MANAGING DIGITAL TRANSFORMATION

Per Andersson, Staffan Movin, Magnus Mähring, Robin Teigland, and Karl Wennberg (eds.) Managing Digital Transformation

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Karyn McGettigan, Language Editor



SSE INSTITUTE FOR RESEARCH

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The Foundation MTC promotes value-creating interaction and learning between business and research in the areas of market, service development, digitalization and ecosystem development. The foundation was established by the Royal Swedish Academy of Engineering Sciences (IVA) and the foundation of the Swedish Institute of Management (IFL) in 1974. MTC is a non-profit organization, thus the projects are financed primarily by major corporations and government agencies.



In his central role at the Wallenberg Foundations, Peter Wallenberg Jr has furthered a broad range of important research and research-led education initiatives at the Stockholm School of Economics (SSE) and its Institute for Research (SIR). This indispensable work has also helped create a fertile ground for research on digital innovation and transformation: a phenomenon currently experienced, shaped, and managed in and between organisations and throughout society.

This is the topic of this book, which we dedicate to him.

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Acknowledgements

Every year since 1992, the Stockholm School of Economics Institute for Research (SIR) has published an Annual Research Anthology, and this year SIR is publishing the book in cooperation with MTC (Stiftelsen Marknadstekniskt Centrum). The purpose of the SIR Annual Research publication is to enable managers and practitioners better understand and address strategically important challenges by showcasing SSE research on a selected topic of importance for both business and society.

This year's book, *Managing Digital Transformation*, features authors from academic areas across SSE together with representatives outside the institution. The book's eighteen chapters show the strength and breadth of SSE's research within the area of digitalization and reflect the importance that SSE places upon closely linking research to practice and on investigating the leadership challenges and their implications in order to support value creation in society.

Participating in the many ongoing research projects at SSE and the multitude of aspects of digital transformation addressed in the various chapters has been very rewarding for the editors. We would like to thank all the authors for their hard work and cooperation throughout the project. In finalising this book, we have relied upon the expert work of Karyn McGettigan for language editing, Petra Lundin for layout and graphic design, and Marie Wahlström for digital access to the book. We are, indeed, most grateful for their excellent and diligent work.

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Stockholm, January 2018

Per Andersson, Staffan Movin, Magnus Mähring, Robin Teigland, Karl Wennberg

Introduction

One of the hottest research topics lately is digitalization. Many research projects are focusing upon different perspectives. Gone are the days when digitalization or business implications of ICT were just about increasing efficiency. Instead, the ripple effect of digital development can now be felt wider and deeper than ever before. The way in which business is conducted and how it creates value, as well as how corporations can become more efficient and sustainable, are all implications of digitalization. Adapting to new demands and taking advantage of the plethora of possibilities, however, is not always easy.

Managing digitalization and the transformation of business always involves new challenges. The novelty and complexity of the digital age has led to an increased academic interest in the area of digital transformation and a call from companies that seek support in this process.

We take a look at digitalization from the perspective of business research. This creates a better understanding of the challenges that today's businesses are facing. We believe this anthology will serve as a tool to help businesses better understand the force that is digitalization and support these corporations in their digital transformation.

The idea behind this anthology grew as Marknadstekniskt Centrum was taking part in several interesting research projects. Companies were asking MTC to facilitate contact with scholars and supply them with academic insight. Vinnova came on board, by supporting the project *Progressiv digital utveckling förutsättningar för framgång (Progressive Digital Development: Pre-Requisites for Success)* of which this book is a part: its aim to stimulate business to become more progressive in digital change. At last, this book and the website www.digitalchange.com have become a reality.

This joint venture between Marknadstekniskt Centrum and The Stockholm School of Economics Institute for Research follows the SIR tradition of publishing an annual yearbook to showcase its vital research contributions. The book begins with an overview of digitalization, then moves to understanding the new digital customer, and ends by exploring re-organisational effects, business models, and ecosystems. We hope this year's anthology will be useful for managers by facilitating their digitalization processes.

PART 1: DIGITALIZATION - DIFFERENT PERSPECTIVES

The role of digital technology in business and society is rapidly shifting from being a driver of marginal efficiency to an enabler of fundamental innovation and disruption in many industrial sectors, such as media, information and communication industries, and many more. The economic, societal, and business implications of digitalization are contested and raise serious questions about the wider impact of digital transformation. Digitalization affects all private and public operations, as well as the internal and external workings of any operation. Digitalization is the major driving force behind sweeping large-scale transformations in a multitude of industries. Part I includes various perspectives on digitalization and digital transformation.

PART 2: THE NEW DIGITAL CUSTOMER

Digitalization has resulted in more user-centric business and user-centric systems. The changing behaviour of the digital consumer/customer is discussed here as it connects to new forms of customer involvement and engagement, as well as analysis models of what creates customer value in this digital context.

PART 3: THE RE-ORGANISATION IN ORDER

TO CONNECT WITH THE DIGITAL CUSTOMER

How can companies connect with digitalized consumers and non-digitalized customers? This is a central issue in managing digital transformation, as it draws attention to the emerging intra-organisational, marketing, and customer interaction challenges associated with digitalization: for both the consumer and the supplier. Another aspect of this is the internal handling of new forms of organizational ambidexterity; that is to say, companies and organizations engaged in digitalization processes often require an internal re-organisation in order to handle the demands that digitalization brings, and to explore new digital opportunities while promoting their existing business and operations.

PART 4: BUSINESS MODELS AND ECOSYSTEMS

How do companies change, adapt, and innovate their business models? Given that digitalization leads to a convergence of previously unconnected or loosely connected markets, the digitalizing company and organisation is analysed in its systemic and dynamic context. This part draws attention to business models and business model innovation. Incumbent firms need to adapt and change business models while competing with digital start-ups based upon new scalable business models, accessible ventures, and rapid processes of intermediating. These chapters discuss completely new co-operative business models: processes that need to be developed as companies shift from products to digitally based services.

The Ecosystem places digitalizing organisations and companies into their broader and systemic context. This includes discussions on digital disruption, industrial convergence processes, and shifting patterns of competition and cooperation. Digital technologies cause markets to converge in many new and sometimes unexpected ways. The result is the emergence of new roles and market positions of technical platforms.

Staffan Movin, Stiftelsen Marknadstekniskt Centrum

AgTech and the City: The Case of Vertical Farming and Shaping a Market for Urban-Produced Food

MARIA J. BUSTAMANTE

Introduction

The world population is expected to reach nine billion by 2050, and the UN Food and Agriculture Organization predicts that food production must increase by 70 per cent to feed the growing population (Beecham Research, 2016). With pressure to not only produce more food, but more sustainable food, agriculture is undergoing a digital transformation as it seeks to use technological solutions to increase yields while reducing food loss and negative environmental effects. Vertical farming, which grows products in vertically-stacked layers, is an emerging trend showcasing how technological innovation can lead to new solutions for food production. This is part of the urban agriculture movement that strives to produce food closer to metropolitan areas where an increasing proportion of people live. Vertical farms utilise new growing techniques, such as hydroponics: growing plants in water, and aeroponics: providing water and nutrients via a spray mist. This, along with technologies such as LEDs, sensors, and software enable farmers to constantly monitor and adjust nutrients, water, and temperature to maximise efficiency and optimise the plant's nutritional content. AeroFarms, based in the United States, boasts using over 30,000 data points to monitor not only the environment around the plants; it also controls the colour, texture, nutrition, and flavour (http://aerofarms.com/). The technological efficiency coupled with the elimination of weather, and other potentially harmful externalities enables the farm to be 130 times more productive from a crop-yield perspective to the equivalent field farm (Ryan, 2017). This digital transformation of food production does not disrupt the current agricultural network; instead, it has the potential to develop a whole new one since the rural setting is exchanged for an urban one. Actors, including urban planners, city governments, and real estate developers now have a role to play.

In order for the technological innovation to be successful, it must find a market. In other words, although technical solutions to produce safer and less harmful agricultural goods in cities do, indeed, exist, it is not assumed that the consumer and the larger agriculture system or other relevant industries will support it. Vargo et al suggest: "Market innovation does not occur automatically when actors (e.g. firms), or groups of actors (e.g. innovation networks) introduce new ideas or products, but only when new practices (i.e., solutions) become *institutionalized*" (Vargo, Wieland, & Akaka, 2015). This implies that it is too narrow to consider innovation strictly from a technology perspective. There is also a need to expand the range of innovation to include the relationships, processes, and collaborative initiatives that ultimately lead to market innovation (Vargo, et al, 2015).

Founders of vertical farms are redefining how we think about food production. In order for it to become institutionalised, they will need to influence the broader ecosystem of stakeholders. The purpose of this chapter is to explore the different dimensions of market innovation that complement the technological innovation of vertical farming by seeking to answer the following question:

What activities are the founders of vertical farms performing in order to influence market innovation?

This chapter will first outline an analytical framework that will be used for discussion, and then present two cases of vertical farms in the Swedish market. The chapter will then discuss the activities that these market entrants are using to affect market innovation using the model. By outlining the activities, we can then begin to see which relationships and collaborations are vital for these farms: that is to say, the ecosystems that vertical farms are establishing in order to build a market for their products. The chapter concludes with a summary based upon the findings and future market considerations as we rethink food networks and production methods in a digital era.

Concepts and Analytical Framework

The key concept and model introduced here will establish a framework that will be used to discuss the cases.

SERVICE ECOSYSTEMS APPROACH

Ongoing negotiations within a firm – that is to say, the vertical farm – as well as within the broader ecosystem, which includes a number of stakeholder institutions, shape both technological and market innovation. By approaching innovation in this way, we recognise that there is more to the success of an innovation than just the binary analysis of the firm/innovator and customer/ adopter. A number of actors and institutions will, indeed, play a role.

The service-ecosystems view provides an integrative approach to marketing that examines both goods and services. In this context, innovation is said to be "driven by collaborative efforts to find or develop new ways to create value" (Vargo, et al 2015). This interpretation consolidates the views of technology and market innovation and defines them as follows:

"*Technological innovation* is the co-creation of new value propositions, or collective, combinatorial evolution that leads to the generation of new, potentially useful knowledge."

"Market innovation is driven by and drives the development of new technologies, but also requires the acceptance of a value proposition as well as the continued exchange, integration and application of a particular technology among multiple actors, over time (i.e. institutionalization)." (Vargo, et al 2015)

To consider vertical farming through a service ecosystems lens, we must first acknowledge that farming has become more than just a "goods" business. Food has transformed from a survival product to one that encompasses a whole range of values: what it means to be organic, locally grown, all natural, and so on. While food remains a product, vertical farming is introducing a new value proposition. In order to institutionalise the idea that urbanproduced food is an important part of our future food system, actors will need to engage in "institutional work and co-create institutions through multiple iterations" until shared value is developed (Vargo et al, 2015).

MARKET PRACTICE MODEL

Markets tend to be defined by relationships that are already established, which means actors must work to change "mental barriers" that inhibit current actors' ability to see the market differently (Storbacka & Nenonen, 2011). As a result, market actors who wish to redefine or reshape a market must undertake a number of activities. In the case of vertical farms, the founders seek to shape a market for urban-produced food. To help outline the activities of the vertical farms, I will use the market practice model developed by Kjellberg and Helgesson (2007). The framework outlines three linked activities the authors call exchange, normalising, and representational practices that are executed continuously. Exchange practices include the activities related to economic exchange such as presenting products, negotiating prices, advertising, and so on. Storbacka and Nenonen extend this definition to include the idea that exchange practices are also the activities that shape an accepted and shared value proposition (2011). Representational practices include the activities that look to depict markets and/or how they work. Lastly, normalising practices are defined as activities that seek to establish guidelines on how a market should be shaped according to some group of actors. This can include norms and rules: such as technological standards, codes of conduct, and so on (Kjellberg and Helgesson, 2007).

The model will be used to outline the activities vertical farms are performing to overcome the mental barriers of current actors and develop a shared value of urban-produced food aided by digital technology.

Overview of Vertical Farming

Food has been produced "inside" in greenhouses for quite some time. Vertical farming builds upon the concept of greenhouses and incorporates the urban setting due to technology providing the opportunity to produce food in an untraditional environment: that is to say, without sun or soil inside different types of structures. While greenhouses have made strides in technological advancement and have been effective in producing products in bulk, they continue to work within their established networks along the value chain. The urban location of most vertical farms today is the catalyst for the need to evaluate the network and ecosystem for food production and distribution in the city.

Urban agriculture has been around for years: in the form of rooftop and community gardens. The concept of vertical farming, however, is still relatively new. Vertical farming is defined as "the practice of growing plants in vertically stacked layers, vertically inclined surfaces and/or integrated other structures. The modern idea of vertical farming uses Controlled Environment Agriculture (CEA) technology, where all environmental factors can be controlled" (Association for Vertical Farming, n.d.). In 2010 when Despommier wrote his seminal work on vertical farming, there were none in existence (Despommier, 2011, pg. 4). Today, however, vertical farms of various size and set-up can be found in countries all over the world: including the United States, Japan, the UK, Singapore, and Sweden. They can be found in repurposed warehouses, newly constructed buildings, and shipping containers. Some strive to sell to wholesale markets; others target consumers, while others exist solely for the purpose of educating and training. Water efficient growing techniques, such as hydroponics and aeroponics, coupled with technologies such as LEDs, sensors, and software enable farmers to constantly monitor and adjust nutrients, water, and so on in order to maximise efficiency. The main output tends to be leafy greens and herbs, though efforts to expand into other crops and fish are underway.

While vertical farming is new to Sweden, a few entrepreneurs have seen an opportunity for the technology and have entered the market. Based upon semi-structured interviews with founders and secondary research, the following sections will outline two cases of vertical farms being developed in Sweden today.

The Case of Plantagon

I said that this is almost impossible because there is absolutely no market for vertical farming. There are no clients. (Hans Hassle, Co-founder, Plantagon)

Headquartered in Stockholm, Plantagon positions itself as a "global innovation pioneer". Much of Plantagon's work has focused upon building relationships with stakeholders and communicating the possibilities of vertical farming through summits and other presentation opportunities. Meanwhile, it has grown its number of patents and initiated a standardisation process for urban food production. Plantagon develops and operates urban farms; its business model is based upon management and performance fees. International awards and recognition have followed Plantagon's ambitions and activities. While plans and agreements for vertical farms exist in Sweden, Singapore and China, the company has faced challenges regarding zoning and financing; no fully functional vertical farm has come to fruition to date.

BACKGROUND

The seeds for Plantagon were cultivated in 2002 as a project led by Hans Hassle. Other partners included Sweco, Åke Olsson (innovator) and the Onondaga Nation, a Native American entity in the United States. The goal was to develop a sustainable business for high-technology food production. Each entity brought a different perspective to the table. Sweco was able to put Olsson's concept of a vertical farm into the context of their sustainable city project, thus, growing food with limited land. The Onondaga people saw an opportunity to protect food sources in the face of climate change. After long discussions and negotiations, Plantagon was officially incorporated as a company in 2008, and was set up as a hybrid company: a non-profit organisation (Plantagon International Association) and a for-profit company (Plantagon International AB). The goal of the model is to find a balance between the commercial and ideological driving forces of a company.

An in-depth visibility study followed: focus was placed upon building a brand and patent portfolio rather than a prototype that would be expensive and obsolete in just a few years. Building a strong brand would enable the company to apply it to other technologies and pursue high-impact partnerships. The company approached the Swedish clean tech industry and contracted large companies to do research and development since they already had the teams, knowledge, and ideas. In this way, the organisation was able to uncover challenges quickly: such as climate control in a vertical building or thinking through water, logistics, and distribution channels. Energy would become a big challenge. Plans were almost abandoned in the middle of the visibility study in 2008–2009, due to the energy costs needed to make the concept work. However, a turning point came when Tekniska verken in Linköping contacted the company. As one of the biggest energy companies in Sweden, it had been working with renewable ideas and sustainable waste management for years and wanted a project that would showcase its work to the public. Tekniska verken was interested in Plantagon's vertical greenhouse concept and wanted to connect the greenhouse with existing infrastructure.

"They offered us the spillage heat for free. So then we took down the energy consumption...and then it made sense economically." (Excerpt from interview with Plantagon)

With the agreement, Plantagon had a viable solution to produce food vertically in a controlled environment. The pitch was adjusted from a stand-alone vertical greenhouse to an integrated façade system, which combines the vertical greenhouse concept with a normal real estate project. The goal was to show the potential for the vertical greenhouse to add value to real estate projects.



Rendering of Plantagon's World Food Building in Linköping, Sweden. Photo credit: fyyr/Henrik Vesterberg.

In February 2012, Plantagon held the ground-breaking ceremony for the Plantagon World Food Building in Linköping, Sweden. This has been the company's premier project, embodying the integrated façade system with a greenhouse on one side and an office building on the other: where people and plants will mutually benefit from the building's airflow. Once completed, it is estimated that the building will produce 500 tons of vegetables per year in a 60-metre tall building (http://www.plantagon.com/exhibition/). The concept incorporates automation, vertical production, and Plantagon's patented uPot, which optimises the indoor environment for plant growth. In addition, the project includes a number of partnerships in order to develop integrated solutions for energy, waste, water, and carbon dioxide.

Plantagon AB has driven many of the above activities: the for-profit company set up as part of the hybrid structure. The organisation drives all commercial activity: including the development, and sales of Plantagon's technology, as well as the discussions with potential partners in the public and private sector.

Non-profit corporation, Plantagon International Association, focuses upon opinion-shaping activities, such as seminars, education, and lobbying to bring to the forefront the issues and possibilities of urban agriculture. Vegetables produced indoors cannot be classified as organic under current regulations due to the lack of soil use, even though the food is produced without chemicals or pesticides. This became a market and branding problem; therefore, Plantagon realised there needed to be a standard for urban-grown food to ensure safe production and to build consumer understanding.

"... So we arranged a seminar in Brussels, which was the first on urban agriculture... [To discuss] what is really meant with sustainable food production in cities." (Excerpt from interview with Plantagon)

These global activities with city officials, governments, and international bodies help to define and establish what is vertical farming, as well as its potential for both business and society. The non-profit's current membership stands between 300 and 400 people/organisations.

THE PRESENT

While Plantagon continues to work with local partners to build the World Food Building, it has begun to focus upon other types of projects as well. One of the big challenges for the company has been to convince real estate companies of the economic viability of incorporating food production in buildings. The conversation has been more about the business of food production rather than a specific technology. "... We're building a new part of infrastructure in cities...it's much bigger than a simple business plan. Of course we have business plans and excel sheets and all of that...but [investors and partners] need to share this extreme long-term perspective." (Excerpt from interview with Plantagon)

Plantagon realised it needed to show that indoor urban food production could be profitable. The company plans to launch its first full-scale energy smart farm in 2017 in a completely controlled underground environment in Stockholm; this will be done in partnership with Fabege, the owner of the building where the farm is being built. The produce will be sold in neighbourhood markets and in the building; this will be the first time the new urban food label is used. The automation and vertical technology upon which Plantagon has built its patents, however, is not the best option to produce in the underground environment. Yet, the company strategy to build its brand as an expert in the conceptualisation and design of indoor food production, rather than tying itself to a specific technology, has enabled it to work with partners to find the best solutions. Hence, it is working with a company it believes has the best technology for the underground environment.

THE FUTURE

Plans for the future include adding at least nine more production facilities in office buildings in Stockholm and ten more in residential buildings throughout the country. The company has also noted that it has transitioned from research and development into *agritechture*, or a "combination of agriculture, technology, and architecture" to safely and locally produce food in cities (http://www.plantagon.com/about/business-concept/agritechture/).

With the new planned projects, Plantagon does not see real estate as much of a challenge moving forward. Once production begins to hit the market, it will be a matter of who will buy the products. There will also be new owners, which the company is currently negotiating.

The Case of Grönska

Every part of the value chain has new things we have to, maybe not entirely reinvent, but rethink and perhaps do differently. (Natalie de Brun Skantz, Co-founder, Grönska)

Grönska is a vertical farm start-up located in Hammarbyhöjden, just outside downtown Stockholm. The company is building out its growing system in the basement of an existing office space. The team currently consists of a grower/ hydroponic systems expert, an architect, and a business and marketing professional. Grönska is the first to grow plants vertically and sell them on the market in Sweden. The company currently owns the whole value chain: from technology development through to distribution. As the team learns about the market by doing and iterating, Grönska sees working on a small scale as a key advantage: not just with how they produce plants; benefits lie with pricing strategies, business models, and distribution as well. Grönska's goal is to make the city self-sustainable.

BACKGROUND

The seeds of Grönska were planted in 2014 when friends Petter Olsson and Robin Lee rented space in Hammarbyhöjden and began experimenting with growing plants hydroponically. They welded and built their own LED light systems to optimise what was currently available on the market. Grönska was officially registered as a company in 2016 when Natalie de Brun Skantz joined the team. That same year, they began selling their first products at Paradiset: the largest supermarket provider of natural and organic products in Sweden.

"Getting out to market has allowed us to have dialogue with customers, to try packaging, to try logistics.... And also to understand how groceries work... Paradiset is very generous with information, so it's more of a cooperation than us just being a supplier." (Excerpt from interview with Grönska)

The relationship between the two companies has been instrumental for Grönska. They work together on pricing in an attempt to find the right level for Paradiset, Grönska, and the end consumer.

While grants and scholarships from entities such as Almi, Stockholm Business Region, and Stockholm Venture Cup have helped bring in some money, the company is largely bootstrapped by the owners. Other revenue comes from opportunistic activities: speaking engagements, consulting on architecture, and real estate projects interested in incorporating food production in their designs.

THE PRESENT

Grönska's main product is basil, which is grown in pots at a capacity of about 600 plants per month under its proprietary LED lighting system. Beyond the lighting system, Grönska uses a sensor and app to monitor and adjust environmental parameters in the farm: such as carbon dioxide, temperature, and humidity levels. Other parts of the process – including harvesting – are done manually. The company currently sells about one tenth of the yield and uses the rest for testing to optimise growth and nutrition. Growing plants in pots was a conscious decision, since the Swedish consumer is accustomed to buying herbs in this way. In addition to Paradiset, the company also sells to Centan: a restaurant focused upon using locally-produced products. Through in-store promotions and demonstrations at events such as Smaka på Stockholm, Grönska has also invested time in talking to end consumers.

"Feedback from customers has been super positive, but there is initial confusion about why we can't say we're organic even though we don't use pesticides." (Excerpt from interview with Grönska)

Educating customers on how the product is grown and why it does not carry the organic label can be time consuming. Grönska believes there is a need to distinguish between urban-produced food and other available products; it has supported efforts from Plantagon to establish an urban food label that would clarify these differences for consumers.

The company is targeting wholesale, retail, and restaurants, with other customers in the pipeline. There is opportunity selling to wholesalers and restaurants that desire food produced in Sweden, which is often difficult to find given the harsh winter climate. Sweden traditionally has approximately three harvests per year: Grönska, however, is able to have 12: amounting to one per month. In addition, its products have a consistent look regardless of whether it is summer or winter, which is not the case for greenhouse or other traditionally-produced goods. Prices are negotiated with the retailers and are set at "a bit of a premium, but still competitive in price." Grönska admits that it is still experimenting and negotiating for the best price level. The challenge has been how to balance growing customer interest with growing production capacity.



Herbs growing in Grönska's farm: just outside downtown Stockholm, Sweden. Photo credit: Grönska.

Experimentation and iterations can be found throughout the whole process. The substrate or material that anchors the plant for growing hydroponically in the production phase is a big point of discussion. Grönska started with soil, then tested a number of materials: from paper pulp to fabrics to coconut coir. In the end, they have returned to using soil for the time being. The reason for this is that it comes down to not only what is organic and cost-effective; it also depends on what is available nearby. For example, coconut coir would need to be imported from the Caribbean, thus, negating any positive impact of local food production.

With regard to the business model, Grönska is thinking about different options and considering whether or not customers are willing to book orders beforehand, so the company can schedule production accordingly, thus, reducing waste or whether it will need to find a secondary market for unsold products. Grönska is also currently handling distribution; as production grows, the experimentation of models in this part of the value chain will also take place. Grönska is currently building a larger capacity production system that will enable it to produce up to 5,000 plants per month. Half of these will be sold; the other half will be reserved for testing. Automation will also soon be tested in some aspects of the production. Due to costs, however, full automation will not be implemented until a third planned phase of expansion. Grönska deems the current construction of a larger scale proof of concept to be instrumental in developing its cost structures and production model. Plans are underway to have the next capacity phase up and running by the end of 2017. Parallel to these activities, the company is participating in events and lobbying the government about the importance of food production to help build self-sustaining cities. Grönska also hopes to form partnerships with important actors in the agriculture sector, such as the Swedish Board of Agriculture (Jordbruksverket) and others.

"We have spoken with LRF [the Federation of Swedish Farmers]. We think we should be incorporated in the group. There's no difference between us and a field farmer." (Excerpt from interview with Grönska)

THE FUTURE

As the farm grows, the plan is to introduce automation in planting and harvesting as well. In the long term, Grönska hopes to target crops that have a large import rate to Sweden, cutting down on greenhouse gas emissions and enhancing the flavour of products available to the Swedish consumer. The company also plans to move into other types of packaging, as well as having nine larger growing facilities in Sweden and then expand to other countries in the Nordics and Europe. Grönska is also testing a more distributed business model in addition to its in-house production that would place its technology in offices or stores, thus, enabling on-site production. While it believes the market is not there yet, it does have a test system installed at Hyper Island: a school in Stockholm.

A number of challenges remain. Distribution is one of them. Currently, the majority of vegetables in Sweden, even if grown near Stockholm, go through Helsingborg. Ideally, Grönska wants to distribute directly. Due to the potential large volumes, however, this might not be possible. The aim will be to balance the benefits of building new networks or joining existing ones.

Discussion

The two cases of vertical farms in Sweden show that the companies are taking different approaches in establishing their respective businesses and building a network to support their product. Plantagon is focused upon designing large-scale projects with state-of-the-art technology; it has worked on a local and international level with a focus upon high-level organisations and contacts to grow the acceptance of vertical farming prior to bringing a product to market. Grönska is a start-up that has concentrated upon building relationships with sellers and the end consumer in Sweden in order to bring product to market on a small-scale; it iterates and makes improvements along the way in operations and technology. The conceptual model of markets (Kjellberg and Helgesson, 2007) will be used in this section to outline and discuss the activities that Plantagon and Grönska are performing to encourage other actors to accept the value proposition of urban-produced food; these include real estate partners, governments, consumers, among others.

Representational practices are those activities that look to reduce the ambiguity around a market. The concept of vertical farming is new to potential customers, sellers, and partners. Therefore, both companies have worked to shape an understanding of it by engaging with a number of different actors: government officials, energy companies, real estate companies, supermarkets, restaurants, distributors, and end consumers. This is achieved through meetings, events, and technology demonstrations. The difference here though is the geographic target. Grönska is more focused upon presentation in Sweden and on influencing the local ecosystem. Plantagon has focused more upon building an international network: for example, organising urban agriculture summits in Brussels and Washington.

Normalising practices help to establish guidelines and rules for how the market should work; it also includes activities related to strategic planning. One challenge that both Plantagon and Grönska have encountered is how to position their products since they do not fit under current rules and regulations for what is considered organic. Plantagon has been leading a standardisation process that has reached the international ISO level in order to establish legitimacy and uniformity when presenting urban-produced food with new technology. Grönska supports these efforts; however, it has not been a focus for the company. Plantagon has also put in place structures to assist with international strategic efforts, as well as an official board of directors with backgrounds in areas such as advertising, banking, non-profit, public sector, and sustainability. Grönska has also worked with a group of advisors on an ad hoc basis, which also represent various sectors; these include environmental research, construction, and the public sector.

Perhaps the biggest difference between the two cases is in the exchange practices. With no product on the market, Plantagon has focused upon setting up large partnerships with various stakeholders: most critically, with real estate and energy companies. Emphasis has been placed upon negotiations of contract terms (for example, rent, subsidised energy costs, and so on) as well as the design of the production set-up, which would enable the co-creation of value for the parties involved. Grönska has focused upon the exchange practices related to selling product to the end consumer. Social media, packaging, press releases, and demonstration products are all examples of activities it has adopted to attract potential sellers and customers. Securing Paradiset as a seller early on has been instrumental in establishing prices.

These activities by both firms are intertwined, and help shape the overall market for urban produced food. What becomes apparent is that they are initially focusing upon influencing two distinct markets: the real estate market (that is to say, vertical farming structures) and the market for the end product (for example, salad greens, herbs, and so on). Plantagon has largely focused upon building a real estate market for urban farming. In doing so, exchange practices related to product price is less the focus; instead, attention has been diverted to building relationships with architects, the real estate sector, and other actors in the city whose support will be instrumental: such as city and national governments. Plantagon has developed renderings and gathered data on building costs, which speak directly to its real estate and architecture audience. Only after the company has been able to secure partnerships that will enable it to test and prove that urban food production is economically feasible, has it turned to the seller and end-consumer market. The initial focus upon brand and technology development also affected the network Plantagon has built; it has focused upon an international network in addition to its Swedish one.

Grönska has concentrated primarily on the customer market in Sweden: both through building economic exchange mechanisms with sellers and participating in activities that enable it to educate the end consumer about vertical farming. Grönska participates in events where it can showcase its product and have direct contact with the end consumer since getting product to market is its intention. While the company also interacts and speaks with architects and other real estate actors, it is not done as a focused strategy. This also affects how the company positions itself, which is as a farm and as a local Swedish producer of food. In this way, Grönska espouses the values of locally-produced safe food.

Vertical farming does not fit squarely in the agriculture or real estate industries. Therefore, vertical farmers must educate and communicate not only with the sellers and end users of their products; they must also reach the larger institutions in society that contribute to the value creation and acceptance of urban-produced food. This links back to the idea of institutionalisation (Vargo, et al. 2015). Plantagon and Grönska are introducing a new concept of farming; for true market innovation to occur, however, there will be an ongoing need for the firms to build relationships (for example Grönska and Paradiset), processes (such as more efficient production and distribution methods) and collaborative initiatives (as with Plantagon and Tekniska Verken).

Summary & Conclusion

The development of technology that enables food production in urban areas has resulted in the emergence of firms that believe not only is food production in cities feasible; it is also a necessity to feed a growing urban population. This chapter's premise was technological innovation must be complemented by market innovation in order for digital transformation to occur and have an impact. This research explored through two cases the current activities upon which vertical farms are focused in order to build a market for urban-produced food: Plantagon and Grönska. A conceptual model of markets was used to help outline the market shaping activities, as well as the network of actors that are vital in institutionalising the idea of urban-produced food. Vertical farming is still in its early stages of development in Sweden and yet, it is already establishing the need for different industries to work together. Plantagon and Grönska are building a network of actors to support their efforts. Relationships in a variety of industries are needed to enable market innovation: including real estate, government, clean technology, food distributors, food markets, and end consumers.

The cases revealed how many activities of the two farms are similar, yet they differ on the scale of the endeavours and the timing at which the companies chose to focus upon them. The reason for this is the two firms are actually shaping two distinct markets: a real estate market and a seller/consumer market. This has affected which actors and networks they have wanted to influence as well as establish relationships. As part of an emerging market in Sweden, however, both companies' efforts appear to be beneficial in building the larger ecosystem that will be ultimately needed for a sustainable market of urban-produced food. For true market innovation to occur, new agricultural standards and norms must be integrated into the current food production system. In other words, vertical farming must become institutionalised. The level of success in which vertical farms are able to co-create the value with other institutions in the ecosystem will have a large effect upon what does and does not eventually work. This also highlights how the values and social forces of current markets have the ability to constrain or encourage the integration of new technologies and form new markets.

FUTURE ECOSYSTEM CONSIDERATIONS FOR URBAN-PRODUCED FOOD

As more technology innovation occurs, which kind of market innovation will need to follow?

In order to scale the output of the farm, there needs to be a scaling of the necessary expertise to run the farms. Managers, engineers, data scientists, plant biologists, technology and software developers, and farm workers will also be required. Laws may need to be modified to enable structures in urban areas to be used for food production. Government and educational institutions will need to support and invest in educational programs that train the needed workforce to produce food in a digital environment. Demand and supply mechanisms must also be balanced to ensure that goals are met, such as the reduction of food waste and reducing transportation needs; it is not one specific practice. The constant and iterative work of the vertical farms, with a number of stakeholders across different industries, will lead to the digital transformation of food production in cities.

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