

Short food supply chains in China: A knowledge management perspective

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Abstract

This paper studies short food supply chains (SFSC) in China from a knowledge management perspective. Using Knowledge Based View and Resource orchestration theory, this paper aims to answer the following research question: *How does knowledge management help explain the e-commerce enabled SFSC?* Using a case study of a Taobao villages in China, the knowledge management as well as the level of e-commerce maturity aspects are explored. We use a case study approach which combines semi-structured interviews with relevant managers, and secondary data. Both coding and template analysis are applied. A rich in-depth understanding of knowledge management aspects (acquisition, possession and utilisation) and their contribution to improving the organisation's performance is provided. This paper contributes to the discussion of e-commerce enabled SFSC, and hence providing interpretation and understanding of a local operation mechanism of the e-commerce enabled SFSC.

Keywords—Short food supply chain, e-commerce, knowledge management, case-based research.

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1. Introduction

Short Food Supply Chain (SFSC) practices focus on facilitating multiform proximities in producer-customer relationship and providing quality food products that are different from the mass-produced ones (Renting *et al.*, 2003; Blasi *et al.*, 2015). The SFSC concept is not modern because similar practices—such as food trading between neighboring areas—have been historically common and still exist in the places where public infrastructure is underdeveloped (Tudisca *et al.*, 2014; Dubois, 2019).

SFSC is interpreted in terms of political- economic, social, territorial governance, etc., hence reflecting new meanings of repositioning and resocialising food production of global markets or highly industrialised practices, and of fighting social exclusion and promoting fair trade (Marsden *et al.*, 2000).

Due to these innovative new meanings and significance of the SFSC in providing a solution to those sustainability issues triggered by conventional food provision, it is observed that attention is given to the SFSC from the government level, especially in some developed countries where SFSC practices are rapidly growing (Bimbo *et al.*, 2015; Eugenio *et al.*, 2017; Popp *et al.*, 2018). For instance, the American government sees the SFSC as an important tool to facilitate new food citizenship; agrarian citizenship; and civic agriculture. In addition, SFSC can have a positive impact on promoting residents' access to food and nutrition. A common form of SFSC practice is farmer markets—which have tripled in number in the US from 1,755 to 5,274 between 1994 and 2009 (Hergesheimer and Wittman, 2012; Bimbo *et al.*, 2015). Numerous efforts have been made by European developed countries where most of existing practices and discussions of the SFSC are generated (Renting *et al.*, 2003; Bimbo *et al.*, 2015; Enjolras and Aubert, 2018). According to the EU regulation No. 1305/2013 and the Common Agricultural Policy 2014-2020, advocacy of the SFSC has been officially defined as a priority in securing long-term sustainability and development of European rural regions (Giampietri

et al., 2016).

Although more than 20 years have passed since the first concept of SFSC (Marsden *et al.*, 2020), this research suggests that understanding it remains limited after reviewing literature of research on SFSC, which is also reflected by the lack of consensus on some of the key elements of SFSC—such as: a widely recognised definition—and the lack of a timely summary of research achievements and gaps (Renkema and Hilletofth, 2022). Therefore, there is a need to re-assess theoretical routes and future directions of the SFSC research. Nonetheless, such a plan is rather challenging, considering the potential restrictions caused by complexities and diversity of the SFSC—such as diverse typologies, definition confusion and the SFSC’s unclarified relations to other similar food management concepts (Grant and Booth, 2009; Ilbery *et al.*, 2006; Kneafsey *et al.*, 2013). In this regard, this research follows the philosophical stance of interpretivism and repositions the idea of this research as a beginning of future discussions, and determining a research agenda on its main contribution as introducing broader research avenues via developing an insight into operation of a particular type of the SFSC practices—i.e., the e-commerce enabled SFSC.

A case sampled from China’s Taobao villages—a group of rural villages dedicated to e-commerce enabled by Taobao.com selling Hickory nuts—are chosen as they have a strong connection with concept of the SFSC.

The research question addressed in this paper is: *How does knowledge management help explain the e-commerce enabled SFSC?*

The remainder of this paper is structured as follows. Next, section 2 explores the literature review. Then, section 3 shows the methodology. Furthermore, section 4 provides results. Finally, section 5 provides discussion and conclusions.

2. Literature Review

2.1 Basics of short food supply chain (SFSC) knowledge

Interpretations of the SFSC have been carried out throughout its theoretical development by a series of discussions with national authorities and organisations (Kneafsey *et al.*, 2013; Kneafsey, 2015; Augère-Granier, 2016). However, because those interpretations often use the term “short food supply chain” to reflect a variety of social meanings and criteria (Jarzębowski and Bezat, 2018), confusion has arisen in how to accurately define the SFSC (See *Table 1* *Error! Reference source not found.*).

[Insert Table 1 around here]

Besides categorising the SFSC by region or food type that cause fragmented results (Nakandala and Lau, 2019), the SFSC is also categorised based on how customers perceive closeness towards food processing and production, hence including the face-to-face SFSC; the proximate SFSC; and the spatially extended SFSC (Marsden *et al.*, 2000). That paper argues that the method’s exclusion of supply chain intermediary is debatable, especially when the SFSC as well is a supply chain knowledge, and the critical role of intermediaries is verified by influential research institutions—such as the Council of Supply Chain Management Professionals (CSCMP) (Gibson *et al.*, 2005; Engelseth, 2016).

In the operations management field, Todorovic *et al.* (2018) discuss the distribution design and its performance in different scenarios and Gruchmann *et al.* (2019) show the determinants to more sustainable distribution—i.e., supply chain orientation; coordination; innovation; and strategy. Their works have reflected the fact that as being an alternative practice to the highly industrialised conventional food provision, achieving balance between costs and outcome becomes the primary challenge faced by the SFSC in operation, in which distribution design plays a critical part. However, they have focused mainly downstream actors such as customers and hence neglected the other operational practices in upstream such as suppliers.

In the ICT field, Elghannam *et al.* (2017); and Espelt *et al.* (2019) inform the positive outcomes generated by integration of the ICT and the SFSC in practice—that are, re-connecting producers and customers; promoting agroecological cooperativism and factors facilitating this outcome such as social network building; and platform’s strong capability. Although their works disclose how the SFSC is affected by the ICT to some extent, they lack in-depth examinations and considerations of potential negative outcomes which leaves room for future discussion.

Furthermore, in the resilience field, as the latest response to the global COVID-19 pandemic, Thilmany *et al.* (2020) discloses two favourable features of e-commerce enabled SFSC when in operation, (1) allowing managers’ fast and accurate decision making; and (2) enabling higher efficiency of supply chain operation. More importantly, this work is one of the few studies that underline the SFSC’s supply chain nature in SFSC research, and it is envisaged that more papers will appear on this topic.

2.2 Knowledge-based view (KBV)

The connection is identified between the KBV and the e-commerce enabled SFSC. As essence of the e-commerce enabled SFSC is virtualising achievement of the dual proximity by committing to e-commerce, its practice is bound to be related to application of the ICT and hence it consists of the possession and utilisation of diverse knowledge—especially when its practice also requires disintermediation and the creation of customers’ perceived closeness to food processing and production.

To ensure efficient adoption of the KBV, it is good to be aware of its limitations, i.e. KBV does not provide: 1) how knowledge is acquired and possessed; 2) how possessed knowledge is then utilised; 3) a clear definition of knowledge; and 4) explanatory power and problem-solving capacity when it is adopted on its own. Essentially, these limitations have caused

researchers to either adopt complementary theories or develop the definitions fitting their own demands. For example, in the research of supply chain manager's risk mitigation competency, Ambulkar *et al.* (2016, p.1398) define knowledge as “*the information about firm's resources that pertain to management of supply chain risk*”.

This paper extends the definition by Chaffey *et al.* (2015) and posits that: knowledge is the combination of data and information, to which is added expert opinion, skills and experience, to result in the valuable asset, which can be used to aid decision making of local managers, by which their e-commerce enabled SFSCs are driven.

The framework proposed by Chaffey *et al.* (2015) shows four core activities that together enable knowledge management in practice, this research further suggests that enabling knowledge management at the same time means accomplishing knowledge acquisition that allows knowledge possession. Therefore, four core activities of knowledge acquisition include: 1) knowledge identification via which knowledge is analysed for availability and completeness based on demand; 2) knowledge creation via which knowledge is created in either individual or organisational level; 3) knowledge storage via which explicit knowledge is stored through structured methods, while tacit knowledge is stored in either individual minds or organisational routines; and 4) knowledge sharing by which knowledge availability is increased and it helps ensure knowledge is correctly utilised (Chaffey *et al.*, 2015).

This research introduces a second complementary theory to this research—that is, the resource orchestration theory (ROT). This theory proposes a series of managerial activities and elements that in detail explain how organisation's resource is orchestrated to generate sustained competitive advantages, which is suitable to complement the as it helps explain how possessed knowledge as organisation's fundamental resource is orchestrated in practice. Besides, participation of the second theory in this research would also enhance its explanatory

power and problem-solving capacity when facing the planned research discussion involving in-depth examination of supply chain.

2.3 Resource orchestration theory (ROT)

D'Oria *et al.* (2021) reviewed the KBV knowledge. Their work not only recalls theoretical origin and development of the KBV, but also verifies complementary relationship between the resource orchestration theory and the resource-based view, by which they further propose the research pathway of “strategic resources–actions–performance”. Overall, this section informs knowledge of the resource orchestration theory via introducing its theoretical essence; developing insight into the extent of its adoption; and justifying its adoption to this research.

Starting with recommendations of D'Oria *et al.* (2021), several works are identified as being core to theoretical discussion of the resource orchestration theory, and they include works of Sirmon *et al.* (2007); Helfat *et al.* (2007); Sirmon *et al.* (2011)—these works underpin this research.

Like the KBV, the resource orchestration theory is another theory that originates from the resource-based view, and it first emerges in the latter's extended discussion of how possessed resource is effectively utilised for value creation (Sirmon *et al.*, 2011). In brief, to complement the resource-based view's theoretical limitation showed by the extended discussion, Sirmon *et al.* (2011) integrate discussions of two external research streams—i.e., streams of the resource management and the asset orchestration, and thus invent the resource orchestration theory that enables a framework through which possessed resource can be effectively utilised in practice (Sirmon *et al.*, 2011; D'Oria *et al.*, 2021).

The resource orchestration theory has inherited and displayed both theoretical and practical features of the resource management and the asset orchestration. Therefore, the resource orchestration theory proposes that to effectively utilise an organisation's possessed resources for value creation, managers should focus on practices of the three managerial activities: 1)

structuring activity by which possessed resource is acquired, accumulated and divested to form a resource portfolio; 2) bundling activity by which the structured resource portfolio is then stabilised, enriched and pioneered for needed organisational capacities; and 3) leveraging activity by which the bundled and oriented resource is mobilised, coordinated and deployed to finish transforming possessed resources into competitive advantages as value creation (Sirmon *et al.*, 2007; 2011). In addition, the resource orchestration theory lists three organisational elements which affect the utilisation, that are, organisation's 4) governance and organisational structure; 5) business model; and 6) innovation. In practice, the three elements not only directly affect the utilization — for example, a corporation can directly achieve value creation by its subsidiaries' innovations—but also are affected by the utilisation at the same time — for example, a corporation might plan to establish new departments that change its extant governance and organisational structure, for facilitating the utilisation. Furthermore, the resource orchestration theory emphasises that although these three managerial activities and three elements can affect the utilisation alone, 7) potential of resource orchestration is unleashed when all six are synchronised and work in concert with each other (Sirmon *et al.*, 2011; D'Oria *et al.*, 2021).

The connection between the KBV and the resource orchestration theory is primarily reflected by how they share the same theoretical origin as the resource-based view, which gifts them the similar theoretical essence as emphasising the role of possessed resource/knowledge in value creation. Then, since the resource orchestration theory offers a concrete resource/knowledge utilisation framework that the KBV lacks in explaining value creation, the resource orchestration theory can play the theoretical extension of the KBV in discussion. This viewpoint of extension is accepted by previous research as well, and it inspires the research pathway of “possessed knowledge— resource orchestration—measurable or evaluable performance”, which is identified and applied in this research to support structuring the initial framework for its significance in enabling a complete research procedure. Furthermore, to ensure that the applied research pathway achieve its completeness

in practice, this research introduces the four knowledge acquisition activities that specify how knowledge is acquired before possession and utilisation. The theoretical framework used in this paper is provided in *Figure 1*.

[Insert Figure 1 around here]

3. Methodology

This research uses multiple case studies, as their properties of exploring phenomenon or system within real-life context and of benefiting interpretivism in research scenario setting (Saunders et al., 2019), these two properties are well in line with essence of the determined interpretivism which emphasises participation of researchers in the discussions with small sample size but in-depth investigation, for helping understand the real world contents from research target's point of view (Saunders et al., 2009).

For more basics of case study, according to the summative works of Yin (2003) and the latter Creswell (2013), case study indicates “*an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*” (Yin, 2003, p.13), and this empirical investigative enquiry has been normally processed by “*detailed, in-depth data collection involving multiple sources of information...and reports a case description and case themes*” (Creswell, 2013, p.97). Also, case study is widely recognised as a valid methodology or strategy that is frequently chosen by researchers to guide their discussions with either single or multiple cases (Yin, 2003), in which interview; observation; and document analysis are the most employed cooperative instruments to enable their data collection (Gibbert and Ruigrok, 2010). In this research multiple case study is chosen to guide this research's discussion, as they help develop stronger analysis by allowing comparison in between multiple research cases (Baxter and Jack, 2008), thus more robust and reliable findings can be identified or generated comparing with single case study (Yin, 2003; Baxter and Jack, 2008).

This research uses ten semi-structured interviews, which were audio recorded and analysed using thematic analyses, as the main source of data, followed by a secondary data collection of websites or documents provided by the case study company. See *Appendix 1* for the interview questions.

To facilitate discussion of this research, a case sampled from China's Taobao villages—a group of rural villages that dedicate to the e-commerce enabled by Taobao.com—is chosen, because it has a strong connection with concept of the SFSC. Additionally, as a booming economic phenomenon in a developing country, a Taobao village's participation in this research also adds to the research in developing countries, such as China, to current research of the SFSC.

4. Findings

This section presents the findings of a Taobao village in China which specializes in the production of Hickory nuts.

4.1 Basics of local e-commerce enabled short food supply chains

Supply chain structure

The *Figure 2* shows the basic steps to process hickory nuts case, and by combining it with the SFSC definition proposed earlier, local supply chain structures and the roles played by managers in operation become much clearer. First, for the two managers identified to be fully independent after registering with the two required licenses—i.e., licenses for nut roasting and packaging, they can practise all the basic steps hence they are the producers of direct sales and own the simplest SFSC structure that is without intermediary. Second, for another two managers identified to register with the nut packaging license only, they can practise all basic steps except nut roasting and it leads them to play the only intermediary in the SFSC structure, relying on upstream supply and operating in the indirect sales form. Third, for those managers identified to fail registering with neither of the two licenses, they should be excluded from nut roasting and packaging but still be able to practise the rest steps, hence they play the only supply

chain intermediary and embrace indirect sales. Finally, for those managers who have been no planning for registration and professional long-term operation, they play the only intermediary in the SFSC structure and embrace indirect sales as well; however, they are normally found avoiding practice of any processing step and fully rely on the finished products from upstream.

[Insert Figure 2 around here]

Although supply chain structures with and without the only intermediary are identified in local managers' operations, operations of the structure without intermediary are found special inside the village as it can significantly affect operations of the rest local majority who play as intermediary. Information suggests this is caused by the rigour requirement of being in hickory nuts industry, as registering with either of the two licenses of nut roasting and packaging—the two vital steps composing a complete hickory nuts processing—is demanding for investments and land use, which hence leads local majority to often fail both registrations, leaving them to rely on processed nuts supplied by regional licensed plants—such as the plants owned by the two managers of direct sales—with which they establish cooperative relationships. As a result, these relationships not only increase complexity of local context, but also divide operations of the e-commerce enabled SFSC into four groups, and each group displays its unique features in operation.

Creation of customers' perceived closeness

Table 3 displays methods employed by SFSC managers in Hickory nuts case to create online customers' close feeling towards their hickory nuts products or operations. To summarise, local SFSC managers are passionate about practices of improving customers' experiences and fostering customers' loyalty, among which recruiting skilled customer services employees and investing in platform's traffic services to increase frequency of customers seeing own products, these two become important practices to their daily operations and where most of their online

operating costs are from. Moreover, managers are found having stressed the role of information embedment in closeness creation, paying constant efforts to explore the best way of transferring prepared information to customers through designs of e-store and product descriptions, which especially involves e-store decoration and product photography that often drive local managers to seek supports from external agencies; forging own skills of decoration and photography; or recruiting professionals to join own operational team. This could be a result of the feature of processed food since similar industrial processing steps have led to local managers' homogeneous nut products, thus demanding marketing strategies, such as the use of extraordinary product images to create individual uniqueness when competing in hickory nuts e-commerce for customers.

[Insert Table 3 around here]

Interactions with online e-commerce platform

The evidence indicates complexity in between platform and SFSC managers in Hickory nuts case as the platform has been engaging them with its two-fold role, which is also strongly perceived by local managers during their SFSC operations. On the one hand, local managers understand that platform is foundation to their e-commerce practices, and it would continue to serve their needs and lead them to more efficient operations via support mechanisms, such as platform customer services; big data; and held online activities. On the other hand, local managers and their SFSC operations receive constant pressures from the platform, as the latter has been profiting by charging them for all possible practices; issuing new regulations that increase demand for operation; and treating the managers differently according to their scales. Moreover, due to the homogeneous feature of hickory nuts products and the sensibility of selling processed food that relates to law and regulation requirement, SFSC managers in Hickory nuts case hold deeper understanding of the pressures given by the first two, which

further pushes them to see the investment of platform's traffic services and resolving license registration or upstream cooperative relationships as the two priorities of their everyday practices.

Interactions with offline local context

A variety of interactions between the managers and local context are discovered in the Hickory nuts case, which is also evidence of the rich factors existed in the village that have deeply connected to and shaped the managers' operations of e-commerce enabled SFSCs. First, five factors are identified in the material set of Hickory nuts case, which include quality of available courier services; local transportation conditions; development of accessible allied industries; a critical government institution directly affecting daily operations of local SFSCs; and limited land in terms of geography.

Benefited from profound industrial basis in the district region, essential accessible allied industries such as nut roasting in nearby villages and towns have strongly underpinned local managers' SFSC operations from the beginning, especially for the two managers' licensed plants within the village area, which have monopolised majority local others' upstream supplies. Further to this license issue and its impact, as the government institution carried obligation of inspecting food production, the township Market Supervision and Administration Authority is in charge of local managers' license registrations for legally executing hickory nuts roasting and packaging steps, and also inspects their cooperative relationships established upstream, calling operations to stop for further investigation and penalty if inappropriate practices such as using other's license code on finished products are found. Those inspections are rather tricky to local managers, since lots of them have been packaging roasted hickory nuts supplied by upstream plants by themselves, and then printing the plants' packaging license codes on products for law and regulation requirement. Local managers describe this practice as a no-choice solution to profit squeeze caused by constant price war, because packaging nuts by themselves is a more

manageable practice than nut roasting and it cuts operating costs effectively. However, despite being much more manageable, registering for packaging license is still challenging even after local managers' efforts, and one vital reason behind is the limited land of Hickory nuts case. Since being embraced by the Tianmu mountain, Hickory nuts case is squeezed into a stripe shape sitting against a river so its land area per capita of the total 551 households drops to a minimum, making the work areas that local managers could arrange for practising packaging step to often fail meeting the modern industry standard followed by registration. As one of the managers with no license but dedicate to long-term operation, interviewee_E stresses this land issue with own experience:

“Land use is the biggest problem. I face a crisis of storage space at present, especially when both my online and offline practices are finished in this house. I have to borrow local others' spaces to store my harvested hickory nuts when peak seasons come. In peak seasons, all processed nuts; myself; my family members; and recruited workers are crowded in here, leaving no space for eating.” [Hickory nuts case, interviewee_E]

The similar interrelations and their enabling and suppressing impacts on local managers' SFSC operations are observed in two factors from the spiritual set of Hickory nuts case—i.e., the previous norms and values and the existing e-commerce atmosphere. Basically, the previous norms and values represent the abstracts rooted in local living traditions long before e-commerce, such as friendships; neighborships; kinships; unity in community; and also, the managers' strong bond to Hickory nuts case as their home. Abstracts like these enable and facilitate emergence and growth of local e-commerce enabled SFSCs, since they have in effect encouraged active sharing and learning in between the managers from the beginning—for example, learning e-commerce for the first time from neighboring pioneers, or sharing each other accesses to nearby relatives' nut processing plants. Nonetheless, the effect is not always positive as it is sometimes criticised for intensifying price war and other competitions in the

village. According to interviewee_B:

“I don’t think it is appropriate that managers gather in one place as it causes leaks of own business secrets; those employees of different managers often chit-chat when they off work. ... Our plans of new packaging; marketing; etc., it becomes difficult to keep them in secret because people are too close to each other and walk around. ... Maybe the managers with small scales could gather together as their need of competitiveness is low, but it is definitely not the case with the managers with larger scales.” [Hickory nuts case, intervieweeB]

Despite being a double-edged sword, effect of the previous norms and values has been overall appreciated by local managers and affected the existing e-commerce atmosphere. In summary, by standing on the shoulder of the previous effect, hickory nuts e-commerce in Hickory nuts case soon experiences a flourishing development and it produces the even more friendly atmosphere that enables local managers’ SFSC operations to continue to grow and mature. The atmosphere develops two important results, the first one is the change to regional hickory nuts industry that leads nut processing plants; packaging material production; and courier services to change their offline strategy, thus they now actively serve local SFSC managers. The second is investments from local government after being aware of the huge economic and social benefits generated by SFSC managers in the village, which include improvements to local infrastructure; assisting establishing village-level e-commerce association; finding alternative solution to local land use; organising training sessions; and encouraging more local residences to grow into managers in hickory nuts e-commerce. Although the results enhance positiveness of the existing e-commerce atmosphere and enrich the material set, they bring modern business competitions as well that greatly suppress local managers’ operations of e-commerce enabled SFSCs, such as constant price war and destructive competitions, which are further intensified by the complex relationships between the four groups of operations (See **Table 2**); limited land;

license issue regarding nut roasting and packaging; and even the managers' strong bond to Hickory nuts case as their home. Again, according to interviewee_B who just complains about own operation being threatened by local business competitions, but deciding not to leave Hickory nuts case in the future for opportunities:

"I think about moving my business to the regional industrial park but finally abandon this idea. ... I'm a native of Hickory nuts case, I know everything here so I don't want to leave." [Hickory nuts case, interviewee_B]

[Insert Table 2 around here]

4.2 Knowledge acquisition

When investigating the role and impact of the four knowledge acquisition activities— i.e., identifying; creating; storing; and sharing—in the village (See **Table 4**), the first emerged finding is that instead of acting individually, these four activities strongly interconnect to each other and act synchronically in practice, serving one another as cause and effect. For instance, to acquire better nut roasting knowledge, local managers owing nut processing plant plan visits to regional others to share understanding of temperature control and flavouring, during which inspirations are identified and contribute to the created new nut roasting technique that is stored in the managers' minds for future sharing and the knowledge utilisation in operation. In other words, these four activities together enable fragmented knowledge contents to be acquired from local context, and then the acquired contents are fully possessed by local managers after being orchestrated into knowledge types according to different orientations—such as digital literacy and hickory nuts knowing. Therefore, knowledge acquisition is tightly connected to knowledge possession in practice.

[Insert Table 4 around here]

Furthermore, connection is also identified in between the four knowledge acquisition activities and knowledge utilisation, especially for the three elements underlined by the latter, that is, the

elements of innovation; governance and organisational structure; and business model. Overall, this connection is contributed not only by the fact that creating activity of the four has the same innovative and boosting effect with the innovation element of knowledge utilisation, but also by how elements of governance and organisational structure and business model can affect the four in practice. In specific, because of impact of these two elements, operations of e-commerce enabled SFSCs in the village are customer oriented and related to the four operational groups demonstrating varying degrees of institutionalisation. This impact is furthered on knowledge acquisition, giving strong orientations to local managers when they execute the four knowledge acquisition activities—i.e., identifying; creating; storing; and sharing. As a result, acquisition of the fragmented knowledge contents that are customer friendly and fitting to own demands and situations determined by featured operational groups becomes priority to SFSC managers in Hickory nuts case, triggering utilisation of a series of relevant knowledge in operation, such as product photography; plant management; and cooperative relationship establishment.

4.3 Knowledge possession

Table 5 summarises knowledge types possessed by the SFSC managers in Hickory nuts case, among which many of them show clear exclusiveness to certain groups of the managers.

[Insert Table 5 around here]

This is a result of the nature of processing hickory nuts in Hickory nuts case as it usually demands various investments—i.e., investments in land; finance; techniques; human resources; etc., therefore only a few local managers can meet them. Nonetheless, instead of seeing own SFSC operations being continuously hindered by the challenging investments, the rest local majority begin to actively seek for alternative solutions in complex local context, which eventually leads to creation of the knowledge of cooperative relationship establishment. In summary, by establishing long-term cooperation with those regional others having sufficient capacity to supply them with semi-processed roasted hickory nuts or finished products, local

majority not just accomplish securing their supply chain upstream, but also effectively offset the operational pressures from unavoidable restrictions—such as limited land and the rigorous license registration that follows industrial standard. This cooperative relationship establishment is actually complicated, since it involves a series of managers' comprehensive evaluations on potential suppliers and it is often affected by the previous norms and values in local context—such as neighborships and kinships. Furthermore, this cooperative relationship establishment is expected to be even more complicated, if managers attempt to settle private agreement with upstream suppliers for using the latter's packaging license codes when packaging roasted nuts by themselves. Interviewee_I explains the establishment of own cooperative relationships:

“I work with several suppliers at the same time, each of them supplies me with roasted hickory nuts of a particular flavour ... I work with the plant of interviewee_E because it is professional at processing cream flavoured roasted nuts; holds good reputation in the village; and transportation between the plant and my place is convenient. I have long-term agreements with my suppliers, which help secure that my orders are first to be fulfilled when peak seasons come.” [Hickory nuts case, interviewee_I].

4.4. Knowledge utilization

Managerial activities of structuring, bundling and leveraging

The three managerial activities—i.e., structuring, bundling and leveraging—together underpin the everyday knowledge utilisation that contributes to operations of local e-commerce enabled SFSCs; this is the first common opinion reached by most of the interviewed managers in Hickory nuts case, after recalling on their previous knowledge utilisation experiences. The reason behind can be traced to the nature of local hickory nuts e-commerce in practice, that is, the integration of fragmented knowledge components, and it normally reveals in local context as the managers' consistent arrangement and coordination of the knowledge driven practices which

seem to be independent from each other but serve shared orientations. For example, hickory nuts processing consists of a clear list of oriented steps to lead harvested hickory nuts to finished products, and if the manager cannot fulfill part of them, then created alternatives shall continue to serve the same orientation. This managerial procedure implicates execution of structuring fragmented steps into bundle of a complete hickory nuts processing, which would be further leveraged with other bundles, such as bundle of marketing to serve the final operational goal in the bottom-up and additive manner (See *Figure 3*).

[Insert Figure 3 around here]

Impact of governance and organisational structure

Since hickory nuts industry has rigour demand for the license registrations for nut roasting and packaging, operations of the e-commerce enabled SFSCs in Hickory nuts case are divided into four groups, based on whether the operations are licensed or not and the agency of managers—that are, operations registered for both roasting and packaging licenses; operations only registered for packaging license; operations with neither license and dedicate to long-term operation; and operations with neither license and dedicate to short-term operation. More importantly, the four groups indicate the four different governance and organisational structures that are determined by the degree of institutionalisation, and each corresponds to a particular solution of knowledge utilisation.

Featured by the registered two licenses, managers of the first group gain full independence in local context so their operations embrace a highly institutionalised structure. In particular, since managers of the first group early resolve issues regarding investment and the land use for work areas, they are able to execute standardised online and offline practices when in operation, and this further allows them to acquire and possess more advanced knowledge than local others—such as the efficient management of nut processing plant and operational team. Similar features are shared by managers of the second group, even though the structure of their operations is

less institutionalised because they as large-scale intermediary have to rely on upstream supply and they only own packaging license, leaving the practice of nut roasting—a critical capacity required by the complete processing process and a sign of upstream control—being excluded from their everyday operation.

Although neither license is of the operations of the rest two groups in Hickory nuts case, managers of the third group that dedicates to long-term operation are unique due to their higher agency. Overall, in facing the investment and land use which are challenging to fulfill in local context, managers of the third group choose to achieve a semi-institutionalised structure by integrating enterprising management into their home businesses. This decision leads managers' work areas and living space to overlap, showing their intention of actively balancing between effectiveness and efficiency when in operation. In consequence, such a semi-institutionalised structure has made the managers more willing to acquire and possess that rather practical knowledge. For example, in the Hickory nuts case, managers of the third group are found keen on flexibly recruiting temporary employees to assist works of family members when in peak seasons; using affordable and simplified processing equipment to upgrade daily SFSC operation; selling other local forest resources in low seasons since their insufficient storage space cannot support year- round hickory nuts sales; and establishing cooperative relationships with upstream suppliers and also borrowing suppliers' license codes to perform packaging step themselves.

In contrast to the structure driven by higher agency, a low institutionalised structure is achieved by managers of the fourth group, and they commit to short-term home business, often causing destructive competitions to local others who dedicate to long-term operation. Managers whose operations are of this low institutionalised structure pursue the knowledge that are simple but effective enough to underpin their basic operations, such as digital literacy; general operational practices; and gaining finished products directly for sale through their cooperative relationships

with upstream suppliers. Moreover, evidence suggests this low institutionalised structure is not unchangeable, because it easily grows into semi-institutionalised structure by the time positive changes happen to managers' agency and operational philosophy. According to interviewee_C:

“Because the village has good industrial basis, those beginners can easily grow into mature e-commerce managers through the accumulation of experience over time. ... There are lots of beginners in the village, they go straight to processing plants, taking finished products back home and selling them online right away; this is actually a very flexible way of operation.”

[Hickory nuts case, interviewee_C]

Impact of business model

Because of the SFSC practice's emphasis of the customer side in supply chain, business models of local managers' operations are primarily customer oriented, and it has deeply affected their knowledge utilisation in practice. In summary, local managers made numerous efforts in letting customers perceive closeness to operations and products, which involve improving customers' experiences by recruiting skilled employees; fostering customer loyalty by investing in website traffic; creating product uniqueness to customers by information embedment; etc. Furthermore, utilisation of these oriented knowledge types not only brings the managers instant benefit, but might also triggers important change to their operations; for instance, interviewee_A who own packaging license explains how communication with customers triggers upgrades to packaging line and parcel packaging method:

“Packaging roasted nuts using big packs, this used to be the only packaging technique of mine. However, after I know lots of my customers are office workers who like to share snacks with colleagues in leisure time, I add new equipment to packaging line thus I can now produce smaller mini packs for their sharing. ... My parcel packing method was simple and caused

complains of products arriving damaged when I first started e-commerce, so I visited many packaging material providers myself to learn how to make improvement that led to present method.” [Hickory nuts case, interviewee_A]

Impact of innovation

In the adopted theory of resource orchestration, innovation has been theoretically defined as an organisational element that directly boosts knowledge utilisation. In the Hickory nuts case, this is more reflected by how local managers have produced a series of e-commerce practices under diverse challenging circumstances, which are all proved to fit their individual demands and situations, as well as to effectively underpin their operations in complex local context (See **Table 6**). Also, it is found that strong innovation ability is particularly demonstrated by local managers whose operations are with no license and dedicate to long-term operating, which can be evidence that comparing with local others, they own higher agency when in operation.

[Insert Table 6 around here]

Synchronisation of all six managerial activities and elements

Although the six managerial activities and elements seem to be independent of each other, they are highly interlaced in action, especially after observing how they affect the managers' operations in Hickory nuts case. For instance, for local managers with the different governance and organisational structures determined by degree of institutionalisation, innovations generated by them and often have customer orientation because of their customer-oriented business models in operation.

The verified interlaced relationship between the six managerial activities and elements reveals powerful effect that they could bring when being synchronised in knowledge utilisation. More importantly, the six have respectively represented the premises to the complete operation of e-

commerce enabled SFSC, which is reached by the managers when all the six are well synchronised in action. To summarise, the first three managerial activities— i.e., structuring, bundling and leveraging—represent fundamental basis of operation, since they together allow fragmented knowledge components to be integrated by shared orientations, and eventually lead to production of the knowledge driven practices which make daily operation of local e-commerce enabled SFSC possible, such as the practices of nut roasting; packaging; and the complicated marketing demanding knowing of investment, photography, etc.

Furthermore, the element of governance and organisational structure represents the framework created with the property of being structural, within which the e-commerce enabled SFSC can stably operate passing the time in local context. In the Hickory nuts case, such a property has contributed to divide between the four operational groups that each is institutionalised to a varying degree based on individual structure. As another vital premise, the element of business model can gift the operation strong orientation and therefore affects priority of the operation's practices. This element of business model is particularly essential to the operation of e-commerce enabled SFSC, since being strongly oriented towards customers is of the latter's theoretical essence. Finally, although the element of innovation is known for radically facilitating the operation, it more follows a long-term accumulation path as showed in the Hickory nuts case, in which local managers gradually produce a series of e-commerce practices to underpin the daily operation of e-commerce enabled SFSC in complex local context.

In summary, this case of Hickory nuts production has shown all aspects of knowledge management application. In terms of knowledge acquisition, the four activities allow local managers to acquire fragmented knowledge contents and then orchestrate them by orientations, hence they form into organised knowledge types for being efficiently possessed. In terms of knowledge possession, due to divide between the four local SFSC operational groups, lots of possessed knowledge types show clear exclusiveness. In terms of knowledge utilization, local

managers develop a shared mindset of how to understand hickory nuts e-commerce in practice.

5. Discussion and conclusions

This paper addressed the research question: *How does knowledge management help explain the e-commerce enabled SFSC?*

This research first makes notable contributions to the theory of SFSC because it offers a new SFSC definition; facilitates discussion of the e-commerce enabled SFSC—a particular type of the SFSC; and helps theorise the experiences in China for the more comprehensive theoretical development of the SFSC. The two chosen theories of KBV and ROT have complemented each other to enhance understanding on this topic.

Overall, as being created to reflect a variety of social meanings or criteria (Jarzębowski and Bezat, 2018), the confusion of how to define the SFSC arises and is identified during literature review. In response, based on the reviewed literature, this paper investigates initial creation of the SFSC concept and therefore discovers and defines the dual proximity as the SFSC essence—i.e., the supply chain and emotional proximities, after which it is combined with the reflection on previous definitions and enables a new SFSC definition to be designed and proposed. Further to the literature review of SFSC, as it is discovered that only ten out of the total 151 papers refer to the e-commerce enabled SFSC, this research intends to make contribution to the discussion of e-commerce enabled SFSC, and hence providing interpretation and understanding of a local operation mechanism of the e-commerce enabled SFSC. Also, in contrast to the previous theoretical development of the SFSC that is grounded in the cases from developed European countries, this research sheds light on the experiences of Taobao villages from China, which then enables an insight into the difference between the contents of developed countries and that of developing countries.

The practical contribution of this research shows in two levels, that are, the manager level and

the policy maker level. For the manager level, this research allows them to realise the impacts that the material or spiritual contents of local could have on their operations, hence inspiring them to solve operational issues from different angles. Also, findings of this research provide managers with a local mechanism of supply chain operation which they can consult in practice; for example, managers can adopt the knowledge management activities and the self-developed operational solution that comprise the local mechanism directly in their supply chain operations. Furthermore, as the findings disclose the important roles of individual agency and operational philosophy in practice, this research as well allows managers to realise the significance of committing to long-term self-development when in operation.

Moving on to the policy maker level. For those policy makers who face challenging governance of local e-commerce, this research not only introduces to them the e-commerce enabled SFSC as an effective practice that can be locally promoted to facilitate e-commerce development, but it also allows them to achieve a deeper understanding of how diverse contents of local context and managers' operations can shape and be shaped by each other and hence deliver positive or negative outcomes, which would then support policy makers' policy making and assist them in making accurate and focused policies for solving faced challenges. Additionally, for the policy makers who pursue the more active and efficient governance over local operations, they would benefit from learning a series of practical insights specified in this research. For example, when verifying role of the four knowledge acquisition activities—i.e., identifying, creating, storing and sharing—in enabling shaping and being shaped relationship, this research further specifies that when in practice, storing knowledge could be processed in individuals' mechanism; local traditional mechanism; public sector mechanism; and private sector mechanism, while sharing knowledge could take place within the operation; with local others; and with broader industrial participants.

Limitations of this research include the investigation of a single case study, so it is recommended

that future case studies are carried out of SFSCs to allow for comparisons on the different elements of the theoretical framework. Other research methodologies could be considered for future research, e.g. focus groups, ethnography, for example. The combination with other methodologies could allow for more discoveries to be made on the role of knowledge management in SFSCs.

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Tables

Table 1: Definitions of the SFSC

Source	Meanings or Criteria	Definition
EU regulation No. 1305/2013 (later supplemented by regulation No. 807/2014)	Supply chain, social relationship, regional development, number of intermediaries	The SFSC is the supply chain with limited economic operators and it commits to co-operations, local economic development and the geographically and socially close relationships in between producers, processors and customers; moreover, the SFSC has at most one intermediary between producers and customers.
French Ministry of Agriculture, Food and Forestry (2009)	Marketing, number of intermediaries	The SFSC is the marketing model that involves the direct sales between producers and customers and the indirect sales with no more than one intermediary.
Marsden <i>et al.</i> (2000)	Emotional relationship, embeddedness, information transmission, customers' perception	The SFSC triggers connection between producers and customers and allows food products to reach to customers with embedded information; thus, the SFSC enables customers to establish close associations with the production places and methods.
Ilbery and Maye (2005)	Constructions of new norms and standards	In addition to product exchanges, relationships between producers and customers in the SFSCs involve constructions of knowledge; value; and the meanings of product and product provenance, production and consumption, and producers and customers themselves.

Source	Meanings or Criteria	Definition
Peters <i>et al.</i> (2012)	Geographical distance, supply chain, number of intermediaries, emotional relationship	The SFSC emphasises the short distance between production and sales (“ <i>as short as possible</i> ”), the minimum intermediaries (“ <i>as few as possible</i> ”), and the promoted understanding and communications between producers and customers.
Slow Food Foundation for Biodiversity (2011)	Social relationship, strategy, promotion of producers, number of intermediaries, geographical distance	The SFSC is created when producers and customers are aware of the same goal they share; the SFSC is an alternative strategy that enables producers to play the active role in local food system and it dedicates to minimising the number of involved processing steps and the food miles in food provisions.

Table 2: Four groups in local SFSC operations

Group	Manager role	Numbers	Operational features
Operations registered for both roasting and packaging licenses	Producer who is in charge of the direct sale of the SFSC	Two	● Being eligible to perform all steps in hickory nuts processing. ● Satisfying land use for online and offline operational practices, such as customer services; work areas for all nut processing equipment; loading and unloading areas; cold storage; warehouses; etc. ● Sufficient investment of finance, techniques and human resources for purchasing, running and maintaining equipment. ● Dedicating to year-round operation. ● Establishing and managing own operational team. ● Being willing to accept cooperation requests from local others, supplying them with finished products or roasted hickory nuts. ● Being applauded as models of the experienced older generation in Hickory nuts case, and hard-working entrepreneurs. ● Being accused of monopoly and the profiting by quantity that leads to constant price war.
Operations only registered for packaging license	The only intermediary in the SFSC	Two	● Being eligible to perform partially steps in hickory nuts processing. ● Partially satisfying land use for online and offline operational practices, such as customer services; work areas for nut packaging equipment; cold storage; warehouses; etc. ● Sufficient investment of finance, techniques and human resources for purchasing, running and maintaining equipment. ● Dedicating to year-round operation. ● Establishing and managing own operational team. ● Being willing to accept cooperation requests from local others, offering rough processing and packaging services. ● Being applauded as models of the experienced older generation in Hickory nuts case, and hard-working entrepreneurs. ● Being accused of the profiting by quantity that leads to constant price war.

Operations with neither license and dedicate to long-term operation	The only intermediary in the SFSC	Above 60	● Being able to perform partial steps in hickory nuts processing. ● Facing land use pressure, online and offline operational practices are executed within front yard and backyard. ● Insufficient investment and limited equipment. ● Dedicating to peak season operation (from Sept. to 10 days before Chinese New Year each year, approx. five months in total), selling other seasonal forest resources for the rest of the year (no independent cold storage or warehouse to support year-round hickory nuts sales). ● Operational team consists of manager and family members. ● Relying on supplied hickory nuts from licensed plants that are roasted and ready for final packaging; trying to perform as many rest processing steps as possible themselves to reduce costs. ● Being described as mostly young, with assistance from parents and regional relatives. ● Being described as backbone in operations of local e-commerce enabled SFSCs.
Operations with neither license and dedicate to short-term operation	The only intermediary in the SFSC	Unknown large number	● No plan for performing any nut processing step. ● Except for the spaces for customer services and storage, no having land use pressure. ● No demand for much investment and equipment. ● Only dedicating to peak season operation (from Sept. to 10 days before Chinese New Year each year, approx. five months in total), leaving off for the rest of the year. ● Operational team consists of manager and family members. ● Relying on supplied finished products from licensed plants. ● Rather flexible and swift operations, even causing difficulty to making statistics of their numbers in the village. ● Being accused of their unprofessional operations that lead to destructive competitions. ● With resources and opportunities provided by mature local industry, they hold potential to convert to long-term operation easily.

Table 3: Local methods for closeness creation

Methods	Steps	Examples
Improving customers' experiences	● Quality harvested nuts and professional flavouring when roasting are critical to hickory nuts e-commerce. ● Timely and high-quality customer services before and after sales, supported by skilled customer service employees. ● Diversifying product line to offer customers more choices.	● <i>“Average salary determined for customer services employees is a little higher than other employees' in the village, such as packagers' and order dispatchers”</i> [Hickory nuts case, interviewee_C]
Fostering customers' loyalty	● Applying targeted strategies, such as word-of-mouth making; decision making from customers' view; building relationships in customer groups; etc. ● Accumulation effect of customer-friendly practices in daily operation. ● Increasing frequency of customers seeing own products or e-store on platform.	● <i>“My strategy is turning some of online customers into agents of my e-store, rewarding them if the given marketing tasks are fulfilled.”</i> [Hickory nuts case, interviewee_I] ● <i>“Website traffic and relationships with customers are important to online operation.”</i> [Hickory nuts case, interviewee_C]
Benefiting from collective and own trademarks	● Displaying identity of being in Lin'an district region in product descriptions and on packaging. ● Displaying own trademark on packaging.	● <i>“Branding helps ensure sustainable profiting.”</i> [Hickory nuts case, interviewee_I] ● <i>“I have been focusing on promoting the influence of my trademark, good influence makes online operation robust.”</i> [Hickory nuts case, interviewee_B]
Information embedment	● Professionally designed e-store and product descriptions, transferring prepared information to customers effectively. ● Prepared information is on designed product package, being visible to customers at the first sight. ● By law and regulation, printing license code on product package to indicate guarantee of food quality and safety.	● <i>“I take product pictures myself when e-store is first set up, but then I find an agency in Lin'an district to help me with professional photography, because I want my customers to receive better visual effect.”</i> [Hickory nuts case, interviewee_B]

Methods	Steps	Examples
Inheriting offline methods	● In contrast to customers of neighboring regions, customers of outer regions are fonder of shelled hickory nuts products.	● <i>“Customers of the nearby regions or of Zhejiang Province prefer unshelled roasted nuts, but customers of the other national regions prefer shelled roasted nuts.”</i> [Hickory nuts case, interviewee_F]

Table 4: Examples of knowledge acquisition

Activities	Features	Examples
Identifying knowledge	● Essential online and offline techniques to reach operation. ● Superior online and offline techniques to reach better-performed operation. ● Significance of individual agency and operational philosophy.	● “Customers of the nearby regions or of Zhejiang Province prefer unshelled roasted nuts, but customers of the other national regions prefer shelled roasted nuts.” [Hickory nuts case, interviewee_F] ● “Good product quality; good customer services; and staying honest, these are the three vital factors in operating e-store.” [Hickory nuts case, interviewee_A]
Creating knowledge	● Online and offline techniques fitting individual demands and situations	● “Sun-dried bamboo shoots and sweet potatoes, small and medium managers who choose to
	when in operation. ● Individual agency and operational philosophy.	keep operating in low seasons sell these two regional products.” [Hickory nuts case, interviewee_C] ● “Lots of small beginners leave their operations in low seasons, working outside the village and etc.; they don’t see e-commerce as their priority in life.” [Hickory nuts case, interviewee_I]
Storing knowledge	● Individuals’ mechanism. ● Local traditional mechanism. ● Public sector mechanism. ● Private sector mechanism.	● “I know hickory nuts since my childhood, I can identify good or bad nuts by just looking at them.” [Hickory nuts case, interviewee_B] ● “My present strategic planning is based on my regular study on other big platform competitors.” [Hickory nuts case, interviewee_B]
Sharing knowledge	● Sharing within operation. ● Sharing with local others. ● Sharing with broader industrial participants.	● “I always visit different spice factories to get information, which helps me design flavouring recipes.” [Hickory nuts case, interviewee_E] ● “I am in an online chat group of village colleagues, in which we often share each other latest news about hickory nuts.” [Hickory nuts case, interviewee_H]

Table 5: Knowledge possessed by local SFSC managers

		Name	Explanations	Examples
Possessed knowledge	Explicit types	Digital literacy	Knowing and mastering how to mobilise ICTs such as Internet and computers, when practising e-commerce; an integration of technical skills and cognitive.	● “Recall on my first time talking to an online customer, my wife and I have to flip dictionary for word spelling before carefully typing words out using single finger.” [Hickory nuts case, interviewee_A]
		General operational practices	Knowing of common and shared operational practices in local hickory nuts e-commerce, such as investing in platform’s traffic services; cost allocation; and communicating with customers.	● “Priority of my online operation has always been marketing in recent years; like, how to have the best marketing for my e-store on platform.” [Hickory nuts case, interviewee_D]
		Hickory nuts knowing	Knowing of various hickory nuts aspects, such as forest locations; harvest time; processing steps; needed preparations for harvest and processing.	● “Harvest of the hickory nut forests in neighboring regions is earlier than that in Lin’an region, which gives an opportunity to start annual operation earlier than local others if nuts are sourced in there.” [Hickory nuts case, interviewee_C]
		Nut roasting (exclusive to the two local managers registered for nut roasting license)	Two local managers who register for the license need knowing of the steps of hickory nuts roasting; required equipment; work area arrangement; human resource arrangement; and the laws and regulations of food production; etc.	● “Due to my experience in flavouring, my plant holds a good reputation of hickory nuts roasting in the village. Flavouring and temperature control, they are the two keys in nut roasting and also on which I focus.” [Hickory nuts case, interviewee_E]

		Name	Explanations	Examples
		Nut packaging (exclusive to the four local managers registered for packaging license of processed food)	Four local managers who register for the license need knowing of the steps of packaging processed nuts; required equipment; work area arrangement; human resource arrangement; and the laws and regulations of processed food packaging; etc.	● “My biggest advantage in comparison with local others is that I sort out land use problem and register the license for packaging processed food since 2014.” [Hickory nuts case, interviewee_A]
		Cooperative relationship establishment (exclusive to the majority local managers requiring upstream supply)	For majority local managers who are unable to meet registration requirements of the two licenses, they need knowing of finding and negotiating with those registered for upstream supply; as well as for borrowing their license codes if the managers plan to practise packaging themselves.	● “A relative of my husband runs a nut processing plant and is where we process our hickory nuts; the relative allows us to use the plant’s packaging license code, when we transport roasted nuts home and begin packaging them ourselves.” [Hickory nuts case, interviewee_C]
		Team management (exclusive to local managers with institutionalised operations)	For local managers who have more institutionalised operations—such as owning licensed nut processing plant, knowing of team management is essential; for example, recruiting employees for different positions and determining their salaries.	● “When peak season comes, I quickly expand number of the employees in my company to 40, and at least 20 of them are machine operators in the plant.” [Hickory nuts case, interviewee_E]
	Tacit types	Individual agency	Ability to take actions and fulfill intention of oneself, especially when in challenging situations; often related to abstract spiritual contents, such as wills and senses.	● “Business is about speed; quickly grasping the opportunity; and timing.” [Hickory nuts case, interviewee_B] ● “Young managers nowadays do business less dedicated and cautious than older managers.” [Hickory nuts case, interviewee_E]

		Name	Explanations	Examples
		Operational philosophy	Forming foundational thinking of how local hickory nuts e-commerce and the oneself in it are seen, by which later operational practices of oneself are guided; even being a determinant to which stages SFSCs can evolve.	<i>“Good product quality; good customer services; and staying honest, these are the three vital factors in operating e-store.”</i> [Hickory nuts case, interviewee_A] ● <i>“I think business is all about being a nice and trustable person, and building relationships with different people”</i> [Hickory nuts case, interviewee_F]

Table 6: Identified innovations in local operations

Innovator	Innovations in local operation
Managers whose operations registered for both/either of the nut roasting and packaging licenses	● Establishing and managing operational team. ● Upgrading processing techniques, such as purchasing new equipment; standardising practices of processing steps; etc.
Managers whose operations are without license and dedicate to long-term operation	● Expanding operation to different platforms for higher profits, also a solution to hickory nuts price war. ● Borrowing packaging license code via cooperative relationships for self-practice. ● Harvesting and processing hickory nuts by times to avoid storage pressure caused by local limited land. ● Selling other forest resources in low season to maintain year-round operation.
Managers whose operations are without license and dedicate to short-term operation	● Expanding operation to different platforms for higher profits, also a solution to hickory nuts price war.
All local managers	● Updating product line, focusing on processing and sales of shelled hickory nuts products to fit preference of the wider customer group. ● Use of the automated order takers in operation. ● Flexible recruitment policy for peak and low seasons.

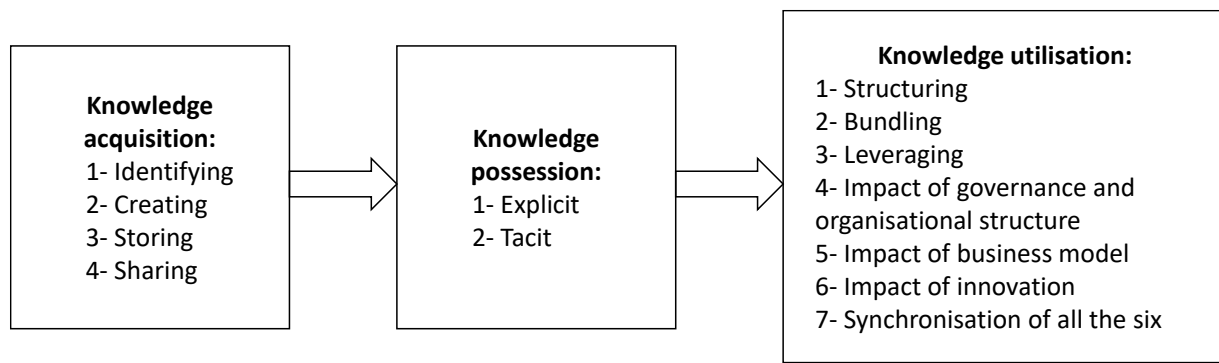


Figure 1: Theoretical framework for research on SFSC

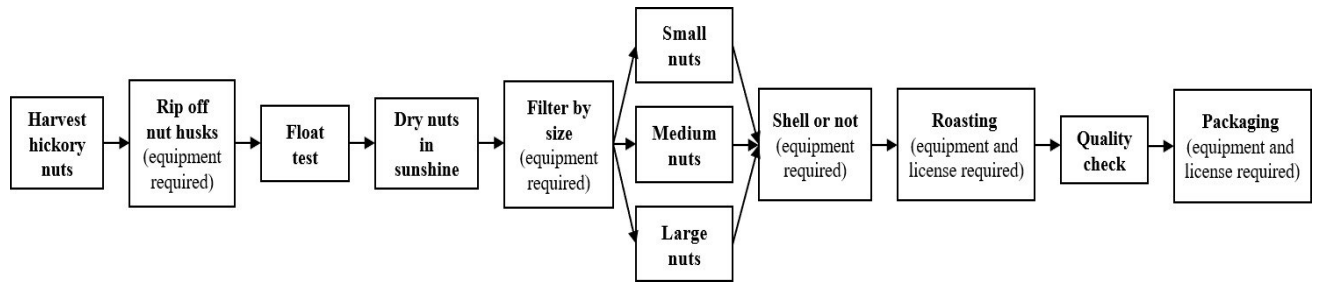


Figure 2: Basic steps to process hickory nuts

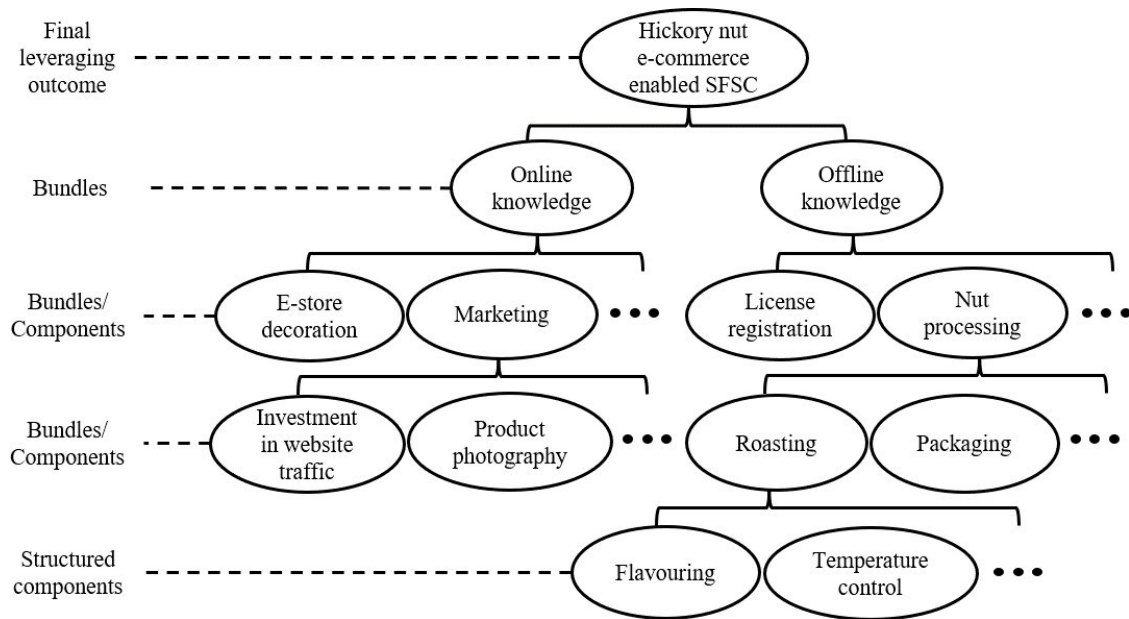


Figure 3: Example of structuring, bundling and leveraging in Hickory nuts case

Appendix 1

Interview questions

1.0 Knowledge acquisition

- 1a: Where and how do you learn the knowledge types that are previously rated by you as important or must-have to your supply chain?
- 1b. If there is a list indicating the activities of knowledge acquisition—i.e., identifying; creating; storing; and sharing knowledge, how do your experiences fall into these four? Please answer this with examples.

2.0 Knowledge possession

- 2a. Based on your experiences, what knowledge types are rated by you as important or must- have to your supply chain?
- 2b. Based on the knowledge types rated by you, please specify which of them are easy to be expressed; learnt; and applied, while which of them are not?
- 2c. Please introduce to me your experience of reflecting on the knowledge types that you learn, which then leads to changes to the learnt knowledge types or creation of new ones.

3.0 Knowledge utilisation

- 3a: Reflecting on the provided table of knowledge utilisation activities, how do the seven activities fit your situation so that knowledge can better underpin your supply chain?
- 3b. Please introduce to me any of your experiences that you gain new knowledge when practising knowledge utilisation activities.