

THE ROLE OF DIGITAL PLATFORM IN WASTE RECOVERY IN THE FOOD SUPPLY CHAIN

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Abstract Food waste is generally seen as highly unethical. Recycling food waste requires establishing information-sharing channels in the food supply chain. However, the lack of relationship between suppliers and potential demanders hinders the delivery of waste products, conceptualized as "structural holes" in social network research. The food recovery digital platform in the food supply chain acts as a market intermediary to bridge the communication at the two ends of the structural holes, fulfilling the function of "brokers", which has been proven in the transaction cost theory to reduce the transaction costs and improve the performance of the supply chain. However, related research on digital platforms and supply chains ignores this new type of brokerage. This research combines network research, transaction cost research, and supply chain research and explores the role of food recovery platforms in food waste problems in the food supply chain.

Keywords:

structural holes, digital platforms, food waste recovery, supply chains, cost

1 Introduction

The Food and Agriculture Organization of the United Nations stated that one-third of the global food produced by humans every year is wasted (FAO, 2017). Studies on sustainable supply chains have shown the lack of communication channels between supply chain participants hinders the transfer and recycling of waste (Schanes et al., 2018). Social network research provides a theoretical basis for this and conceptualizes it as "structural holes" (Burt, 2004). Social network scholars have also proposed the supplementary concept of "brokers" to describe organizations or individuals that build bridges between organizations to fill structural holes.

Nowadays, digital platforms in the food supply chain can establish more connections than other brokers through market intermediary functions and external network effects. However, the role and impact of inter-organizational connections and information sharing established by the brokerage function in the supply chain have not yet been clarified. In terms of precisely explaining the structural holes of the food recycling supply chain and how digital platform organizations act as brokers to promote waste recycling, research has not yet caught up with practice. This research helps bridge this gap by exploring existing food recovery platforms and food recycling-related supply chains. In sum, this research explores structural holes and the role of brokerage of the food recovery digital platform in the food supply chain.

2 Literature review

2.1 Food Wasted in the Food Supply Chain

The importance of waste recycling has led people to re-explore the traditional supply chain concept. The literature on food waste shows the importance of complex interrelationships among different stages of the food chain (Chaboud and Daviron, 2017; De Steur et al, 2016; Gustavsson et al., 2011; Mena et al., 2011). The fight against food waste depends on the creation of connections along the chain, which expands the chain's integration capacity, linking actors who have goods at risk with actors capable of using these inputs (Ciulli et al., 2019).

In addition, scholars related to circular economy have also expanded the traditional concept of waste based on the waste-as-food principle (Murray et al., 2017). According to this concept, waste also includes products that are produced but not sold, not consumed, or at the end of their life cycle. This expanded waste concept means that when a supply chain participant's "waste" can become a potential resource for other supply chain participants, the value of "waste" can be realized through the recollection, redistribution and reuse of the supply chain. (Murray et al., 2017). In the food supply chain, structural holes between supply chain participants hinder recycling efficiency and large-scale waste recycling. Both the supply and demand sides influence the formation of structural holes. In addition, the solution to food waste also hindered by geographical restrictions (Garrone et al., 2016). A new type of supply chain participant: the digital platform organization, seems to be able to break the deadlock to some extent. With the development and dissemination of digital platforms, food waste and food recycling solutions are no longer very local, temporary or accidental measures.

2.2 Food Recovery Digital Platform

The food recovery platform focuses on establishing connections between suppliers and food waste beneficiaries, promoting the recycling and reuse of food waste while reducing the negative impact of waste on society and the environment (Michelini et al., 2018; Ciulli et al., 2019). Start-ups that have been established around the world include Too Good To Go and OLIO. The success of these platforms shows that the organization of the digital platform business model can promote the sustainable development and transformation of the food industry and act as a tool for social changers when entering the food industry (Acquier and Carbone, 2018).

Researchers related to the sharing economy define the food recovery platform as a sharing economy which brings challenges and controversies. First, scholars have disputes over the conceptualization of the sharing economy (Schor, 2016; Acquier et al., 2017). Secondly, the business model of the food recovery platform seems to be different from the mainstream concept of the sharing economy. The latter means that commodity owners provide other consumers with opportunities for underutilized commodities (Frenken and Schor, 2017), which means that the ownership of this commodity does not seem to have changed. In addition, according

to the research of Ciulli et al. (2019), the food recovery platform plays a variety of roles in the food supply chain, not just the sharing of goods.

2.3 Structural Hole and Brokers

Social network theory draws people's attention to "Missing relations" (Burt et al., 2013) through the concept of "structural holes". The existence of "structural holes" means that the participants in the network "have an uneven connection with each other" and therefore cannot share information (Burt, 2007; Ellis, 2003). Social network scholars believe that when people focus on activities within their own group, they create loopholes in the information flow between groups (Burt et al., 2013).

Social network scholars also proposed to bridge the holes in the network structure through brokerage (Burt, 2004). The broker connects two or more unrelated participants in the network and builds a bridge for them to communicate information and knowledge. Scholars explored how different types of participants can become brokers and facilitate the establishment of connections between organizations and organizations or between organizations and individuals including individual employees (Manning and Roessler, 2014), non-governmental organizations (Kaine and Josserand, 2018) or government agencies (Stadtler and Probst, 2012). Based on the structural holes and brokers theory, this research emphasizes the importance of inter-organizational knowledge and information communication in the food supply chain and explores the role of digital platform as a new type of brokers.

3 Research methodology

3.1 Research approach

This research adopts a mixed-methods research approach. In qualitative research part, this research adopts an inductive interpretive theory method to construct the theoretical framework (Gioia et al., 2013; Shah and Corley, 2006). This research method is suitable for the current situation where the research on food recovery platform organizations cannot keep up with practice. In addition, research literature in different fields can provide theoretical guidance for food recovery platform

organizations. Therefore, this research builds a theoretical framework for the food recovery platform to solve the food waste problem:

The food supply chain has structural holes, and the food recovery digital platform can act as brokers to bridge structural holes, which means establishing communication channels between the supply and demand sides and promote information sharing. Information sharing reduces the cooperation cost between the two parties and the uncertainty of the supply chain, so it reduces transaction cost and improves food recycling performance.

In terms of quantitative research, this study measures the promotion of information sharing by food recovery digital platforms as brokers. The scope of information refers to the information transmitted by both parties through the digital platform, including information exchange between the two parties for transaction purposes and private information that is not directly related to the transaction. The measurement of information sharing refers to the six indicators adopted by Li et al. (2006).

3.2 Data Sources and Sampling

The main data collection unit of this study is the food recovery platform organization in the food supply chain. Considering the classification of food recovery platform organizations by Michelini et al. (2018) and Ciulli et al. (2019), the food recovery platform organizations in this research will include the following types:

- Business-to-Business (B2B), both the supplier and the demander (requester) of food waste are corporate organizations;
- Business-to-Consumer (B2C), digital platforms match food waste to suppliers and consumers; Business-to-NGO (B2NGO), the suppliers are companies that provide food waste, and the recipients are non-governmental charitable organizations;
- Consumer-to-Consumer (C2C), digital platforms are dedicated to promoting the flow of food waste between consumers.

4 Contributions

4.1 Theocratical contributions

For the research on social networks, this research contributes to the theory of structural holes and brokers and promotes the application of these theories in the supply chain through the research on the new type of brokers- the digital platform. In addition, this research combines transaction cost theory with brokerage related research to contribute to the development of transaction cost theory in the supply chain. Finally, this research contributes to sustainable circular supply chain research by investigating the impact of digital platforms.

4.2 Practical contributions

This research has practical implications for relevant practitioners, digital platforms, and policymakers in the food recycling industry. First, identifying structural holes in the food supply chain can help improve inter-organizational communication and information sharing with practitioners related to food recycling. Secondly, this research helps policymakers understand and position the functions and advantages of digital platforms and provide corresponding support for the development of digital platforms. In addition, this research also brings inspiration to other digital platforms in the supply chain to explore future functions and development directions.

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