Hub</td>
<td>$3.28 PSF</td>
<td>$230 PSF (Ph. 1, new construction)</td>
<td>Grants (Ph. 1)</td>
<td>$1 PSF (Ph. 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$380 PSF (Ph. 2, projected rehab)</td>
<td>Loans, tax credits (Ph. 2)</td>
<td>Market-rate (Ph. 2)</td>
</tr>
<tr>
<td>Rainier Beach Innovation</td>
<td>$286 PSF (projected)</td>
<td>$430 PSF (projected new construction)</td>
<td>Loans, grants (projected)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 5.3 shows that two of the six case studies were able to acquire their site for free or at a nominal $1 annual rate due to partnerships with a municipality. Two more—The Plant and the Baltimore Food Hub—acquired their site at a subsidized price, one from a private seller and one from a municipality. The last case study, Rainier Beach, was considering the acquisition of a site at a market rate price, which was substantially higher than any of the other case studies. This disparity indicates that the FIC process innovation may still be one that requires financial support in some capacity from the municipal level.

The average cost to build new construction from the case studies was $430 PSF, which dropped substantially to just $263 PSF when the Rainier Beach project is removed from the sample. These
reported costs were generally lower than the $421 PSF average costs to build new reported in the survey data.

The survey results from Chapter 4 showed that for-profit firms were more likely to cover their operating expenses and were also more likely to utilize loans and self-financing, rather than grants, in their capital stack. The Plant reflected this trend, but Crop Circle Kitchen and Grand Rapids Downtown Market both bucked the trend of non-profits being generally less capable of covering operating expenses than for-profits.

The Plant, which is owned by a for-profit entity, utilized self-financing for acquisition and in-house labor for construction and is able to cover operating expenses, which aligns with the survey results. However, although owned by a non-profit, the Crop Circle Kitchen's Pearl facility was acquired and built out using a substantial debt component, and covers its operating expenses through tenant triple net leases that include substantial CAM allocations. In that sense, although operated by a non-profit, the Pearl facility runs on a business model more reflective of the for-profit firms surveyed.

Similarly, although the Grand Rapids Downtown Market is owned by a non-profit and did not utilize any loans or self-financing in the acquisition and development process—the capital structure was almost entirely comprised of philanthropic donations and grants—the project was still designed to cover all of its operating expenses through revenue generated on site. Although the Grand Rapids Downtown Market used a capital structure aligned with the majority of non-profits analyzed, it did not reflect the trend of non-profits being less capable of covering their operating expenses. This may be because many of the Market's other operational traits, such as number of business operations and a business model in which the building owner leases spaces to tenants to run the actual FIC operations, are more indicative of the higher earning, better performing FIC.

With active, engaged municipalities, the creation of not only a single FIC but also a Food Innovation District is a very real, financeable economic development project that generates jobs and capitalizes on the US's growing interest in locally produced food. In instances where a municipality does not or cannot offer acquisition or construction financing support, the developer of the FIC must be able to identify a site that is below-market value with high value-add potential.

The economic demand identified in Louisville, KY, for locally grown food—as much as $800 million in unmet demand, according to Karp Resources—is not unique to Louisville and represents an important emerging market for developers to tap.

Developers can capture the innovation value of the FIC if they pursue projects that leverage public resources and lower construction costs through piecemeal development. Rather than attempt to both own and operate the FIC, building owners should identify strategic tenants whose innovative food business can afford to pay the rents
required to cover building operating expenses. Developers and entrepreneurs who want to pursue the creation of a FIC in their own city should bring demand data to their municipality, engage in a public-private partnership to identify a publicly owned site ripe for re-development, and build a network of small and mid-sized food producers and manufacturers who would benefit from expanded operating space and shared capital costs.
6

The Future of Food Innovation Centers

This thesis documents the economic feasibility and benefits of FICS. Although a nascent real estate and enterprise business model, at least 190 FICs exist today in the market place and of those 62 responded with financial information. These FICs are clustered primarily on the west coast in urban locations.

Importantly, FICs are financially feasible from a real estate and enterprise standpoint. Sample evidence documented in my thesis supports positive financial performance of FICS themselves and their ability to operate in commercial space. A majority of FICs earn $5,000 annually in NOI, but with higher earning FICs included, the mean NOI in a sample of 53 respondents reporting income was $161,415. The majority of FICs operate as for-profit tenants in commercial spaces and are able to cover their operating expenses.

Some caveats of the FIC space suggest that in general, business owners who were tenants in a building owned by a separate landlord operated more profitable businesses than developers who owned the building and operated the FIC business within. This is reflected in the comparison of average net operating income between the businesses who owned the building in which the FIC operates, versus those who rent; renters reported on average $64,000 more in net operating income. Businesses inclusive of at least three but less than seven distinct business operations produced the highest NOI and the best ability to cover all of their expenses.

These two features of FICS—leasing space to businesses who operate the individual FIC components, and providing a diverse enough tenant mix to represent at least three separate business components—are further supported by the tenant lease-up business model outlined in the case studies. For example, Dorchester Bay EDC master-leased the business operations of the Pearl Facility to CropCircle Kitchen, who has expertise in managing shared-use commercial kitchen tenants. CropCircle Kitchen has since established an incubator kitchen, commissary kitchen, expanded food manufacturing and storage capacity, educational training courses, and some public events to the facility’s revenue stream. Similarly, Bubbly Dynamics LLC and the Grand Rapids Downtown Market leases
individual spaces to FIC tenants throughout their projects to create the strongest mix of food users, and West Louisville and Baltimore plan to do the same once their projects are built.

Further, there was evidence from both the survey analysis and the case studies that industrial re-use is a less feasible means of development than operation within an existing non-industrial building. 23 of the 62 respondents operated in a rehabilitated industrial structure; of those, six businesses own the property and operate within it, and reported average construction costs of $240 PSF. Seven business owners who own and operate in rehabilitated buildings that they did not identify as industrial reported average construction costs of $78 PSF. Business owners who built new buildings to house the FIC reported average construction costs of $421 PSF.

However, data does appear to support the fact that renters in rehabilitated industrial buildings still operate successful businesses. Of the firms earning more than $500,000 annually (n = 5), three of the five operate in rehabilitated industrial, and all of them rent. Of the middle-income firms earning between $100,000 and $300,000 annually (n = 16), eight operate in rehabilitated industrial structures, and 75% of those firms are renters. Data regarding low-income-earning firms, those earning less than $5,000 annually (n = 12) was less conclusive; only two firms operate in rehabilitated structures at that income level, and one rents while the other owns.

Further research could analyze whether owners of industrial buildings may not reap the same benefits as the tenants who rent within the building. None of the building owners of industrial rehabilitated building stock who also operated their FIC earned more than $500,000 annually, potentially due to the large cost overhead associated with construction that tenants in general do not bear. This may also indicate that building owners of rehabilitated industrial buildings are not charging high enough rents to the tenants operating within, and are not capturing the full value of the site.

The figure below reflects this data on the ownership versus renter status of industrial building users, by income generated.

Figure 6.1: Income Level by Building Ownership of Rehab Industrial (n = 13)
Notes: Of the 3 high-earning firms who operate in an industrial building, all three rent. Propensity to rent rather than own seems to be correlated with revenue generation.

The construction costs for industrial rehabilitation are supported by case study evidence. Of the six case studies, three—the Grand Rapids Downtown Market, the West Louisville Food Port, and the Baltimore Food Hub, proceeded with new construction instead of industrial rehabilitation due to cost prohibitive factors like asbestos and ADA compliance. Construction costs for the Crop Circle Kitchen Pearl facility, an industrial rehabilitation project, were $328 PSF, while construction costs for the Grand Rapids Downtown Market, which included the demolition of the existing industrial structures on site, were $246 PSF. Similarly, the Baltimore Food Hub’s development costs to build a new 13,000 SF facility were actually less than the costs to rehabilitate the adjacent existing industrial structures on site. These results indicate that further study is warranted on the feasibility of industrial reuse for food manufacturing purposes.

The Economics of Food Innovation Centers

Food Innovation Centers impact the market equilibrium of agricultural R&D through the introduction of indoor vertical farm systems, a process-level innovation. Second, FICs capture the knowledge spillover effect and input sharing that economic clusters have shown to provide, which is considered a firm-level innovation.

Process level: Agricultural R&D

Parley, et al (2010) describe how the nature of agriculture, and subsequently agricultural innovation, has certain unique features that separate it from traditional industry and industrial innovation. Namely, traditional agriculture is highly site-specific, and is subject to random shocks, such as extreme weather changes, pests, and blights, and overall climate change that continues to impact the agroecological condition of individual sites. These features imply that innovations must vary with “changes in climate, soil types, topography, latitude, altitude, and distance from markets,” (942) which gives rise to a demand for innovations that “reduce the susceptibility of production to uncontrolled factors and allow technology to adapt to sustain production possibilities as pests and diseases and other aspects of the environment coevolve” (942).

The impacts of the unique features of conventional agriculture on innovation are many, but three of the more distinct impacts relate to the costs of research, the lag time in the application of innovations, and the need for maintaining research gains that are lost due to the endogenous conditions of conventional agriculture. Vertical farms provide a potential mitigation to each of these impacts.
Research costs are impacted by the economies of size, scale, and scope in research. Typically, unit costs fall with the size of the R&D enterprise, but agriculture performs slightly differently due to the site-specific nature of the enterprise. In agriculture, R&D unit cost reductions are offset by the costs associated with making local research results applicable to other locations, essentially “transporting” the research results to more distant locations. For example, a corn hybrid developed in Iowa may not grow at the same rate, or with the same yields, in Alabama soil, based purely on the soil, climate, and other endogenous factors associated with agriculture. This must be accounted for in research costs.

Second, the same site-specific nature of agriculture implies a spatial attribution to an otherwise typical lag in the time between when research investment occurs and when the innovation that develops as a result of the research is adopted commercially. Parley et al (2010) define the research lag process as one that moves from the “gestation” or “invention” lag, before the research has any effects, to the “adoption” lag, where the research product begins to diffuse but the time which it takes to diffuse reaches a maximum weighted threshold, to the eventual final stage in which lag times decline for each subsequent innovation as past investments on current productivity diffuse. Empirical work supports a research lag of at least 35 years and up to 50 years for US agricultural research, with the peak of the lag distribution in year 24 (Alston, et al 2010). This implies that the majority of agriculture research innovations take more than two decades to become adopted by the agricultural community.

Third, due to the random shocks and endogenous conditions of conventional agriculture, anywhere between 35 to 70 percent of US agriculture research is devoted to maintaining previous research gains. In fact, if agricultural R&D were to cease altogether, “the typical scenario would be declining agricultural productivity or crop yields and rising costs, not simply a continuation of current (or baseline) yields and costs” (Parley, et al 2010). This means that even as overall spending (both public and private) on agricultural R&D continues to decline, significant portions of that investment must be devoted simply to maintaining the biological and mechanical gains produced through past agricultural research.

Vertical farms, as opposed to conventional agriculture, significantly mitigate all of these impacts. Indoor farming can reduce the costs of “travel distance” by operating in controlled environmental conditions. R&D spending invested in indoor vertical farming technology can be easily applied to indoor farms around the world, and the most significant adaptations that must be made on a site-specific basis relates to the building typology in which the farm is located.

77 In 2006, total public and private investment in food and agriculture R&D in the US cost an estimated $9.2 billion, just 2.7 percent of total spending on all areas of R&D in the US. Trends show that more technologically advanced countries, where fewer residents rely on the agricultural economy for their livelihood, are beginning to invest a greater share of R&D resources to areas other than agriculture. In 2000, only four percent of the total investment in R&D in high-income countries was in agriculture (Parley, et al 2010).
housed. However, the variations in building typology – whether the building receives natural light or not, and to what extent – are far fewer than the variations in agroecological conditions across the globe. For the same reasons, indoor vertical farming reduces the spatial attributes that contribute to the research lag in agricultural productivity. The controlled nature of the building environment significantly reduces the likelihood of random shocks and the evolution of pests, diseases, and other environmental conditions, which eliminates much of the need to re-invest spending in maintaining productivity gains.

**Firm level: Economic cluster effects**

Beyond the individual vertical farm product, all of the food and beverage production and distribution businesses that comprise a Food Innovation Center face many challenges to operate a viable business. FICs bring together disparate actors in the food and beverage industry, who have historically acted independently from one another in seeking space, capital, distribution networks, and regulatory expertise, into an economic cluster that promotes agglomeration and, as a result, innovation in food growing, processing, manufacturing, and distribution.

In particular, food sector firms often have very unique space needs, requiring extensive drainage, ventilation, and loading access. Other space requirements include large, open format floor plans, high ceilings, and occasionally heavy-duty electricity and water hook-ups. Capital considerations within the building include fumes or oven hoods, grease traps, code-compliant washing equipment, and the ability to build out a retail component on-site.

Firms also face challenges accessing the capital required to invest in up-front construction needs, connecting with the distribution networks needed to effectively market and sell the products produced on-site, and identifying in-house knowledge of a city’s regulatory structure to avoid delays and fees in overcoming the permitting and entitlement process. A 2014 study released by the City of San Francisco found that the lack of turnkey production and distribution space in the city was a major issue for food sector business operators. Despite historically low industrial vacancy rates, roughly 110 acres of land zoned for industrial remains vacant or underdeveloped due to the low expected rents, which do not cover the costs of development. Business owners in the sector reported out-of-pocket tenant improvement expenses of as high as $50 PSF, and climbing, to retrofit existing industrial buildings to their needs.78

Porter (1998) defines clusters as “geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities

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important to competition." Well-known clusters include the film industry in Los Angeles, the advertising and financial industries in New York City, and the fashion industry in Italy. Mapping the businesses associated with a single economic cluster shows that beyond the direct services offered by the clusters, other businesses that co-locate include suppliers of specialized inputs, manufacturers of complementary products, and companies in industries related by skills, technologies, or common inputs.

The advantages to being in a cluster are many. Businesses can operate more productively in "sourcing inputs, accessing information, technology, and needed institutions, coordinating with related companies, and measuring and motivating improvement" (Porter 1998). Rosenthal and Strange (2003) further found that distance between firms in a single industry is significant on a very granular level to realizing these positive effects; their research found that the positive localization effects of being within one mile of another company in the cluster is at least ten times greater than the effects realized when locating two to five miles from that company. Carlino and Kerr (2014) note that in cities with agglomeration economies, doubling the size of that economy would more than double the innovative output of a given firm in that city due to the positive spillover effects of the cluster itself.

Finally, Waits (2000) outlines six key activities that take place within an economic cluster, services which Food Innovation Centers naturally provide, as detailed by the business models expressed through the surveys and interviews administered. The activities include the following:

2. Co-learning: Educational and training programs sponsored by the cluster.
3. Co-marketing: Collective activities that promote the cluster’s products or services.
4. Co-purchasing: Activities that strengthen buyer-supplier linkages within the cluster.
5. Co-producing: Alliances to make a product together or conduct R&D together.
6. Co-building economic foundations: Collective activities that build stronger educational, financial, and governmental institutions, which enable firms to compete better overall.

FICs have the potential to address the issues identified by the City of San Francisco’s report on the industry, and provide all of the support systems and innovation agglomeration identified by Porter (1998), Waits (2000), Rosenthal and Strange (2003), and Carlino and Kerr (2014) in their studies on economic clusters.

FICs reduce the challenge of financing development for industrial space by pooling enough businesses together to generate the rents required to support new construction, as shown in the West
Louisville Food Port and the Phase 2 portion of the Baltimore Food Hub model for development. The agglomeration of firms allows FICs to retrofit space as needed for specific tenants, as reflected in both the Pearl facility’s and The Plant’s build-out plans, and they reduce individual businesses’ out-of-pocket tenant improvement expenses as a result. The events programming, business assistance, and expanded food manufacturing services so frequently offered by the FICs surveyed and interviewed demonstrates many of the activities Waits (2000) identified as the primary advantages of economic clusters. Firms are better able to market their individual products, reach a greater band of clients by sharing resources and information with one another, and exchange knowledge of the regulatory process to avoid the fees that San Francisco’s food and beverage production and distribution industry reported facing.

Porter (1998) and Waits (2000) express that export-oriented clusters will be most successful since clusters targeting local markets are inherently limited by their finite market share. Unlike most any other good, food is extremely inelastic; provided the price points of the goods being produced, marketed, distributed and sold through a FIC are not prohibitively expensive to the majority of the local region’s customers, FICs can potentially reach a finite number of people, an infinite number of times. The idea that “everyone’s gotta eat” makes FICs as potentially powerful from an economic development and GDP growth perspective as a traditional export-oriented cluster that has a far more global market share.

The replicable nature of FICs also means that not every FIC must look the same. Cities or regions that already have competitive advantages in some food-related industry, such as almond growers in the Central Valley of California, can further hone their FICs to reflect all of the support systems required to grow that particular industry. In cities without a strong agricultural economy, FICs can pivot to emphasize incubator kitchens and value-added food processing. The flexible outdoor-to-indoor nature of food production in FICs, as well as the many business operations that can grow around that to support food production, like shared-use kitchens, commercial outposts, education spaces, business assistance, and food R&D, allows for the possibility of specialized FICs throughout very distinct economic and climatic regions.

The Financial Feasibility of Food Innovation Centers

Based on the survey and case study data collected and the recognition of the economic value that FICs bring to both agricultural innovation and firm cluster dynamics, the question of the financial feasibility of the FIC product type can be assessed.

From the survey data, the average cost to develop a FIC via rehabilitation of all product types was $153 PSF and to build new was $421 PSF. For renters, the average rent paid by tenants to landlords
in industrial buildings was $7.08, while the average rent paid by
tenants in rehabilitated buildings not identified as industrial was
$8.72, both of which represent a mix of gross, single net, and triple
net leases.

Some of the projects, both in the survey data and in the case
studies, were rendered feasible primarily through public-private
partnerships that either eliminated or drastically reduced acquisition
costs (if own) or lease rates (if rent). Financing for all of the projects
came from a variety of sources, both public and private, although none
of the projects utilized venture capital equity and 16 projects indicated
using self-financing for at least a portion of the capital stack.

One business owner, who asked to be interviewed rather than
respond to the survey but chose to remain anonymous, cited a difficult
lending environment for financing the rehabilitation construction of a
14,600 SF warehouse into a shared use kitchen facility. The facility,
which provides an incubator kitchen, food procurement division, on-
site food truck parking, meeting space, chef training space, and "show
kitchen" where products can be filmed, was financed with a blend of
construction debt and equity, but was scrutinized closely by the lender
before a loan was approved. The business owner cited lender concerns
with the large upfront capital investments in the kitchen, which
rendered the project’s cash flow heavily dependent on a single use, as
well as the difficulty of underwriting cash flows associated with
numerous start-up businesses occupying the kitchen and utilizing the
facility’s alternative revenue streams.

The business owner also stated that, in the FIC industry,
“everything is proprietary, including how to actually make one of these
things profitable.” At the time of the interview in February 2015, the
FIC had been open for 8 months and was not yet profitable. The
owner hoped to break even within the next year to 18 months.

As more FICs move into more mature, stabilized stages of
operation, underwriting the FIC cash flow based on the variety of lease
types required might become more standardized. Leases described in
the case studies that lenders and building owners must underwrite
range from hourly kitchen rentals, to monthly food storage, to
commissary kitchen contracts, to semi-permanent and permanent
food vendors. Additional non-lease revenue that goes back to the
building owner can come from events, classroom demonstrations,
research and development funding, and other revenue streams.
Identifying the level of risk associated with each of these cash flows,
especially those that rely on start-up businesses who may lack credit
relative to traditional industrial or commercial tenants will be a key
driver of drawing greater commercial investment into the FIC product
space.

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79 FIC business owner, telephone interview, February 11, 2015.
Suggestions for Further Research

Vertical Farming Costs and Returns

The primary business use studied in this thesis was a mixed-use real estate product centered on an incubator kitchen, with supplementary business activities. Fewer indoor vertical farms were willing to speak about their business operations due to the highly proprietary nature of the technology currently under development. Future research would delve further into the expenses associated with developing a commercially viable vertical farm and the evolution of the technology used to operate the growing systems. It may also be worthwhile to more explicitly cross-reference the returns from vertical farming with the returns from food processing and manufacturing to best determine which business operation within a FIC provides the highest return on investment.

Entrepreneurial Financing Mechanisms in the Food & Agriculture Sector

None of the FICs who responded to the survey request utilized venture capital in their financing stacks, nor did any of the case studies analyzed. Yet, entrepreneurial finance is attracted to clusters, especially those exploring products that may be new to conventional underwriting standards. Carlino and Kerr (2014) note that “[t]raditional sources of financing, such as bank loans, may be unavailable to innovative start-ups due to their high risk, large financing requirements, and asymmetric information […]. As a result, VC organizations tend to invest locally in order to monitor their investments and to provide operating assistance to these firms.”

Further, in the third quarter of 2014, venture capitalist and private equity firms invested $269 million into 41 deals in agriculture and food startups, which was the highest dollar amount ever in that sector and double the amount invested that quarter the previous year. To support research surrounding Food Innovation Centers, further research that parses the direction in which entrepreneurial finance is headed in the food and agriculture sector, including which types of firms are most likely to receive investments and where, would help prove or disprove the feasibility of the product type.

Conclusion

Applications to Food and Industry

The results have implications for the three issues addressed in Chapter 2: food access in increasingly dense urban areas; the emerging significance of local food and the desire from consumers for greater transparency in production and processing methods; and the adaptive re-use of underutilized urban and peri-urban industrial building stock.
Regarding access, the results show that it's possible to increase access to locally grown and processed food by operating a FIC, but the quantities of food produced in FICs must continue to scale in order to make a large enough impact on the local food economy to combat issues of food access. Right now, vertical farms scaling up to factory-size facilities will address part of the problem by producing crop yields equivalent to hundreds of acres of agriculture. For example, Green Spirit Farms reported the ability to produce up to 100,000 plants growing in a 50,000 SF facility; the equivalent of 150 acres of farmland.\(^1\)

However, cities also need more local food manufacturers and producers selling goods directly to consumers via commercial outposts to ensure that low-income urban residents in particular aren't forced to turn to a local corner store or fast food chains for their food supplies. The fact that event programming was the second most frequent use in the FIC surveys, after incubator kitchens, shows that FICs acknowledge the importance of serving local food entrepreneurs by running shared-use commercial kitchens, as well as the importance of marketing directly to consumers in order for their businesses to succeed through creative programming and marketing.

Regarding production and processing transparency and the development of the local food economy, FICs can contribute to the increasing popularity of direct producer-to-consumer marketing via on-site retail components as well as events programming, such as seasonal markets. FICs provide the physical space in which consumers can meet the food and beverage manufacturers behind the products they consume. FICs can also contribute to the growing food truck economy: some FICs house space for food trucks to park, re-fuel, and clean off their exteriors, while others provide space for food trucks to actively sell food. FICs that operate commissary kitchens can provide meal prep services to food trucks and local restaurants in need of mass quantities of chopped foods. Further, the continued sector growth of specialty grocers\(^2\), as well as large supermarket chains' emerging interests to source a portion of their goods locally\(^3\), shows that there is demand for the types of value-add processed goods that come out of incubator kitchens.

\(^3\) Walmart, the largest grocery provider in the United States, states a commitment of selling $1 billion of goods sourced from 1 million small and medium-sized farmers by the end of 2015 on its website. The company also has a local supplier program in which local food entrepreneurs can apply to have their product sold in a specific Walmart store. Source: “Sustainable Food,” Walmart, accessed April 22, 2015, http://corporate.walmart.com/global-responsibility/environment-sustainability/sustainable-agriculture.
Regarding consumers’ increasing interest in the environmental impacts of conventional agriculture, the indoor farming component of FICs has the capacity to reduce water waste, increase crop yield, help prevent further soil depletion, and provide a means of obtaining freshly grown food for residents who live far from America’s agricultural heartlands. In order for this innovation to diffuse further, consumers must become comfortable with hydroponically and indoor-grown herbs, greens, and vegetables, and LED lighting technology has to become much more efficient to combat the utility costs of heating plants, in particular in industrial re-use spaces where natural light is at a minimum.\textsuperscript{84}

Finally, regarding industrial re-use, the majority of FICs in operation today are doing so out of commercially and industrially re-used space. Only two of the projects in industrial re-use incorporate both farming and food processing, but the majority operate at least a mix of value-add processing, commercial sales, and R&D. However, interviews with developers of FICs and the survey data regarding construction costs for rehabilitated industrial versus rehabilitated commercial show that while industrial buildings can be suitable to FICs, they may be challenged by internal issues that increase the cost to develop. These can include environmental remediation issues, tenant space requirements, zoning and permitting issues related to food production, and lack of natural light for indoor farming. Financing any industrial re-use project continues to be difficult, as evidenced by the fact that only seven FICs used solely conventional loans to finance development; the remaining 28 FICs who provided information on financing sources utilized a combination of loans, grants, public loans, and self-financing. However, the announcement of AeroFarms’ partnership with Goldman Sachs and RBH is a promising sign of the future of investment in urban agriculture.

\textbf{The Future of Food Innovation Centers}

Food Innovation Centers exist on a spectrum: from those that exist to serve low-income clients who utilize the shared-use kitchens to help scale their mom-and-pop businesses, to vertical farms that grow greens and herbs for the purpose of being sold to high-end customers willing to pay a price premium for indoor farming. Somewhere in between lies the FIC: by combining one element with the other, the project serves a wider band of clients and diversifies its revenue stream.

Demand exists for regionally grown and processed food, and entrepreneurs in the food processing and manufacturing industries benefit from co-location in a FIC. They benefit both from a marketing perspective, but also from the economic perspective of being able to internal efficiency metrics. Source: Gus Van der Feltz, telephone interview, February 27, 2015.

\textsuperscript{84} According to Gus Van der Feltz, Global Director of City Farming at Philips, the technology around vertical farming lighting system is as developed as semi-conductor technology was 20 years ago; however, Philips recently introduced a LED light that increased efficiency by 20 percent based on their food production, and lack of natural light for indoor farming.
share common area costs and invest less individually in major capital expenditures. So developers of a FIC should think big: the grander scale the project, the more likely it is to attract municipal support, venture capitalist funding, and investment vehicles seeking a viable business model in the food and agriculture space. FICs are a feasible model for industrial redevelopment, but they have to combine the strengths of both ends of the spectrum: municipal support and established federal and state-level funding to get the incubator kitchen and entrepreneur-serving operations off the ground, while seeking venture capital and equity for the more profit-driven vertical farm enterprise.

Separately, small-scale FICs operating principally as incubator kitchens with a few additional programming pieces, be it a small café, farmers market, or running an educational series, will continue to proliferate but will operate at relatively low margins, as observed by the large number of FICs surveyed who earn less than $5,000 in annual NOI. On the other hand, as LED lighting technology and vertical farm growing systems continue to proliferate and commercially diffuse, these types of businesses will grow in popularity and will be the most likely candidates for seeking conventional equity and debt financing.

As a building owner, the cash flow produced from operating a FIC will cover operating expenses the majority of the time, but may not provide substantial net operating income after the fact. As the case studies showed, even the owners of The Plant, one of the more successful FICs in the United States today, can struggle to meet all of their monthly expenses based only on the rental revenue received from each individual tenant. Tenants, even those with triple net leases responsible for most their pro-rata operating expenses, on the whole fared better.

However, FICs are still a nascent process innovation: all of the currently operational facilities still have vacancies waiting to be filled with additional innovative food manufacturing tenants, which will increase the building’s NOI and allow the developers to raise rents as the project becomes more successful overall. Neither the West Louisville Food Port or the Baltimore Food Hub have established the market rents they will charge yet in order to meet their expenses, but both feel confident in the network they’ve established of food entrepreneurs that the targeted tenants will be capable of paying market rents to cover the costs of new construction and historic rehabilitation. From the case studies, it appears that FICs are designed as long-term hold assets for developers, in part due to the municipal partnerships leveraged to obtain the site initially, and also due to the tax credits utilized that require holding at least seven years prior to refinancing. In that time, developers should continue to refine their tenant mix to get the tenants with the highest financial performance, which will increase the property’s value at time of sale.
Drawing traditionally scattered businesses into a single shared space, converting traditionally land-intensive activities to the vertical realm, and better connecting consumers with food grown and processed in their community drives innovation value. That value is derived from assembling the strongest tenant mix of food growers, processors, and distributors combined with a vibrant, active educational and commercial component. Developers must approach the projects thoughtfully, recognizing that they will likely yield better returns by being landlords over multiple tenants than operating the business themselves. They should approach the FIC as both a potentially profitable enterprise, but also as a social enterprise yielding social returns in the form of increasing food access and reviving industrial activity in America’s cities.
APPENDIX A

Copy of Survey

The following survey was distributed to 190 companies in January 2015. 62 companies responded for a response rate of 33 percent.

Food Innovation Center Survey
My name is Alison Crowley, and I am a graduate student at MIT conducting research for my Masters Thesis in City Planning and Real Estate Development. My academic and professional interests lie at the intersection of sustainable, regional agriculture and real estate. As a result, at a very high level my thesis seeks to quantify the economic returns of innovative food businesses (like yours!) relative to the cost of development for these projects.

In an effort to complete this research, I am creating a database of food innovation centers in the United States. This survey seeks to gain insight into the businesses operations comprising the field of food innovation. This includes food production, processing, packaging, or sales, including but not limited to incubator kitchen space, indoor farming techniques, and/or a food market featuring products produced on-site.

Your response to this survey will be used in an industry-wide analysis of the costs and returns associated with these different business operations at the level of the physical asset-- the building in which you operate. Ultimately, I would like to show whether "food innovation centers" comprising a mix of the above-described business operations could be a viable investment for conventional lenders. The knowledge you can share about your business would be an invaluable contribution to this research.

Although I do ask that you state your name and business, you may choose at the end of the survey for the information provided to remain anonymous when published. All information received will be kept in a password-protected file on a password-protected computer and will be erased following the completion of the Masters thesis in May 2015. I am happy to provide you a copy of the final thesis if you’re interested.

Thank you for your participation! Please contact me with any questions, comments, or follow-up you may have. I can be reached at acrowley@mit.edu or (336) 926-6559.

1. What is your name?
2. What is your e-mail address?
3. What is the name of your business?
4. Where is the business located? *Please provide at least city and state.*

5. What are your primary business operations? *Please select as many as apply.*
   a. Incubator kitchen: Commercial kitchen for food business start-ups and small business owners
   b. Commissary kitchen: Commercial kitchen in which staff on-site prepare food for clients
   c. Expanded food manufacturing: Expanded production, storage, distribution, and/or co-packing capacity beyond incubator kitchen
   d. Food R&D: Product testing and development
   e. Indoor farming: Aquaponics, hydroponics, aeroponics, or vertical farming
   f. Greenhouse farming: Rooftop or ground-level greenhouse farming
   g. Food hub: Physical cluster of food-related businesses
   h. Commercial component: Producer-to-consumer direct sales, such as market, cafe, or grocery store on site
   i. Business assistance: Technical assistance and educational programming for food-related small business owners
   j. Events programming: Classes, food production demonstrations, and/or public event space
   k. Other

6. What is the ownership structure of your business?
   a. Private non-profit
   b. Private for-profit
   c. Publicly owned
   d. Public-private partnership
   e. Other

7. Is your business located in an urban, suburban, or rural context?
   a. Urban
   b. Suburban
   c. Rural
   d. Other

8. Does your business operate in a rehabilitated industrial structure? *Examples include a rehabilitated brewery, meatpacking facility, warehouse, or manufacturing plant.*
   a. Yes
   b. No
   c. I'm not sure
   d. Other

9. Does your business operate in a building constructed new for your purposes?
10. Does your business own or rent the space it occupies?
   a. Own
   b. Rent
   c. I’m not sure
   d. Other

11. What is the size of your facility? Please provide building square footage or, if you are a tenant within a larger building, please provide the square footage you rent.

12. If own: What was the cost to construct the project? Please include site acquisition, hard costs and soft costs related to project development.

13. If own: What were the primary sources of financing used for project construction? “Project construction” may include new construction or building rehabilitation. Please select all that apply.
   a. Private bank loans - conventional, e.g. Bank of America
   b. Private bank loans - community-based, e.g. CDFI loan
   c. Private grants
   d. Venture capitalist lending
   e. Public loans
   f. Public grants
   g. Tax credits: New Market Tax Credits, historic tax credits, or other
   h. Family and friends
   i. Other

14. If rent: What are the terms of your lease with the building owner? Please include rent per square foot, lease type (gross, triple net, other), and lease term.

15. Please describe the range of net operating income (NOI) that your business typically generates annually.
   a. $0 - $5,000
   b. $5,000 - $15,000
   c. $15,000 - $30,000
   d. $30,000 - $50,000
   e. $50,000 - $100,000
   f. $100,000 - $200,000
   g. $200,000 - $300,000
   h. $300,000 - $400,000
   i. $400,000 - $500,000
   j. $500,000 - $1,000,000
   k. $1,000,000+
   l. I’m not sure
16. What are the annual building operating expenses for your project? Operating expenses include maintenance, utilities, and other overhead fees.

17. What percentage of annual operating expenses are covered by business revenue? If operations do not cover 100% of costs, please describe how the business covers the difference.

18. Please provide the names of any businesses you know operating similar innovative food practices. The more comprehensive the database, the better!

19. May I contact you if I have follow-up questions?
   a. Yes
   b. No

20. Would you like the information provided here to remain anonymous in the published thesis?
   a. Yes
   b. No

21. Would you like to receive an electronic copy of the published Masters thesis?
   a. Yes
   b. No

Thank you for participating in my graduate thesis research! Your response has been recorded.
APPENDIX B
Companies Contacted

The list below reflects the 190 companies who received a survey request, listed in alphabetical order. No designation is made regarding whether or not the company responded to the survey.

Table B.1: Companies Contacted

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APPENDIX C

Interview Questions

Interviews were structured around the following questions, which were asked of the owners and employees associated with Food Innovation Centers.

**Project Assembly**
1. In what year was the project conceived?
2. How did you select the site for your project? Please describe any metrics you took into consideration, such as population density, employment growth, household income, complementary adjacent businesses, appropriate zoning, or other.
3. How many parcels were acquired for the project? Please describe the land assemblage process.
4. What, if any, zoning or building code issues did you face prior to starting construction?
5. Who did you engage during the project planning process? (Examples include community members, community stakeholders, and local government officials)

**Project Construction**
1. Is the building for the project new construction (built-to-suit) or adaptive reuse?
2. What was the cost to construct the project? If possible, please provide land, hard, and soft costs as a percentage of total costs.
3. How long did it take to construct the project?
4. Did you engage a general contractor, or perform the construction yourself?
5. Were contractors with adequate knowledge of food manufacturing available to construct the project?
6. Did the project encounter any major issues during the construction process related to the building structure, environmental remediation, utilities and infrastructure, or other?
7. What were the primary financing sources for construction? Please describe public vs. private financing.
   a. *If public*, at what level – federal, state, or local, and did the project utilize tax credits, tax increment financing, direct grants, or other?
   b. *If private*, did the project utilize conventional lending, venture capital, crowd-sourced capital, philanthropic grants, or other?
**Project Operations**

1. Do you own the building or lease the space for your project?
2. How many part-time and full-time employees does the project employ?
3. What are the principal business operations in the project? (Examples include incubator kitchen, vertical farm, rooftop farm, aquaponics, food testing and laboratory, educational space, commercial/retail, and other)
4. Please provide pertinent dimensions for your project—gross square feet, rentable square feet, and square foot breakdowns of relevant spaces (such as rooftop garden, commercial kitchen, and retail components).
5. What are per square foot (PSF) rents for the project?
6. What are expected annual operating expenses for the project? This includes energy expenditures and maintenance.
7. What are the project’s primary sources of revenue?
8. Does the project pay an annual mortgage on debt, and if so, what is the magnitude of the mortgage payment relative to project income?
9. What percentage of overall annual operating costs are covered by project revenue?
   a. *If not 100%:* How does the project cover the difference in revenue and costs?
Image Sources

15. Source: http://pinck-co.com/pearlfood/
18: https://www.flickr.com/photos/plantchicago
19: https://www.flickr.com/photos/plantchicago
25: http://www.via-architecture.com/project/rainier-beach-urban-design-framework/
Bibliography


Carlino, Gerald and William Kerr. “Agglomeration and Innovation.”


http://www.sciencedirect.com/science/handbooks/22108807


