

# FOOD HUBS IN AUSTRALIA: BENEFITS, CHALLENGES AND POTENTIAL ICT CONTRIBUTIONS

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## Abstract

*Food Hubs have been developed to promote sustainability practices in managing regional distribution of fresh produce in a number of countries including the United States and Australia. They have the potential to support the resilience and sustainability of regional food supply chains by improving the local economy, environmental condition, and community well-being. However, despite the potential benefits, Food Hubs face many challenges that threaten their long-term survival. Currently, limited research has been conducted to investigate benefits and challenges of Food Hubs and how Information and Communication Technology (ICT), which is known as one of the key enablers to facilitate sustainable practices, can help address the challenges. In this research-in-progress paper, we present preliminary findings from an on-going research project that seeks to explore benefits and challenges experienced by Australian Food Hubs and the role of ICT in supporting their operations and growth. Our study enhances the understanding of the contributions of Food Hubs to sustainability and the roles of ICT in supporting sustainability practices.*

*Keywords: Food Hubs, sustainability, challenges, IT support, Australia, food supply chain*

# 1 INTRODUCTION

Globally, sustainability has become an important issue for business and the broader society. Within the food supply chain context, Food Hubs represent an innovative sustainability initiative for alternative food systems. Food Hubs are regionally located organisations that aggregate and distribute fresh produce sourced directly from producers within their region, through simple, more sustainable supply chains (Fischer et al. 2013). They connect multiple producers to mid- and large-scale wholesale purchasers as well as individual customers (Barham et al. 2012). Food Hubs help community access affordable foods that make up a healthy and nutritious diet. They provide a much shorter supply chain from producer to consumer than the traditional commodity supply chain (Matson and Thayer 2013) and seek to improve the welfare of local and regional producers, focusing on social change more than economic profit (Matson and Thayer 2013).

In Australia, a significant supply chain issue is food waste because of growing supermarket domination (Foley et al. 2010). Large supermarket chains in Australia apply high quality control which leads to greater rejection of imperfect produce, as well as leaving farmers with limited means of distributing excess fruit and vegetables once their contract quota is fulfilled (Blay-Palmer et al. 2013). Food Hubs offer a potential mechanism through which the prevalent issue of food insecurity can be addressed. Despite the rapid emergence of these hubs globally, currently little research exists to explore and advance the theoretical and practical implications of the phenomenon. Several studies (Leman et al. 2012; Hardesty et al. 2014; Matson and Thayer 2013) have explored various aspects of Food Hubs including how they function, benefits, barriers, consumer preferences, successes, and best practices. Nevertheless, much of the existing literature is largely limited to the North American context, which is different from other parts of the world including Australia. In particular, the Australian grocery industry is dominated by very few players (e.g. Coles, Woolworth, ALDI) servicing a relatively small population. This uniqueness has different implications to the way Food Hubs operate, benefits offered and challenges faced in operating Food Hubs, which in turn affect the use of ICT in supporting the operations of Food Hubs in Australia. Currently, there has been limited research effort in exploring how ICT systems can be used to help improve survivability of Food Hubs by addressing the challenges they face.

This preliminary study is part of a larger research project investigating how ICT can be used to help implement and support the sustainability practices of organisations. It focuses on the regional food industry context and aims to explore the current status and operations of the existing Food Hubs in Australia as well as the benefits and challenges they experience. The specific research questions addressed in this paper are:

- a) *What are benefits and challenges experienced by Australian Food Hubs?*
- b) *How can ICT be deployed to address these challenges?*

A total of 11 in-depth interviews with representatives from various Australian Food Hubs were conducted to address the first research question. We then propose a number of suggestions outlining how ICT can be used to address the challenges faced by Australian Food Hubs. We thus claim a modest contribution to the existing literature by identifying a potential mapping between Australian Food Hub's challenges and potential roles of ICT to address those challenges for the Australian context. Our study provides an important base from which to conduct more comprehensive research concerning the ICT needs of Food Hubs in Australia.

The paper is structured as follows. The next section briefly provides an overview of the benefits and challenges of Food Hubs identified from the literature. Then the research method is explained and the study findings are presented. Finally, we discuss the study findings and conclude the paper by outlining some limitations, contributions and future research directions.

## 2 OVERVIEW OF FOOD HUBS: BENEFITS AND CHALLENGES AND THE POTENTIAL ROLE OF ICT

The U.S. Department of Agriculture 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” (Barham et al., 2012). Food Hubs can be viewed as a new, innovative business model that helps small- and medium-sized producers to reach local consumers directly. The concept of Food Hubs has attracted the attention of practitioners and researchers in a number of countries due to its potential to improve local food supply chain coordination, sustainability and resilience (Woods et al. 2013).

Existing research indicates that Food Hubs may offer a number of environmental, social, and economic benefits to the food industry and the community. Food Hubs provide environment friendly production such as certified organic food items that do not use pesticides and chemicals, thereby reducing the impact on the land (Flaccavento 2009; Stevenson 2009). Furthermore, less transportation is involved with the presence of Food Hubs due to local sourcing and distribution of food items through the use of a central location (Masi et al. 2010). With the use of optimisation technology, the routing schedule and truck optimisation can be further enhanced to minimise fuel consumption and carbon emissions.

Food Hubs help ensure equitable income for farmers and food system workers, as well as fair prices for consumers (Flaccavento 2009; Matson et al. 2011). Furthermore, Food Hubs facilitate civic agriculture that enables community members to understand the origin of their food and the supply system behind it (Lyson 2005). Food Hubs also have the potential for providing greater fresh food access to low-income communities, schoolchildren, and other institutions (e.g. universities, prisons, and hospitals) (Erlbaum et al. 2011; Corner et al. 2011). Finally, the provision of fresh food potentially improves the wellbeing and health of the community. Food products lose nutrients over time as they are moved along the supply chain and, therefore, shortening the delivery timeline through restructuring of the supply chain enhances nutritional value (Masi et al. 2010; Lawrence et al. 2013).

Masi et al. (2010) identified that local food is an economic driver for local economies. Food Hubs offer opportunities for the development of local enterprises which provide economic benefits to the organisations involved and the local community. In addition, the presence of Food Hubs helps facilitate the development of regional food distribution systems which in turn creates more jobs (Flaccavento 2009). Thus, Food Hubs strengthen the local economy and community and potentially contribute to the resilience and sustainability of local food supply chains.

Despite the growing popularity of Food Hubs, their operations regularly encounter a range of challenges (Fischer et al. 2013). Pricing is a key challenge that requires fair price assurance for producers that are also affordable for consumers. Managing growth is another challenge as many Food Hubs are established by new entrepreneurs with limited experience and business skills. Therefore, as the volume of transactions increase, many have found it challenging to manage the rise in suppliers, buyers, and operational costs associated with the growth (Fischer et al. 2013; Clancy and Ruhf 2010). Some studies have also identified balancing supply and demand as a challenge. Prohibitively high demand can strain farmers’ capacity while overly high supply can reduce the price premiums paid to farmers. Furthermore, access to capital is another key challenge of many Food Hubs (Clancy and Ruhf 2010; Melone et al. 2010; Fischer et al. 2013; Hand 2010). Capital requirements include the cost of new infrastructure, start-up costs, distribution of products, marketing and so on.

Previous studies have indicated the roles that ICT can play in supporting organisations to practice sustainability initiatives within the supply chains (Dao et al. 2010; Elliot 2011; Kurnia et al. 2014). These roles include: automating, informing, transforming and providing infrastructure to support organisational activities in such a way that sustainability goals can be addressed (Dewet and Jones 2001; Kurnia et al. 2012). However, the ways in which ICT can support sustainability practices have not been adequately explored in the context of Food Hubs in particular. ICT can potentially be used to support

online training to empower entrepreneurs who lack experience and business skills to better manage their Food Hub operations and growth. Furthermore, ICT has been useful to support information sharing and facilitate collaboration among different organisations, opening the potential to address one of the challenges related to collaborating and goal alignment among different parties involved in the operation of Food Hubs.

Currently, the literature exploring the link between ICT roles and Food Hubs is scant, although some IT-related challenges in the sector have been identified. It appears that Food Hubs often have limited ICT skills and therefore do not have a clear understanding of ICT requirements to support business operations (Jablonski et al. 2011). They may experience lack of technical assistance related to web and data management, organizational management, product development, and food safety knowledge and compliance (Day-Farnsworth et al. 2009). A survey study involving Food Hubs in 2013 indicated that technology is one of their top three challenges (Fischer et al. 2013). There is some evidence that information technology developments in food supply chains connected to traceability, efficiency in distribution, quality systems, market information, and product development, are also being adapted to shorter, localized food chains (Barham et al., p.13, 2012; and Matteson and Hunt, 2012) although there is little research on specific interventions and impact. Therefore, more effort is required to better understand how ICT can be used to support Food Hubs to enable them to run their operations more effectively and efficiently and how this is specifically linked to environmental, social, and economic benefits.

### **3 RESEARCH METHOD**

This study explores a contemporary and complex phenomenon to understand the benefits and challenges currently faced by Food Hubs in Australia and how ICT can be used to help address the challenges. The literature available on benefits and challenges of Food Hubs is immature and extremely limited in regard either the Australian context or in relation to ICT. A qualitative in-depth interview based research approach is appropriate in this early exploratory phase of emergent and not well understood dynamics (Yin 2014). There are 79 Food Hubs currently in operation in Australia, 27 of which are based in Victoria. This study involves in-depth interviews with 11 representatives from the 27 Food Hub organisations in Victoria. Participants are current users or self-identified potential users of the Open Food Network (OFN), a specific electronic marketplace system developed in Australia to connect Food Hubs with other parties in their respective communities. Therefore, they are all Food Hubs that have used ICT/e-marketplace tools to support their operations. Interviewees had varied roles within their Food Hub, although all were involved in its day-to-day management. The interviews were undertaken during the middle of 2014 and were subsequently transcribed and analysed using thematic analysis technique (Yin 2014) to identify key themes related to Food Hubs benefits/values and challenges. We then briefly discuss how ICT can potentially address the challenges faced by Australian Food Hubs. The preliminary findings will contribute to a larger study assessing how ICT helps organisations implement sustainability practices.

## **4 THE PRELIMINARY STUDY FINDINGS**

### **4.1 Overview of the Australian Food Hubs' Operations**

In total, there are 11 participating organisations involved in this study. All participating organisations have been established for more than five years. The number of employees ranged from two to 30 members, with a mix of paid staff and volunteers. The use of volunteers was very common, with some organisations run solely by volunteers. However, other smaller entities did not have any volunteers. Working groups appeared to be an even split of genders, with most people aged in their 30's and 40's. Overall organization size ranged from those servicing a few selected businesses to those servicing thousands of customers.

In terms of the operations, the participants indicated that orders for produce were taken through email lists, online stores, and via the OFN. Eight organisations offered delivery, either to pick up points or straight to homes or businesses. In terms of marketing, no explicit, large-scale marketing strategies were mentioned. Local advertising, word of mouth, and community networking proved to be the major form of marketing for many participants. Facebook was identified as a vital advertising and marketing tool for two participating organisations. According to Participant 5, “*Facebook was a turning point, an absolute, total turning point*”.

All participants sourced local produce from three to several hundred producers and suppliers. All organisations sought seasonal produce, with some complementing this with continuous produce. Nine organisations offered organic produce, with two offering exclusively organic food products. Similar to the trend noticed in the literature, fruits and vegetables were the most commonly offered produce. Other offerings included commercial kitchens/cooking demonstrations, farm tours and special dinner events. The participating organisations supply to a wide range of clients, with no organisation limiting itself to only one type of customer. The most common customer appears to be residential consumers, followed by restaurants/cafes and coops/household buying groups. Other types of customers identified by the interviewees include independent grocers/green grocers, pubs, food service customers, caterers and conference centres, a church, and local health services.

#### 4.2. Benefits and Challenges Experienced

Based on the interviews with the participants, we have identified a range of benefits and challenges, which are summarized in Table 1.

Benefits	Challenges
1. Improved access to healthy food	1. Staffing issue and limited resources
2. Improved environmental and economic sustainability	2. Lack of marketing campaign
3. Community engagement	3. Distribution of products
4. Improved the economy local community	4. Lack of corporation with local farmers
5. Respect, responsibility, accountability, and transparency	5. Customers attitude
	6. Lack of understanding

Table 1. Key Benefits and Challenges Identified

In term of the benefits, six participating organisations stated that Food Hubs *improved access to healthy food* and addressed common public health issues including obesity, diabetes, and low fruit and vegetable consumption. Participant 1 explained that their organisation helped provide fresh produce to the community: “...so people are able to access it, can eat more of it and ultimately ... people will have a healthier weight and be overall healthier”. Equity, social justice, and making fresh local food accessible, specifically to those with a low socioeconomic status, were also benefits frequently cited by the participants. Over half the participants also asserted that their organisations provide an alternative food system to *reduce waste* which *improves both environmental and economic sustainability*. This was commonly driven by growing awareness of supermarket domination. In addition, Participant 7 explained that his organisation allow farmers to “*set their own prices, rather than being ‘squeezed’ by the [giant supermarket chains] monopoly*”. This value is in line with the shared value principle of supporting producers, most notably small-scale farmers, mentioned by 70% of the participants. Most participating organisations valued *fair prices* set by farmers and ensured that farmers and consumers have joint control over the food system.

Another benefit commonly cited by the participants is *community engagement* and *empowerment*. This value can be achieved through increasing the understanding of the journey food products take from farm to consumers’ table. Participant 7 asserted that a number of ‘hubs’ offered “*a few more slices in the pie to illustrate where the food comes from and who are the people in the process*”. In addition, *building and strengthening the local food economy* through local employment, training, and up-

skilling was another benefit cited by most of the participants. One of the participants asserted: “*different local jobs can be created... [through] up skilling and training of people*”. This was supported through the value placed on *collaboration* between producers, project workers, and consumers to improve social connections and networks, as stated by two participants.

There were benefits less frequently mentioned by participants including respect, responsibility, accountability, and transparency. Three participants cited respect and responsibility toward land, farmers, and community members as core drivers of their initiative. This was embodied by one organisation as “*respect for ecological systems... respect for the people and communities that are involved in producing... food that everyone relies on for survival*” - Participant 8. Several participants specifically associated their organisations with the value of transparency and felt that it did not only improve the connection between the consumer and the producer, but also maintained the honesty and integrity of the supply chain.

In terms of challenges, eight participants stated they had *inadequate staff or volunteers* working for them to support the workload. Difficulties in recruiting staff were related to having limited marketing, insufficient time and resources to engage the community, lack of confidence as new organisations and new community members, and lacking a clear vision or strong communication of what the organisation is. One of the interviewees believed that the age of the organisation affects the interest of the community to participate. Consistently, *limited resources* for tasks such as managing administration and creating business and long term plans were experienced by five organisations. Five of the interviewees stated that lack of resources was an issue that their organisation faced. “*We need a bigger team and we need more resources*” (Participant 4).

Furthermore, *marketing* was cited by seven participants as a challenge. It was common for interview participants to state that they either did not know how to go about marketing or did not have sufficient funding to do so. They often have to rely on ‘word of mouth’ from community members. “*It’s all word of mouth*” (Participant 11). Issues with *distribution of products* were also often cited by the participants. Distribution issues ranged from fuel costs, access to vehicles, logistics of transportation, and having a physical site to store, sort, and distribute the produce. Four of the organisations stated that not having a physical site to work from was a challenge. Participant 1 remarked: “*We would ideally like to have a location that we would be able to have a physical site for a food hub... we don’t have that*”. The same participant further commented: “*...the problem of finding satisfactory base, and having grown to a point where we can’t just work at someone’s farm shed.*”

Getting cooperation with local farmers has also been a challenge experienced by four of the participating Food Hubs. This included being able to source local produce, motivate farmers to work with them (especially if they were already locked into export contracts), and the organisation and logistics of distribution. This view is expressed by Participant 1 as follows: “*We’re working with local produce so that is a constraint. ...They’re [the farmers] stuck into export contracts...and once they’ve fulfilled their quota, they’ve got no other option if they’ve got excess produce, they’re just dumping it and we need to look at a way of getting it to the people*”.

Another identified barrier is the attitude of customers. For example, the lack of flexibility of fitting into a weekly pick-up cycle was raised by Participant 11: “*...“people have found that difficult so they say look even though the produce is wonderful and we know we think it’s a great idea at this stage it’s a bit hard for us to be flexible*”. Another organisation said that people tend towards the cheapest product, and don’t necessarily think about buying local products to support the community. The response from Participant 2 to the question of what’s making it difficult for them to be successful was: “*Well you know that when you go shopping and see what’s available to you, you buy the cheapest product, everybody does that, it’s logical*”. A third organisation pointed out that many people still do not accept seconds produce, and prefer their fruits and vegetables to be of a certain appearance.

*Lack of understanding* in operating Food Hubs as a new type of food system was also identified as a common problem. Four participants specified that trying to understand what is involved in the development of a produce distribution business had been challenging. According to Participant 1, “*I was*

*still very new to the understanding what was actually involved in the development of Food Hubs and activating the local system”.*

Other barriers identified include: food insecurity in the community, lack of community communication to create change, volunteer based organisation structure, working together to have similar goals and limited policies supporting what the organisation is trying to achieve. Challenges related to ICT have not been recognised by our study participants. This observation is consistent with the fact that Food Hubs are still emerging in Australia and therefore, the main concerns currently focus on basic operations. Based on the challenges identified, we have made an early attempt to show how ICT can help address the challenges faced by Australian Food Hubs as discussed in section 5.

## **5 DISCUSSION AND FUTURE STUDY DIRECTION**

The importance and concern of sustainability has motivated organisations to explore various new ways of conducting business activities along the supply chains in order to increase economic, environmental and social benefits (Elkington 1998; Carter and Rogers 2008). This study provides an initial understanding of the context and operations of a nascent network of e-market enabled Food Hubs in Australia to support the resilience and sustainability of regional food supply chains. In-depth discussions with Food Hubs that are currently seeking to establish and participate in e-market systems revealed many similarities with Food Hubs discussed in the international literature (primarily in the US). However, there are a number of differences observed which are mainly because of the relative immaturity and sophistication of the sector in Australia.

The study findings reinforce the previous studies’ findings on various benefits that Food Hubs can offer to improve the local economy as well as environmental and social outcomes. Despite the potential of e-market enabled Food Hubs, there are significant challenges that need to be addressed. Many of the challenges experienced by Australian Food Hubs involved in this study are common to those identified in the literature. For example, “time” and “funding” identified in the majority of our interviews accord with the top barrier related to staffing issue identified by US Food Hubs in the 2013 National survey (Fischer et al. 2013). Challenges related to marketing and motivating people to become involved in Food Hubs are also consistent with the experience of US Food Hubs (Fischer et al. 2013). Distribution is another major common issue identified that is consistent with other previous study findings indicating that over 40% of US Food Hubs identify warehouse and delivery capacity as a hindrance to growth (Stevenson et al. 2011; Fischer et al. 2013).

There is a much greater diversity of size and longevity of Food Hubs in the US due to a more mature alternative food sector. Hub managers interviewed for this study generally demonstrated a low level of sophistication and experience in business administration and marketing. This may have reflected the fact that Food Hubs are still new and emerging in Australia. In particular, the hubs seeking support from the Open Food Network e-market may not be well established and may not have put in place alternative technology to support their operations.

The Food Hubs discussed in this study appear to be experiencing complex issues and challenges that will likely impact the ability of these entities to select and adopt ICT solutions. The majority are experiencing very significant and basic business administration and strategy challenges that need to be addressed alongside ICT solutions. More research is required to understand specific ICT challenges and how these relate to general challenges identified for Food Hubs.

As an intermediary step we have developed a list of possible supporting roles of ICT based on the Dao et al. (2010) framework, potential ICT applications, and the future research agenda for each of the challenges identified from our study (Table 2). A detailed discussion of the usage, role and impact of ICT application for each challenge is beyond the scope of this research-in-progress paper. They will be further explored in the next stage of the study. In brief, Table 2 demonstrates the importance of two key roles of ICT (informate and infrastructure provision) in addressing most of the challenges faced by Food Hubs. With the availability of ICT infrastructure, Food Hubs can efficiently capture data related to products, inventory levels, customer order and so on which enable them to access to required infor-

mation in a timely manner to coordinate the business operations and distribution of products as well as manage resource utilisation more efficiently and effectively. ICT infrastructure will also improve the communication with local farmers and customers which help foster cooperation and establish common understanding among various stakeholders.

<b>Challenge</b>	<b>ICT Role</b>	<b>Potential ICT Application</b>	<b>Future Research Agenda</b>
1. Staffing issue and limited resources	Automate, informate, infrastructure	More efficient processes requiring less staff time with inventory management, order fulfilment and marketing. Analysing how to allocate existing resources to strategies that make the most difference in cutting costs and/or increasing sales.	Specific opportunities to reduce time spent through better information systems/ICT. Trialling strategies to cut costs and measuring impact through analytics. Financial modelling for different Food Hub models overtime.
2. Lack of marketing campaign	Informate, infrastructure	Reaching existing and potential customers through online channels Customer Relationship Management	Understanding online channels used by “early adopter” and early majority end customers (of Food Hubs).
3. Distribution of products	Informate, transform, infrastructure	Information to support logistics and optimise the transportation capacity. Real time information about inventory and movement of food can optimise use of physical infrastructure.	Information needs of participants in a distributed supply chain. Information needs for Food Hubs collaborating/sharing logistics.
4. Lack of cooperation with local farmers	Informate, infrastructure	Enabling an efficient service that meets the needs of local farmers. Understanding the online channels used by different segments of producers. Communications to raise awareness and promote the service.	Understanding the online channels used by different segments of producers. User experience - Understanding the ICT awareness and needs of producers.
5. Customers attitude	Informate, infrastructure	Using online channels for education of customers about their food choices	Market research. Understanding the characteristics and needs of existing and prospective end customers.
6. Lack of understanding	Informate, infrastructure	Enabling transparency in the supply chain (end customers can see where food has come from and how) ICT-enabled feedback mechanisms between different supply chain participants (peer to peer reputation systems).	Understanding how ICT can enable greater transparency in the whole supply chain and how this relates to supply chain participant and customer knowledge (and behaviour).

*Table 2. Potential roles of ICT for addressing Australian Food Hubs’ challenges*

We acknowledge that although this preliminary study is currently limited to 11 Food Hub organisations in Victoria State of Australia and the analysis of benefits and challenges as well the potential roles of ICT in addressing the challenges is also limited, the findings provide an important base from which to conduct more comprehensive future research required to inform e-market design for supporting alternative food sector such as Food Hubs. In the next step of the project, we will further investigate specific ICT applications that have been developed to support Food Hub operations and other sustainability practices in general. In particular, a longitudinal case study with the Open Food Foundation that has developed the Open Food Network will be conducted to assess how the development of various ICT applications played the roles as specified by Dao et al. (2011) to support regional supply chain business operations including Food Hubs. Such a study will offer useful contributions by demonstrating how ICT can support and enable the practice of sustainability by organisations, which is currently not well understood.

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