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# Exploring the Process of Fresh Produce Supply Within a Platform Ecosystem During City Lockdown Period

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# Exploring the Mechanism of IT-Enabled Platform Ecosystem Orchestration During City Lockdown Period

*Completed Research Paper*

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## Abstract

*While the existing literature focusing on how organizations collaborate within ecosystems to overcome institutional logic conflicts and the information systems enabled inter-organizational cooperation, less is known on how information systems develop during crises and enable effective collaboration among stakeholders. Through an in-depth case study of Shenzhen Company H (pseudonym) platform ecosystem, we present an IT-enabled fresh produce supply process. Our findings reveal that this process unfolds across four dimensions - iterative IT tailoring, progressive system synergy, facilitative IT confluence, and user-attuned technological adaptation. Based on these dimensions, we propose an IT-enabled platform ecosystem orchestration mechanism in crisis situations. These mechanisms also offer practical implications not only for organizations' strategies when facing crises but also for the enhancement of their daily operational competence.*

**Keywords:** Fresh produce supply, IT enabled collaboration, platform ecosystem

## Introduction

The pandemic's impact on fresh produce supply has gained attention from both academic and industrial practitioners. On one hand, COVID-19 has posed significant challenges to fresh produce supply chains (Chenarides et al. 2021), as fresh produce is essential for daily life and subject to perishability, unstable demand, and climatic conditions (Shukla and Jharkharia 2013). Lockdowns exacerbate these challenges (Hobbs 2021). On the other hand, the pandemic has spurred information system usage and enhanced operational capabilities. This holds true particularly for platform firms where public and private stakeholders within the platform ecosystem need to collaboratively establish resilience and co-create value through information systems (Boh et al. 2023).

Platform governance is crucial for ecosystem value co-creation activities (Tiwana et al. 2010). Prior research on platform ecosystem governance has mainly focused on the orchestrating role of platform owners (Smedlund et al. 2018) or other firms, especially in software development (Mukhopadhyay and Bouwman 2019), but not on public sector players. Besides platform owners, the ecosystem includes complementors

such as suppliers, regulatory authorities, and consumers (McIntyre and Srinivasan 2017). Therefore, the platform ecosystem involves not only firms but also other stakeholders impacting value co-creation (Iansiti and Levien 2004). Although Lin (2011) posits that the Chinese government can actively participate in economic life, other ecosystem actors must leverage their expertise for value co-creation. In the process of value co-creation, organizations increasingly adopt interorganizational systems to facilitate timely and accurate information sharing, enhancing collaboration and problem-solving capabilities, particularly in emergency situations (Yang et al. 2012). Information technologies play a critical role in improving organizational capabilities and enabling efficient stakeholder interactions (Andrews and Entwistle 2010). However, the pandemic presents a novel challenge for stakeholders within the ecosystem, which is to enhance the resilience of information technology in order to absorb the crisis. Therefore, our research question is: how do information systems enable efficient collaboration among stakeholders within a platform ecosystem during a crisis?

To provide insights into this question, we employed the method of case study to analyze the Shenzhen Company H platform ecosystem. Shenzhen's Company H fresh produce platform ecosystem met the fresh produce needs during the lockdown through applying iterative information systems and multi-stakeholder collaboration.

In our study, we analyze the Company H fresh produce platform from the lens of ecosystem, considering the collaborative efforts of multiple parties in addressing the fresh produce supply problem. Next, we draw on institutional theory to describe how stakeholders collaborate amidst conflicts in institutional logics. Subsequently, we explore the role of information systems in facilitating collaboration among stakeholders. In the methodology section, we provide a detailed description of the qualitative data collection and analysis procedures employed in our study. The findings section provides a detailed discussion of the theoretical coding. Finally, we discuss the mechanism and potential contributions.

# Conceptual Framework

## *Platform Ecosystem*

Moore (1993) first introduced the ecosystem concept to the field of business management and explained firms as a group that co-evolved in business ecosystems. With the advancement of digital technology, platform-based business models have emerged in the market, and the platform ecosystem concept has gained attention in the information systems (IS) discipline (Huber et al. 2017; Parker et al. 2016; Tiwana et al. 2010). In previous literature, the platform ecosystem comprises four primary players: owners, providers, producers, and consumers. However, the platform ecosystem orchestrates a wider variety of organizations. During the Covid-19 pandemic, numerous cross-sector collaborations, such as online grocery platforms, have emerged, enabling public and private organizations to co-create value beyond mere profit generation (Floetgen et al. 2021). Thus, the online grocery platform ecosystem represents a context where various resources are exchanged under different institutional logics, facilitating value co-creation (Vargo et al. 2008). Furthermore, platform ecosystems necessitate cost-efficient orchestration mechanisms to foster collaboration among a broader range of stakeholders. However, current research on platform ecosystems within the IS domain has not adequately addressed the challenges of cross-sector governance (Mukhopadhyay and Bouwman 2019). Gaining insights into cross-sector collaboration within the platform ecosystem can provide valuable implications for practitioners and policymakers, especially during crises that demand rapid and effective coordination among stakeholders. Next, we draw on institutional theory to review institutional logic and isomorphism, aiming to explore the tensions and mechanisms underlying cross-sector collaboration within the platform ecosystem.

## *Institutional Theory*

When it comes to interorganizational collaborations, it can happen at different tiers of the value chain within organizations that are located in different regions and/or countries (Bhakoo and Choi 2013). Organizations can have their own legal bodies or professional associations to develop institutional rules and norms (Dong et al. 2017). Friedland and Alford (1991) define institutional logic as a set of material practices and symbolic systems that individuals and organizations use to guide their actions. Organizations usually adhere to their own institutional logic and do not easily absorb new or conflicting logics (Thornton et al. 2012). Their distinct characteristics may become an obstacle when working together. In the literature on

hybrid organizations, these entities integrate different institutional logics to solve complex problems, and this combination usually creates uncertainty that hinders their efforts (Jay 2013). Particularly when it comes to public-private hybrid organizations, integration brings legitimacy as well as tension and instability (Cappellaro et al. 2020). The ecosystem comprises diverse organizations in different environments, each with its own institutional logic (Berente et al. 2019). Specifically, incongruence in organizational goals, governance structures, and administrative processes will affect the operation inside the platform ecosystem (Weber et al. 2021). In contrast, the interdependent and complementary components of the platform ecosystem together can make more co-created value than the sum of the value created by each component individually (Smedlund et al. 2018).

When incongruent logics are applied simultaneously to a situation, they may create an incongruity and require responses to mediate the incongruity (Berente et al. 2019). The institutional theory provides a lens for responding to the incongruence of institutional logics (Goodstein 1994). Some studies maintain that loose coupling is an effective way to navigate incongruence because it can isolate practices guided by these incongruent logics from each other and satisfy the demands associated with different organizations (Berente and Yoo 2012). Some organizations selectively couple logical elements they lack, forming hybrids to incorporate a pluralistic institutional environment (Pache and Santos 2013). However, if the pressure to comply with the introduced institutional logic is great, then the organizations will comply with the new logic. Coercive, mimetic, and normative isomorphic are the three processes that enhance compliance (DiMaggio and Powell 1983). Coercive isomorphism refers to changes made by organizations when they are under pressure from other powerful organizations on which they depend. In some cases, regulators exert coercive pressure through policies and regulations to enforce certain practices (Labro and Stice-Lawrence 2020). Mimetic isomorphism is defined as the process of modeling other successful peers when the organization faces profitable uncertainty (Liu et al. 2010). Normative isomorphism is a pattern of action derived by organizations based on common cognitive assumptions. Understanding the dynamics within the platform ecosystem through the lens of institutional theory, we now turn to explore how organizations adopt interorganizational systems to facilitate information sharing, collaboration, and the overcoming of barriers posed by different institutional logics in various contexts

## *IT-enabled Collaboration*

In recent years, organizations have increasingly adopted interorganizational systems to facilitate timely and accurate information sharing (Dong et al. 2017; Gopalakrishnan et al. 2022), enabling them to leverage external resources and achieve joint strategic goals (Rai and Tang 2010, 2014). For instance, healthcare stakeholders utilize health information exchange systems to decrease costs and enhance the quality of healthcare services (Yaraghi et al. 2015). Furthermore, information systems-enabled interorganizational collaboration has gained significance in addressing complex and urgent societal issues (Andrews and Entwistle 2010; Koschmann et al. 2012), particularly in emergency situations requiring diverse organizations to cooperate efficiently and effectively. A notable example is the integrated information platform designed by the Beijing government during the 2008 Beijing Olympic Games, which facilitated collaboration and information sharing among various organizations, enabling prompt responses to emergencies (Yang et al. 2012). Chiu et al. (2010) proposed a unified platform to streamline collaboration among governments, healthcare institutions, companies, and individuals for timely responses to epidemic outbreaks. In such contexts, information technologies augment organizational capabilities and allow organizations to interact more efficiently (Barua et al. 2004). Moreover, during these processes, organizations must navigate the challenges posed by differing institutional logics when implementing interorganizational systems, as conflicting and evolving institutional logics create obstacles for enterprise systems deployment (Berente and Yoo 2012; Dong et al. 2017).

In summary, while existing literature has focused on how organizations within ecosystems collaborate to overcome institutional logic conflicts and how information systems guide interorganizational cooperation, there remains a research gap in understanding how information systems facilitate efficient collaboration among stakeholders from different sectors during crisis situations. Consequently, we aim to address the following research question:

*How do information systems enable efficient collaboration among stakeholders within a platform ecosystem during a crisis?*

# Methodology

Wittgenstein posits that logical connections between phenomena precede experience and can be represented by synthesized theoretical propositions. In order to test and expand upon the theoretical framework, we employ a single-case analysis of the Shenzhen Company H International Agricultural Produces Logistics Park (Eisenhardt 1989). Grounded in the interpretive paradigm, this study investigates the mechanisms underlying the Company H online grocery platform ecosystem's ability to ensure the supply of living essentials at regular prices during the lockdown period (Yin 1984).

## *Data Collection*

In line with our research question, we identified potential constructs such as cross-sector collaboration, conflict, and informatization that might help answer the question (Eisenhardt 1989). We collected second data about the fresh produce supply during the lockdown period before primary data collection based on these potential constructs. The data sources mainly include (1) archival survey of press articles, analyst reports, and company press releases from focal and non-focal firms, such as Company H and Missfresh, and (2) archival survey of policies and reports from government agencies, such as CDCP, the Shenzhen Administration for Market Regulation (AMR), and the Shenzhen Transportation Bureau (TB). The secondary data focuses on the background and history of the whole process of fresh produce supply during the lockdown period. Particularly, we compared the operation in other cities to identify unique aspects of Shenzhen. Also, the secondary data plays a role of triangulation, supplements primary data, and improves the validity of the case studies (Yin 2009).

From the secondary data, we preliminarily determined that Company H connected fresh produce sources with online e-commerce platforms. Company H's vegetable delivery capacity reached 5,000 tons daily, accounting for 70% of the city's supply. Additionally, its status as a state-owned enterprise indicated government involvement in the market. Given Company H's central and critical position in fresh produce supply, we chose it as our case. Based on the literature and secondary data, we further developed the interview outline and conducted (3) semi-structured interviews with executives and key employees in Company H. We selected interviewees based on their extensive experience in fresh produce supply and their senior positions, such as senior executives and department managers. This allowed us to obtain a comprehensive view of external interactions and internal operations, as these interviewees oversaw the fresh produce supply process during the lockdown period and were familiar with the platform ecosystem's stakeholder interactions.

We conducted three types of semi-structured interviews: office interviews, on-site interviews, and WeChat interviews. The first two types were offline interviews, where we initially obtained and verified Company H background information before discussing it with interviewees through face-to-face office interviews. Additionally, we consulted with Company H managers during park visits to improve our intuitive understanding of operations and conducted follow-up interviews on issues observed during the visits. The third type of interview was online through WeChat, where we further inquired about issues encountered while organizing interview content.

During the interviews, we followed an interview outline, asking questions related to fresh produce supply during the lockdown period. These questions comprised three parts:

- Company H's role and its interactions with other stakeholders in the online grocery platform ecosystem,
- Emergency strategies employed by Company H during the lockdown period and how they differed from the pre-lockdown period,
- How information technology assisted Company H in fresh produce supply during the lockdown period.

In addition to textual data, we obtained digital data on Company H's on-site management from the Company H Big Data Smart Notification System (Figure 1). Secondary data collection occurred before and after the interviews, from January 2022 to June 2022, while interviews took place in November 2022. Interviews lasted between 15 minutes and over an hour, with interview notes transcribed as soon as possible after each session. All interviews were conducted in Mandarin Chinese and translated into English by researchers.

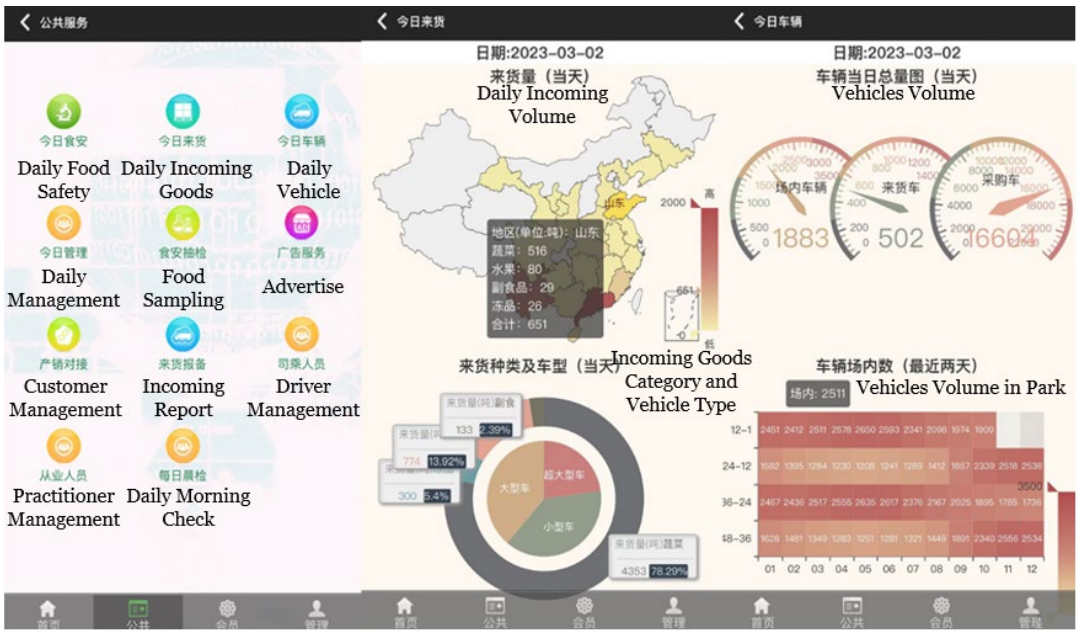


**Figure 1. Company H Big Data Smart Notification System**

## *Data Analysis*

We employed grounded theory procedures and conducted a three-level coding analysis of the data (Eisenhardt 1989; Gioia et al. 2013). In the first step, we performed open coding. The analysis was based on comprehensive secondary data and discussions with Company H employees. Specifically, we identified terms and descriptions as codes from the interview notes and validated all codes through secondary data and other interviews with similar descriptions to reduce biases. These codes represented the institutional logics of stakeholders in the Company H platform and information system utilization ecosystem. Moreover, we identified similarities and differences among all codes, clustering them into primary codes.

In the second step, we discussed the results of the first step coding and identified connections between the primary codes. Subsequently, we merged clusters with strong logical relationships into axial codes.

In the third step, we combined these axial codes into higher-order and more abstract concepts that helped us theorize the process of fresh produce supply during the lockdown period. For instance, we coded government policies and enterprise strategies in the first-order coding, merging them into second-stage codes such as government coercive pressure application and enterprise compliance. Those second-stage codes were further abstracted into theoretical codes of enterprise-to-government logic compromise, laying the groundwork for constructing the theoretical framework. We iteratively performed this process and abstracted the other three theoretical codes. Figure 2 illustrates the entire coding process.

In the last step, we identified the relationship among these theoretical codes in order to generate a grounded process mechanism (Corley and Gioia 2011). In the finding section, we demonstrate the mechanism by elaborating on the linkages among the codes.

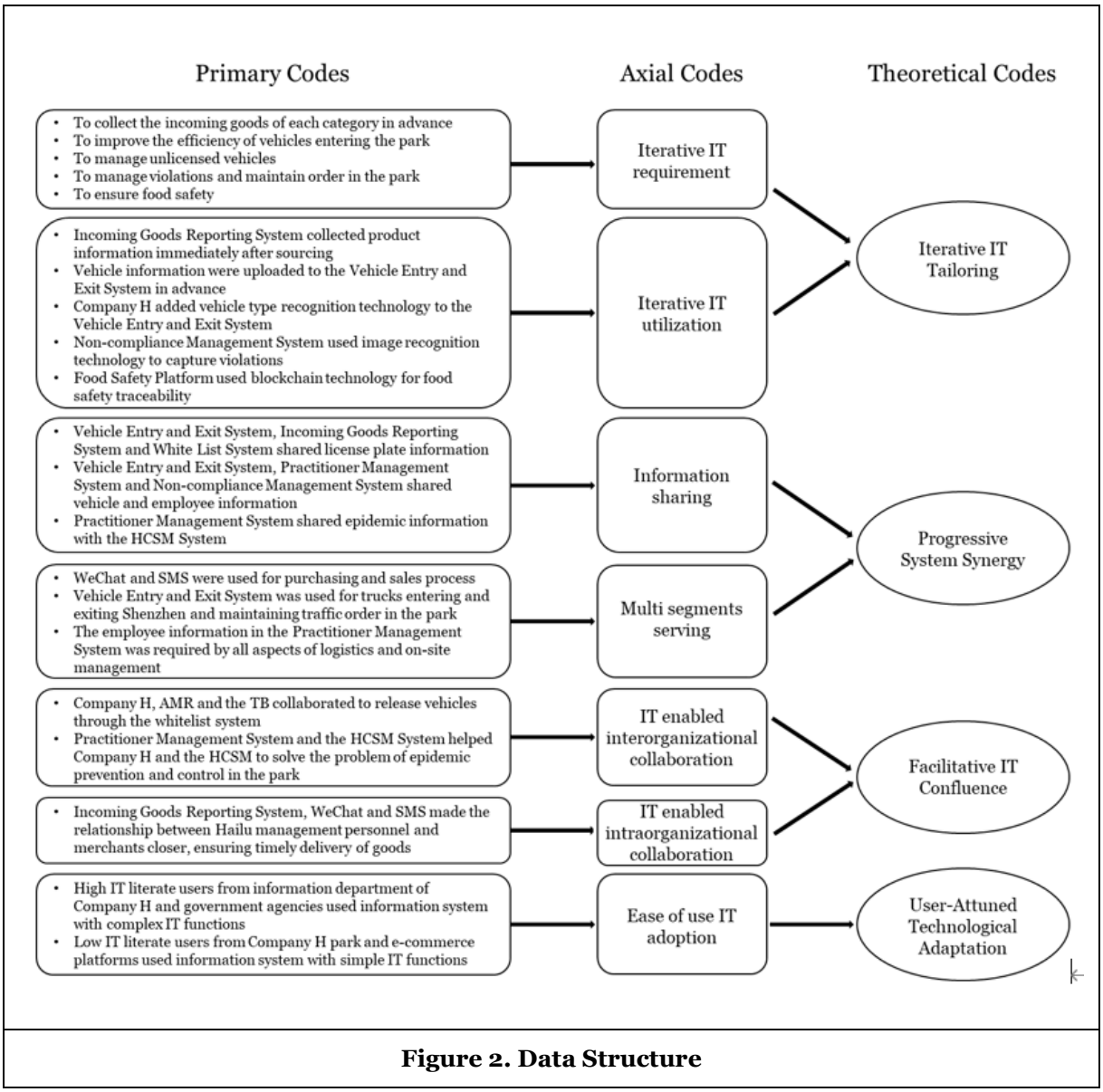


**Figure 2. Data Structure**

# Findings

## *Overview of the Company H Platform Ecosystem*

The Company H platform ecosystem, encompassing Company H and collaborating organizations, focuses on value co-creation activities. As a leading fresh produce wholesale market in Shenzhen, Company H received the 2012 World Union of Wholesale Markets silver award for its innovative approaches, including advanced planning, IT technology, food safety systems, and eco-friendly strategies. Being the focal firm in the ecosystem, Company H forms a government-oriented, bilateral relationship with government agencies while maintaining close ties with sourcing regions, clients, and logistics firms for supply chain efficiency. The company primarily sources from regions such as Shandong, Yunnan, Guangxi, and Fujian, and embedded merchants prefer social logistics for cost savings. Under AMR's guidance, Company H platform ecosystem stakeholders collaborate on value co-creation activities, facilitating sufficient fresh produce supply at regular prices.

To understand the role of information systems in the supply assurance process, it is crucial to elaborate how Company H leverages technology to enable efficient coordination and communication among various stakeholders. This technological integration contributes to the seamless flow of fresh produce from procurement to sales, ultimately reaching consumers. We divide the overall supply assurance process into four stages: procurement, logistics, on-site management, and sales. Each stage is further broken down into several specific steps. These steps describe the particular strategies applied by stakeholders within the platform ecosystem during the lockdown period and also reveal why Shenzhen was able to secure citizens' fresh produce needs facing contingencies. The application of information systems played a crucial role in the implementation of these steps. Company H not only customized and used information systems (such as the Incoming Goods Reporting System, Vehicle Entry and Exit System, Practitioner Management System, Non-Compliance Management System, Market Regulation Management System, and Food Safety Platform) according to its needs, but also incorporated daily social communication tools (WeChat and SMS) into the supply assurance process, as shown in Figure 3.

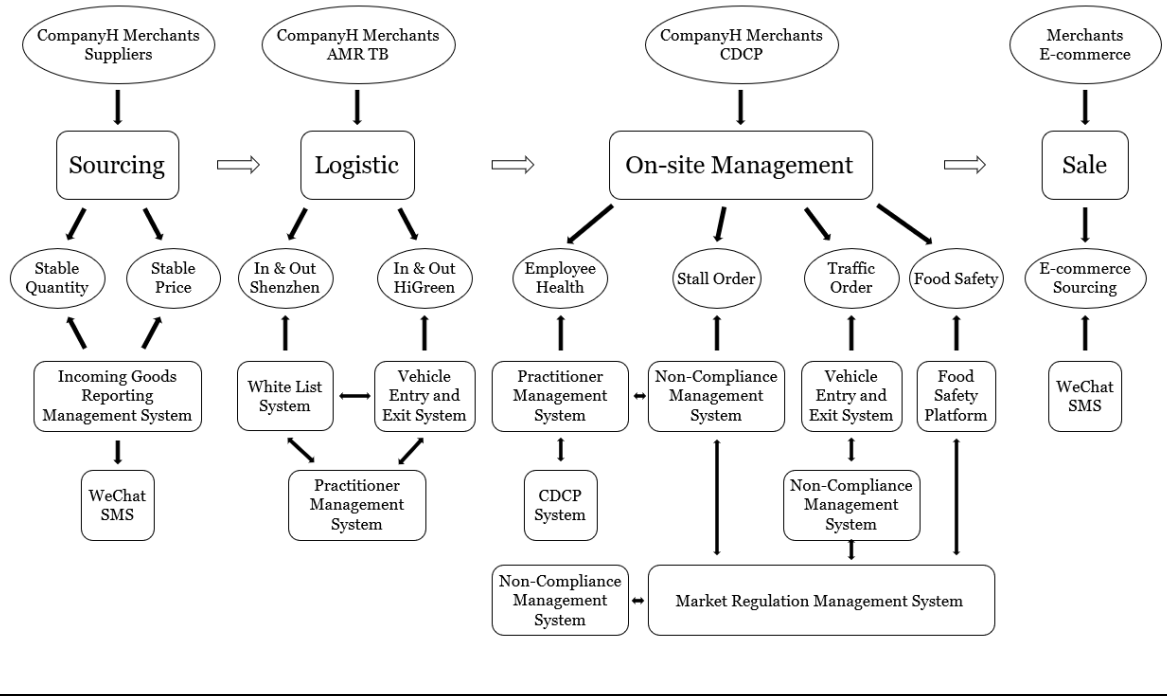


**Figure 3. Process of Fresh Produce Supply**

Specifically, in the procurement process, Company H monitored incoming goods status through the Incoming Goods Reporting System and informed merchants to restock via WeChat or SMS, ensuring adequate supply and stable prices for various categories of fresh produce. Subsequently, these products were smoothly transported into the Shenzhen Company H Park via logistics trucks. In this process, the Vehicle Entry and Exit System and White List System helped trucks carrying fresh produce quickly pass through checkpoints. In the on-site management stage, Company H addressed violations by employees and vendors through the Practitioner Management System, Vehicle Entry and Exit System, and Non-Compliance Management System, maintaining operational order within the park and enabling rapid circulation of fresh produce. Furthermore, Company H established a Food Safety Platform to trace products with food safety issues, ensuring the quality of fresh produce. In the sales phase, e-commerce platform purchasers placed orders with Company H merchants through WeChat.

Ultimately, fresh produce was distributed to consumers through e-commerce platforms. Overall, the synergy between Company H's customized information systems and its stakeholders' strategic actions

significantly contributed to the successful assurance of fresh produce supply during the city lockdown period.

Our theoretical coding of the data is primarily divided into four dimensions, as shown in Figure 2: Iterative IT Tailoring describes the continuous adjustment and optimization of information technology solutions based on user needs and environmental changes; Progressive System Synergy refers to the gradual integration process among information systems to achieve more efficient collaboration and process optimization; Facilitative IT Confluence reveals the significant role of information technology in promoting interorganizational collaboration by integrating various IT tools and platforms, enabling effective communication and cooperation among organizations; User-Attuned Technological Adaptation emphasizes that information technology solutions should be adjusted according to users' technical literacy and needs to improve user experience and system usability. We will now elaborate on these four dimensions with evidence and propose a mechanism based on our findings.

## *Iterative IT Tailoring*

The first dimension is the continuous iteration of information systems. Customizing information systems according to operational needs has enabled Company H to provide Shenzhen citizens with a sufficient supply of fresh produce at stable prices during the city's lockdown. Based on secondary data and interviews, information technology has been a long-term strategy for Company H, primarily divided into three stages: initially, leveraging computer-based network databases to address information entry and transmission issues; subsequently, utilizing IT technology to solve data collection problems; and finally, employing data analysis and presentation to assist managers in efficient management. As stated by a Company H manager:

> *Our long-term IT strategy began when it was Company B. The integrated system, designed in 2009 and launched in 2011, initially used voice-to-text for info transmission, replacing manual data collection with video streams, and displayed it on a large screen.*

### Iterative IT requirement and utilization

Since the inception of its information technology strategy, Company H has continuously adjusted and optimized its information systems based on its needs and changing business environment. The integrated system of Pinghu Company H was designed in October 2009 and went live in September 2011. With the gradual implementation and deepening of various business services in the park, the application of the integrated system has been progressively promoted. Major business systems, such as customer systems, financial management systems, electronic settlement systems, food safety record systems, property management systems, parking management systems, and fire safety management systems, have been successively put into operation. Through continuous improvement, and iterative updates, the overall operation of the integrated system is satisfactory, and the information technology infrastructure can meet the needs of main business and internal management. In particular, to provide buyers and sellers with safe and efficient settlement services, Company H has introduced a new transaction model - the electronic settlement transaction system. By promoting electronic settlements, operators have shifted from traditional cash transactions to the habit of using card transactions and settlements, forming a simple, efficient, fair, and smooth transaction environment. Meanwhile, the use of the integrated information system has accumulated massive data. By comprehensively analyzing various business data and management data, timely and scientific data support can be provided for daily business operations and management tasks.

> *Before the epidemic, they (information systems) were mainly used for electronic settlement transactions. Among them, the portable all-in-one machine can integrate the functions of commodity input, cumulative weighing, buyer and seller card swiping, fund settlement, receipt printing, etc., providing safe and fast services for both buyers and sellers. The settlement service facilitates the trading of mass commodities.*

With the outbreak of the COVID-19 pandemic and the obstacles to the circulation of fresh produce caused by city lockdowns, ensuring the supply of fresh produce has become crucial. Information systems are increasingly needed by Company H's management and applied to various stages of fresh produce supply assurance. According to Company H's requirements, DaBaiCai Technology Company designed the following information systems: Incoming Goods Reporting Management System, Vehicle Entry and Exit System, Practitioner Management System, Non-Compliance Management System, Market Regulation

Management System, and Food Safety Platform. The design of each system originated from the needs of each stage and underwent continuous iteration based on new requirements during the application process.

In order to ensure the procurement of sufficient products, Company H needs to grasp the inbound situation of various categories in advance to adjust its procurement strategy. The Incoming Goods Reporting Management System collected information on the weight and origin of each category immediately after the procurement was completed. In addition to reporting product information in advance, vehicle information also needs to be uploaded to the Vehicle Entry and Exit System, including: license plate information, target areas and stalls, reported weight, and estimated arrival time. Company H allowed relevant vehicles to enter the park based on the license plate numbers in the system, improving the efficiency of vehicle entry. However, many vehicles without license plates entering the Company H park could not be managed. Therefore, Company H added vehicle model recognition technology to the vehicle entry and exit management system, solving the problem of unlicensed vehicles entering the park.

When fresh produce arrives at Shenzhen Company H Park, orderly on-site operations are essential, as the pandemic and traffic issues could severely hinder transportation. However, manual on-site management is not practical, as the massive workload would bring significant labor costs. The use of the violation handling system greatly improved the circulation efficiency of fresh produce in Company H Park. Specifically, the Non-Compliance Management System employed image recognition technology to capture behaviors such as not wearing masks according to regulations, stall products not being displayed according to regulations, and traffic violations. It prevented the spread of the pandemic among workers, ensuring that there are enough employees to maintain Company H's operation during the lockdown period. Company H regularly sampled the procured products and uploaded the results to the food safety intelligence platform. During the pandemic, Company H applied blockchain technology to the Food Safety Platform, increasing food safety traceability. When products fail the tests, Company H traced the source of the products and adjusted its procurement strategy. The Market Regulation Management System collected violations from the Non-Compliance Management System and the Food Safety Platform and compiles statistics for the reference of managers.

The design of the Practitioner Management System initially originated from the need for human resource management, collecting information on employee names, ID numbers, working stalls, and departments. With the arrival of the pandemic, a temperature module was added to the system. Employees were required to report their temperature before entering the park daily, and those with elevated temperatures will not be allowed to enter Company H Park. With the establishment of the Non-Compliance Management System and Market Regulation Management System, Company H needed to match the identity information of violating employees based on captured violations. Therefore, the employee management system added a facial information module to collect facial data for each employee. Finally, Company H integrated these systems into a mobile app, the Smart Company H app, which constantly updated and accumulated content.

Company H's information systems can be applied quickly and produce results. Unlike directly adopting systems with similar functions available in the market, the design of Company H's systems is based on the rules within the Company H park. This allows Company H's management to reduce the time spent adapting to the systems, quickly improving the efficiency of various links, as mentioned by the manager of Company H's information department:

> *External information systems need customization for Company H Park. For instance, while construction sites have helmet-capture systems, workers there are more static. In the park, helmet-wearing tricycle riders are dynamic, requiring a new understanding of park traffic rules before systems can be effectively implemented.*

### *Progressive System Synergy*

The second dimension is the synergy among Company H's systems. Although most of the systems used by Company H are customized based on the specific requirements of various stages in the fresh produce supply chain, there is collaboration among these systems, serving multiple stages. The cooperation among information systems accelerates information flow and reduces the cost of information system design.

### Information sharing

During the lockdown, vehicles were not allowed to enter and exit Shenzhen freely, which posed challenges for the transportation of fresh produce. The collaboration between the Vehicle Entry and Exit System, the Incoming Goods Reporting Management System, and the White List System resolved this issue. After collecting license plate and product information, the Vehicle Entry and Exit System and the Incoming Goods Reporting Management System share this data with the White List System, which then allowed the entry of vehicles transporting fresh produce based on license plate information, product types, and weights.

In addition, the Vehicle Entry and Exit System, the Practitioner Management System, and the Non-Compliance Management System collaborated to maintain operational order within the Company H park. Specifically, the violation photos of vehicles, stalls, and employees captured by the Violation Handling System were compared with the vehicle and employee information collected by the Vehicle Entry and Exit System and the Practitioner Management System to identify the responsible individuals and impose penalties. At the same time, these violations, along with those detected by the Food Safety Platform, were uploaded to the Market Regulation Management System for visualization.

The Practitioner Management System shared information with the Health Commission System. On the one hand, when an outbreak occurs in the residential community where an employee lives, the Health Commission System shared the employee's information with the Practitioner Management System, allowing Company H's management to promptly isolate the affected individuals. On the other hand, when Company H identifies an employee infected with the novel coronavirus, the Practitioner Management System shared the information with the Health Commission System, which then conducts contact tracing.

### Multi segments serving

Not only did the information systems collaborate with each other, but they also served multiple aspects, reducing the use of redundant systems and compressing the cost of informatization. WeChat and SMS were often used for communication between Company H management, employees, and e-commerce platform purchasers, assisting these stakeholders in their procurement and sales processes. Initially, the Vehicle Entry and Exit System was established in accordance with the entry and exit of Company H Park; however, as the system continuously evolved, it was also applied to the entry and exit of trucks in Shenzhen and the maintenance of traffic order within the park. Employee information in the Employee Management System was required by various aspects of logistics and on-site management. The Non-Compliance Management System and Market Regulation Management System not only prevented the spread of the epidemic among employees but also regulated market order and accelerated the circulation of fresh produce.

## *Facilitative IT Confluence*

### IT enabled interorganizational collaboration

Organizations with interrelated tasks require collaboration. Information systems can serve as a bond for these organizations, enhancing trust among them and improving the efficiency of cooperation. In our case study, Company H, the AMR, and the TB used information systems as a bond to collaborate and accelerate the logistics aspect of the supply guarantee process. Logistics is an essential component of the fresh agricultural product supply guarantee and embodies the uniqueness of Shenzhen's supply guarantee. During the lockdown period, Company H, the AMR, and the TB cooperated to resolve the contradiction between prohibiting vehicles from entering the city and allowing fresh produce transportation vehicles to enter.

The White List System served as the bond that led to their collaboration. They ensured the smooth passage of transport vehicles by sharing information through the whitelist system. Specifically, to reduce logistics costs, Company H merchants utilized social logistics companies rather than corporate logistics companies, resulting in a large and diverse number of vehicles transporting fresh produce. This made it difficult for the TB to quickly identify vehicles carrying fresh produce, causing congestion. To solve this problem, the TB established a whitelist system, allowing the rapid release of registered logistics vehicles in the system. The White List System fostered mutual trust and collaboration between Company H, the AMR, and the TB. Company H obtained the license plate numbers of logistics vehicles in advance through the Vehicle Entry and Exit System and the Incoming Goods Reporting Management System, which were promptly uploaded

to the whitelist system. The TB released the trucks based on the license plate numbers in the whitelist system, without needing to check the products being transported, accelerating the circulation of goods. As a senior manager at Company H stated,

> *Most merchants use their own trucks to purchase goods, and eat and stay in the trucks, which greatly reduces costs. At the same time, the trucks are too complicated, and it takes too much time for the Transportation Bureau to confirm the goods on the trucks one by one, so there is a white list system, and the cars registered in the system are directly released.*

During the on-site management stage, the Practitioner Management System and the Health Commission System led to collaboration between Company H and the Health Commission. Both Company H and the Health Commission developed information systems to enhance their efficiency in completing tasks. At the same time, the use of these information systems opened up more possibilities for the two parties to collaborate in solving common problems. For Company H, ensuring that the epidemic did not spread among employees was the foundation for maintaining operational capabilities during the lockdown. Therefore, Company H needed to quickly isolate employees infected with the novel coronavirus and those at risk of infection. Information systems could help Company H quickly locate employees within the park.

> *When an epidemic occurs in the community where the practitioners live, the system of the Health and Medical Commission will transmit the information to the management system of the practitioners, and we will find this person and isolate him.*

#### IT enabled intraorganizational collaboration

Moreover, information systems also empowered internal collaboration within the organization, leading to closer connections between Company H managers and merchants. Through information systems, Company H management ensured information symmetry among merchants, safeguarding the interests of merchants, Company H, and the general public. Specifically, the source of goods might be unable to supply products due to an outbreak of disease or extreme weather conditions. Company H management would obtain advance information through strong relationships with the source of goods and disseminate the news to merchants via WeChat and text message channels. Merchants would then adjust their procurement strategies based on the information, ensuring that sufficient stock was available for each category of fresh produce, and stabilizing product prices. As a senior manager at Company H mentioned:

> *For instance, if an outbreak or heavy rain occurs in Guangxi, fresh products become unavailable. Our strong supplier relationships provide early info, which we share with merchants through WeChat or SMS, directing them to buy from Fujian or Shandong instead. Without this, some merchants may face shortages and price hikes. We act as a market organizer and gain their trust.*

### *User-Attuned Technological Adaptation*

The user-friendliness of Company H's information systems determines the extent to which they can fully exert their utility. As can be seen from Table 1, the information systems used by Company H can be divided into two categories. One category involves complex IT technologies, such as the violation handling system that employs image recognition technology to capture instances of improper mask-wearing, irregular placement of items, and violations of traffic regulations within the park. The vehicle entry and exit system utilizes vehicle model recognition technology to identify vehicles without license plates, and the food safety intelligence platform employs blockchain technology to trace the source of abnormal video detection. The other category includes easy-to-operate systems, such as WeChat and text messaging, which are used as daily communication tools by the Chinese for communication among Company H management, merchants, and e-commerce platform purchasers during the supply guarantee process. Company H merchants use the stall management system to pay rent, and Company H employees upload daily temperature data to the employee management system.

The users within the Company H platform ecosystem are diverse, including employees from the government and Company H's information department, as well as employees within the Company H park. The information department employees have a higher level of IT literacy and can proficiently operate information systems embedded with complex technologies after training and assessment. In contrast, employees within the Company H park have a lower level of IT literacy and are more suited to using simple,

functional information systems. As a result, Company H selects information systems for users based on their IT literacy, ensuring the ease of use of all systems. As a senior executive in Company H's information department mentioned:

> *One challenge in system development is changing habits. Managers, usually well-educated, adapt quickly after training. However, some merchants struggle with complex systems due to their diverse backgrounds and low literacy. In China, WeChat and SMS are popular, simple communication tools that even non-typists can use through voice or speech-to-text. Thus, these tools align with their habits, making them easier to accept.*

| Systems | Functions | Users | Outcomes | Technologies |
|---|---|---|---|---|
| Practitioner Management System | Register the information of employees in all departments in the park | Company H managers<br>merchants<br>HCSM | Prevent spread of virus among practitioners; Efficient operation in Company H park | |
| Market Regulation Management System | Count violations of fire safety, food safety, market order, traffic, security, and apartment regulations | Company H managers AMR | Reduced violations of fire safety, food safety, market order, and traffic order in Company H park | |
| Incoming Goods Reporting Management System | Report the category, weight, truck license plate number, and target fresh produce stalls before arriving at Company H park | Company H managers<br>merchants | Obtain the incoming goods information in advance, adjust the purchase strategy, and ensure sufficient supply | |
| Pricing Management System | Report the price of the produce from different areas | Company H managers AMR | Adjust purchase strategy according to price information | |
| Non-Compliance Management System | Capture incorrect masks wearing, incorrect placement of goods, and vehicles with excessive emissions | Company H managers | Prevent spread of virus among practitioners; Efficient buying; efficient traffic | Image Recognition Technology |
| Vehicle Entry and Exit System | Identify the type of trucks and license plates | Company H managers AMR<br>TB | Improve entry and exit efficiency | Vehicle Identification Technology |
| Food Safety Platform | Collect and count food safety testing data | Company H managers | Ensure food safety | Block Chain Technology |
| WeChat and SMS | Communication | Company H managers<br>Merchants<br>E-commerce | Ensure adequate supply | |

**Table 1. Company H Systems**

## Discussion

Through an in-depth study of Company H-centered ecosystem, we obtain the orchestration mechanism for stakeholders within the platform ecosystem collaborate so as to supply fresh produce during the city lockdown period. We say that consistent with previous literature on institutional logic, Company H platform ecosystem stakeholders such as AMR, Company H, and Missfresh carried different institutional logic that hindered their interaction. Consistent with institutional theory, we suggest that instead of working on their own, enterprises comply with the institutional logic of government due to its coercive pressure. Under the guidance of the new logic, stakeholders use information systems to improve operational efficiency. Information systems are continuously iterated by appropriate users while also leading interorganizational collaboration among stakeholders. This integrated mechanism helps stakeholders respond quickly when facing crises. In our case, Company H ensured an adequate supply of fresh produce and stable prices during the lockdown period through this mechanism. Figure 4 shows the specific content of this mechanism.

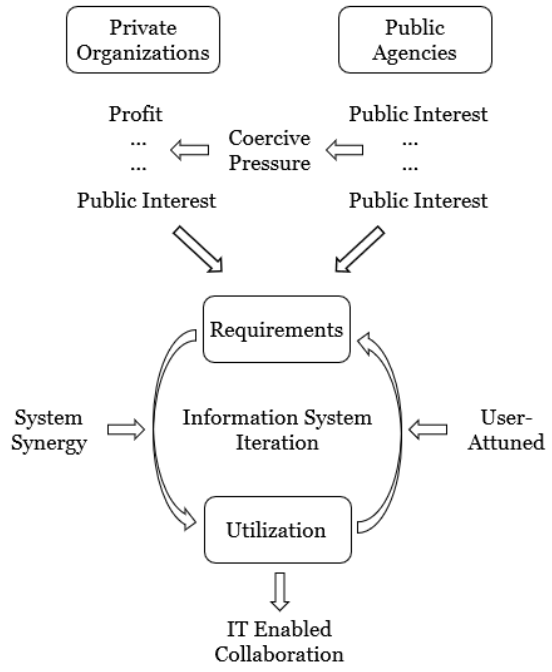


**Figure 4. An Integrated Mechanism of the Company H Platform Ecosystem Orchestration**

It is widely recognized that institutional logic varies among organizations from different sectors (Saz-Carranza and Longo 2012). Public agencies, owned by political forces (Boyne 2002), prioritize maximizing happiness (Duncan 2010; Frijters et al. 2020), which during an epidemic means ensuring a healthy life with sufficient necessities. In our case, AMR considers the supply of safe fresh produce as one of their institutional logics. In contrast, private firms, controlled by stakeholders and market forces (Boyne 2002), focus on high profits, and their primary logic for selling fresh produce on e-commerce platforms is to increase profits by retaining customers through large purchase volume and high purchase frequency.

To ensure residents' livelihood, the Shenzhen government used coercive pressure through policy releases to change the institutional logic of private sector enterprises. Under government pressure and social responsibility, these enterprises adjusted their profit-oriented institutional logic and adopted the government's public interest-oriented institutional logic. One of the senior managers said:

> *We regarded the epidemic as order and prevention as responsibility…We actively organized the main merchants in the market to strengthen the ability of sourcing, mobilized a number of distribution merchants promptly to increase the delivery volume, and ensured that Wal-Mart, Pupu, Meituan, and other channels had sufficient supply with stable prices.*

In times of crisis, a new organizational logic is formed. First, information systems required by the new organizational logic are customized and continuously iterated based on changes in the environment and demands during the application process. Secondly, during the iteration process, the design of information systems should consider the needs of the entire process rather than just targeting a single stage. At the same time, information systems should share information with each other to reduce the cost of duplicate information collection and improve usage efficiency. In addition, based on similar organizational logic,

organizations can establish connections between information systems, thereby strengthening trust between organizations and accomplishing tasks that are difficult or impossible to complete individually.

## Contributions

Our study contributes to the literature in three aspects. Firstly, we investigate the governance of online fresh produce platforms from an ecosystem perspective and explore how the utilization of IT technologies assists platform ecosystem orchestration, thereby expanding the existing literature on platform governance. Secondly, we enrich the understanding of the impact of public sector stakeholders in the platform ecosystem and explore collaborative behavior within this ecosystem based on institutional logic literature. Particularly during the epidemic, effective collaboration should be led by the government instead of relying solely on the market. Thirdly, we enrich the literature by identifying the role of information system-enabled collaboration and on-site management, which can significantly improve management efficiency during contingencies.

Our findings offer valuable managerial implications, emphasizing that user-friendly information systems can enhance utilization efficiency, particularly in emergent situations. While previous research on information systems has predominantly focused on utilizing high-end information systems, there is limited research on information systems that leverage simple information technology. Particularly, when users with low literacy levels face advanced technology and uncertainty, they may struggle to effectively utilize the information technology, resulting in inefficient operations within the platform ecosystem. Our case study suggests that, instead of using Company H-specific communication apps, practitioners with low literacy levels in the Company H platform ecosystem successfully conducted communication and transactions using low-literacy IT tools such as WeChat and SMS.

The occurrence of a pandemic has arisen new demands for organizational agility, and the introduction of new information technologies or systems has addressed these needs, significantly enhancing the competence of the entire operational process. In the future, once crisis happens, organizations can directly utilize these information systems to navigate through the crisis. Furthermore, certain information systems be embedded into routine technologies and continue to improve day-to-day operational efficiency. In summary, the impact of the pandemic has altered the operational logic of organizations within the platform ecosystem. Continuously iterating user-attuned and synergic information systems can guide the collaboration of stakeholders within the ecosystem, thereby absorbing the negative effects brought by the pandemic and leading to a long-term enhancement of competence.

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