Supply chain learning of sustainability in China: What role does MNCs' leadership play?

Submitted by Yu Gong to the University of Exeter

As a dissertation for the degree of

Doctor of Philosophy in Management Studies

In September 2016

I certify that all material in this dissertation which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature: Yu Gong .....

Abstract

Sustainable Supply Chain Management (SSCM) has increasingly been considered important by both industry and academia, organizations around the world seek to extend or disseminate their sustainable practices to their multi-tier supply chains in order to make the whole chain sustainable.

Among the main streams of SSCM research, it is surprising that, with a few exceptions, the leadership role of multinational corporations (MNCs) in their supply chains in an emerging economy has been ignored by researchers. Little is known on how MNCs, assuming leadership in their supply chain, have been able to facilitate their supply chain members to learn sustainability practice in an emerging economy context i.e. the mechanisms.

To address this gap in the literature, a multiple-case study is designed. Multi-tier supply chains of three MNCs were selected to investigate their proactive sustainability projects in China. They are: Tetra Pak creating a recycling chain in China; Nestlé modernising China's dairy industry; and IKEA's sustainable cotton initiative.

By adopting Resource Orchestration Theory (ROT), findings related to supply chain leadership, supply chain learning, multi-tier SSCM are presented. A number of testable propositions are advanced. The main findings of the research are that rather than focusing on the 'low hanging fruits' of sustainability, MNCs implement proactive sustainable initiatives requiring a strategic thinking and long term significant investment by engaging their multi-tier suppliers and non-traditional supply chain members. They tend to play a leadership role in the implementation process enabled by transformational and transactional leadership styles. These MNCs applied different leadership styles and governance mechanisms on different tiers of suppliers, which render different supply chain structures in the process of supply chain learning, which includes three stages of set up, operating

and sustaining.

This research contributes to SSCM research in the following ways: *first*, it may be the first attempt that investigates multi-tier SSCM through supply chain learning and supply chain leadership angles adopting a ROT perspective. This help to explain how MNCs implement sustainable initiatives in China; *second,* it contributes to supply chain learning literature by differentiating supply chain learning stages and learning content in terms of focal company knowledge resources and supplier learning complexity to explain the implementation of SSCM initiatives; *third,* leadership at an individual level is well researched and understood but it is not the case for organisational level leadership. This research enriches our understanding of the role of organisational leadership in MNCs' SSCM; *fourth,* the research contributes to multi-tier SSCM with a focus on both supply chain governance mechanisms and supply chain structure; *fifth*, this research extend ROT from within an organization context to supply chains and include three aspects: breadth (resource orchestration across the scope of the supply chain including both internal and external breadth); depth (resource orchestration across multi-tiers of the supply chain); and project lifecycle (resource orchestration at various stages of supply chain learning stages); *finally*, a complete theoretical framework is developed to tie together the constructs of supply chain learning, supply chain leadership, multi-tier SSCM with ROT.

Practically, a step by step methodology, integrating the key factors affecting the implementation of SSCM initiatives including supply chain learning, supply chain leadership, multi-tier supply chain governance and supply chain structure, is proposed. The 'best practices' of the researched MNCs provide a feasible roadmap for these organizations to learn from.

Acknowledgement

Three years has gone behind me quickly. It feels like yesterday when my family and I arrived in Exeter, Devon, UK. Looking back over the three years, there have been exciting moments for the achievements made while there were also some confusing ones from time to time. It is no easy task taking care of my two boys while carrying out my PhD research. Albeit the ups and downs, I am sincerely thankful for the opportunity of pondering the true meaning of human lives, society and sustainability (social and environment) at the philosophical level.

For making my PhD journey come true, I would first like to thank my first supervisor Professor Fu (Jeff) Jia, who provided meticulous support to me with all his heart, from the beginning helping me apply for the scholarship, all the way to providing guidance on my research and helping me look for job opportunities. Professor Jia is no doubt a transformational leader and always encouraged me to look to the long term, leading me through a feasible approach, guiding me step by step from a consultant toward a young academic. He has been a role model for me and I admire his hard working and desire to carry out quality research. He provided me with support whenever I needed it, praised me if I have done things outstanding, while he sometimes challenged me to be more critical where appropriate. As a supervisor and a friend, he has also pointed out my weaknesses and given me valuable suggestions.

Next, I would like to thank my second supervisor Professor Steve Brown, who is extremely busy, but always spent time providing guidance to me. I thank him for setting strict timelines for my research from the very beginning. I followed his suggestions and made my PhD journey just under 3 years, an achievement itself. He also checked my progress from time to time to make sure I was on the right track. He supported me in applying for internal funding for my next stage of research on supply chain followership which no doubt demonstrates a confidence

in my research capability. I am so grateful to both supervisors who are inspirational and considerate at the same time.

Beside my supervisors, I thank sincerely the sponsors to the PhD project. First is University of Exeter Business School, who covered my tuition fee and sponsored me with three years' living allowance. Thanks go to the life-changing decision made by Professor Richard Owen. Without the scholarship, it would not have been possible for my whole family to stay and accompany me in the UK. Thanks to my parents and parents-in-law who sponsored extra living expenses for my family. Thanks to the Santander Postgraduate Award panel, who awarded me twice to support my international field trip to China in 2015 and the SSCM conference held in Lancaster in April, 2016. Thanks to the case companies Tetra Pak, Nestlé and IKEA, and Professor Jianli Luo, Deputy Dean of Business School at Wenzhou University, China which covered part of my domestic travel expenses in China.

Special thanks to all the interviewees from five organizations: Lafarge, SKF, Tetra Pak, Nestlé and IKEA. Thanks to all the senior executives of each company: Xioahong Fan, Vicent Yang, Angela Mou, Jonathan Dong and Stefan Karlsson, who provided me insightful ideas. With their full support, I was welcomed by the internal employees and external multi-tier suppliers.

Special thanks to both external and internal examiners of Professors Helen Walker and Mickey Howard, who spent their precious time to read through this dissertation and provided me the most constructive and valuable feedbacks which significantly enhance the overall quality of the dissertation and deepen the theoretical foundation of the work.

Last but not least, I thank all my family members. Thank you to my wife Yuqin Zeng, we share the happy moments and you encouraged me at difficult times. As a full time housewife it is not an easy task to take care of the whole family and

Chinese stomach. Thank you for looking after the two naughty boys, who always made you exhausted. Without your support it would not be possible for me to focus on my research.

Thanks to my two boys Yifu Gong and Yitai Gong. I made the decision to bring you to the UK, to grow up in an environment surrounded with knowledge and wisdom. I hope it is not bad a decision made on your behalf and hope you enjoy these three years after you grow up. Thanks for your company, I never feel lonely and you are always my source of strength and the meaning of my life.

Thanks to my parents who support me all the time whenever I needed in chasing my dream. Thank you to my father Shaoxiong Gong who made a long term plan for me, cared for my needs and gave me advice based on your own wisdom. Thanks to my mother Juxian Li, who sacrificed so many years for the whole family. Thanks to my sister Lei Gong and brother-in-law Wentao Cao, who took care of my parents when I am away from my hometown.

In memory of the three years' dedicated research, I hope this piece of work could contribute to the theory and practice in multi-tier sustainable supply chain management.

Yu Gong

May, 2017

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Acronym used in this dissertation

BCI	Better Cotton Initiative
CSR	Corporate social responsibility
DFI	Dairy Farming Institution
FSC	Forest Stewardship Council
FY	Financial Year
GSCM	Green supply chain management
MNC	Multinational corporations
NGO	Non-governmental organization
OM	Operations Management
PolyAl	Polyethylene and aluminium mixture
ROT	Resource Orchestration Theory
SSCM	Sustainable supply chain management
TA	Technical Assistant
TP	Tetra Pak China
UBC	Used beverage cartons
WWF	World Wide Fund for Nature

Chapter 1 Introduction

In the last decade, sustainable supply chain management (SSCM) has drawn much attention from both industry and academia alike. From a practical perspective, with media putting massive attention on sustainability, more and more people care about climate change, environment and natural resources. To cater for this trend, organizations review their products and processes to deliver more environmental friendly products and services and also pay attention to the social aspects such as health and safety, community programs (Huq *et al.*, 2016a). A large number of papers have been published in recent years. This research identifies around 40 literature review papers on SSCM or green supply chain management (GSCM) in the last ten year from 2007 to 2016. Among them Winter and Knemeyer (2013) found 456 papers on the integration of sustainability and supply chain management covering the years from 1995 to 2010; and Fahimnia *et al.* (2015) identified 884 papers through a bibliometric method on GSCM covering the years from 1992 to 2013.

It has been widely accepted that competition has shifted from between companies to between supply chains (Christopher, 2011). To be 'truly' sustainable, organizations need to embrace upstream suppliers and suppliers' suppliers and downstream customers and end consumers (Pagell and Wu, 2009). Consumers put higher expectation than before for organizations to govern their multi-tier suppliers in a sustainable way.

Evidence can be found globally, such as the 'horsemeat scandal' in the UK (Busse *et al.*, 2017), and the 'melamine milk powder scandal' in China, which have drawn wide public attention (Huq *et al.*, 2016b). Focal companies claimed it was not their fault but their suppliers or lower tier suppliers, consumers still lose confidence in them and their reputation and brand image suffer, the so called 'chain liability' effect (Hartmann and Moeller, 2014). Even worse a whole industry can be negatively affected. The argument is that sustainability is not an issue only

for focal companies but also for their supply chain members. Similar to ‘barrel theory’, the weakest point decides the overall performance of the chain i.e., the supply chain is as strong as the weakest point.

Multinational companies are more vulnerable to sustainability issues due to their large number of customers, large supplier base and difficulty of managing supply chains across a diverse geographic locations globally. Therefore, it is increasingly recognized by the industry that organizations need to extend or disseminate their sustainable practices to their supply chain members and make the whole chain sustainable.

Major Western based multinational corporations (MNCs) respond to the constraints of scarce resources and environmental degradation proactively (but may not be adequate), by integrating sustainability as a part of their strategy and tend to assume a leadership role in their supply chains in emerging economies with an aim to implement sustainability (Ivarsson and Alvstam, 2009; Lam, 2011). However, among the main streams of SSCM research, it is surprising (due to its prevalence in practice) that the leadership role of MNCs in their supply chain in emerging economies has been ignored by researchers with a few exceptions (e.g., Groves and LaRocca, 2011). Little is known on how MNCs, assuming leadership in their supply chain, have been able to facilitate the supply chain members and learn sustainability practice in an emerging economy context. Ashby *et al.* (2012) may be the first to call for research on investigating the role of supply chain relationships and learning in achieving sustainability.

Two case examples (good and bad) of supply chain learning are provided to illustrate the importance of supply chain learning in a Chinese context. Ivarsson and Alvstam (2009) provide a case of Volvo’s work with its first tier suppliers and disseminated quality management and supply chain management (SCM) to sub-tier Chinese suppliers which benefited all members of the chain. Tang (2008) provides Mattel’s recall case: the fact that Mattel’s principal supplier (Lee Der)

had not disseminated the learning of quality control to sub-tier suppliers was the main reason for the recalls of millions of toys, resulting in significant loss in market share and reputation for Mattel in 2008. Underlying these two cases is that Volvo applied its leadership to disseminate quality management in their supply chain in China successfully; while Mattel also being a leader in their supply chain did not. Whether or not the focal company is in the leadership position is one thing, whether they use it well is another.

Existing literature is focused on building the definitions of SSCM (define SSCM and build the related roadmaps and frameworks) (Zhu, *et al.*, 2005; Carter and Rogers, 2008; Seuring and Muller, 2008); some start looking at the implementation of SSCM (Lam, 2011; Ahmed and Sundaram, 2012; Walker and Jones, 2012; Wittstruck and Teuteberg, 2012), other discussed the strategies of SSCM (Seuring and Muller, 2008; Harms *et al*., 2013). Most authors focus their discussion on the enablers and barriers for organizations implementing SSCM (Seuring and Muller, 2008; Walker *et al.*, 2008; Cheung *et al.*, 2009; Gimenez and Tachizawa, 2012; Walker and Jones, 2012; Harms *et al.*, 2013). Some debate on SSCM governance mechanisms (Mamic, 2005; Gimenez and Tachizawa, 2012); others consider the decisions to pursue sustainability in a complex and uncertain environment (Pagell and Wu, 2009; Wu and Pagell, 2011; Alexander *et al.*, 2014). Very few contributions focus on supply chain leadership and supply chain learning, although organization leadership and learning are believed to be conductive to win competitive advantages. Next, I provide justification for choosing China as the research site.

MNCs as leaders in SSCM

MNCs are believed to be much more mature than Chinese private or state owned companies in not only supply chain management, but also corporate social responsibility (CSR) (Lam, 2011) and therefore more likely to assume leadership in the supply chain. Foreign enterprises are in leading positions in sustainability development, especially in environmental sustainability and core value services

(supply chain sustainability) in comparison with Chinese companies (A.T. Kearney, 2008). MNCs that have the ability to influence their suppliers and customers in a developed country context could potentially expand their CSR standards and associated best practices to developing countries (Cote *et al.*, 2008).

Although not all MNCs operating in China display strength in sustainable development, some may hold double standards in their operations in China and their home country. For example, they initially relocate their production to China because China lack certain laws to regulate their operation or because the penalty for pollution is minimal comparing to their profit margin. However, overall MNCs performance surpass their peers in China (A.T. Kearney, 2008). Table 1-1 shows some examples of MNCs using their leadership to extend sustainable practices to their supply chain members through supplier's code of conduct (IKEA), training (GE, Wal-Mart), and collaboration on sustainable projects (Wal-Mart).

As the BSR (2011) report states, there is a tendency that global leading companies are making efforts to enable their supply chain to achieve improved sustainability performances. Pagell and Wu (2009) also find that leading companies in SSCM helped their suppliers to improve their environmental performance. Research also found that focal companies tend to collaborate with lower tier suppliers (Mena *et al.*, 2013; Tachizawa and Wong, 2014).

Company	SSCM projects	Contents
IKEA	"IWAY"	"IWAY" is short for "the IKEA way on purchasing home furnishing products", it contains strict principles for its suppliers. The principles have three domains and 19 aspects, such as environmental enhancement, land pollution, child labour etc. It divides sustainability into four levels, and lists detailed requirements: (1) transfer requirements: require suppliers transfer the IWAY standards to employees and upstream suppliers; (2) start requirements: suppliers at least reach level 1 to cooperate with IKEA; (3) audit requirements: suppliers should support IKEA auditors or the third party to audit at plant; (4) Amend measures: suppliers provide detailed adjustment plans to solve the problems been found in step 3; (5) certificate: after all problems have been adjusted, suppliers get the certificate and commit to continuous improvement, accept re-audit at least every two years.
GE	EHS training	Provide tailored EHS (environment, health, safety) training to suppliers to help them fulfil detailed requirements. Before the launch of such trainings, GE used audit methods to its suppliers but found it not effective. It then cooperate with third parties and provides high level EHS trainings to suppliers and changes their traditional mind-set.
Wal-Mart	Environmental friendly packaging	Promote environmental friendly products and packaging projects, since 2008 hold forums and related trainings annually, list environmental friendly packaging as one aspect of its environmental protection balanced scorecard project. Reward excellent suppliers such as Coca-Cola which invent a light packaging for pure water, reduce 35% CO2; P&G which redesign cosmetic package reduce 40% of packaging board and half weight in 2010.
BASF	"1+3" CSR Project	The project launched in 2006, has undergone three rounds in total and involved 27 partners in 2013. It forms a team with three types of business partners, customer, supplier and logistics service provider along the supply chain, with the aim of promoting CSR and giving guidance in the form of best practices, expertise and customized solutions. The three partner companies then each introduce the same concept to three further business partners in their own supply chain, to create a snowball effect. BASF hold conferences and forums to promote these activities.

Table 1-1 Examples of MNCs extending SSCM practices to suppliers in China

MNCs in China

China, which has an abundant work force, raw material resources and production capacity, has attracted many foreign companies, was known as the 'factory of the world' (Harney, 2008) and is still one of the most rapidly developing centres of production in the world (Biggermann and Fam, 2011; Kang *et al.*, 2012). However, there is a two-way street in global supply chain strategies, where emerging markets, once attractive primarily for low-cost manufacturing and sourcing, have become important sources of new revenue growth, and this represents a new set of challenges for supply chain practices (Taylor, 2011). MNCs operating in China were no longer merely "foreign investors", but had become "strategic insiders", their operations in China are vital to their overall corporate success (Luo, 2007).

As a major emerging and the second largest economy in the world, China together with India is considered the '10 trillion dollar prize' for MNCs in the next 10 years (Silverstein *et al.*, 2012). Any MNC who misses this opportunity runs the risk of losing their competitive advantage over competitors. Realising the importance of the Chinese market, all Fortune 500 global companies have significant investment in China and many of them set up sustainability departments or teams implementing international and internal sustainability codes of conduct (Lam, 2011).

Along with the economic achievement, China has also been the 'largest carbon emission country' and 'largest energy consumer country' (Chinese Academy of Sciences, 2012), and played a vital role in global resources and environmental protection. While Chinese GDP grows at a rapid rate, the damage caused by environmental degradation has increased from 3.05% of GDP in 2004 to 3.8% in 2009 (First Financial Daily, 2012). Chinese consumers are highly concerned by food safety, air quality (such as the serious wide spread haze) and water pollution. Take milk powder as an example, the 'melamine milk powder scandal' in 2008 affected around 300,000 babies. Consumers were highly concerned about the quality of local powder brands thus purchase from Western branded products, which create high market pressure on Hong Kong and even overseas such as Australia, Germany and the UK (BBC, 2008; 2010).

Scholars call for research on SSCM in emerging economics especially in China

(Zhu, *et al.*, 2005, 2008; Lam, 2011). Both central and local Chinese governments have been facing an increasing pressure on increasing scarce resources, degradation of environment, and from increasingly environmentally sensitive Chinese consumers and thus exerting its influence through increasing environmental regulatory and tax policies, however SSCM practice is still in its infancy in China (Zhu *et al.*, 2005; 2008). Due to the lack of basic facilities, information systems, related policies in China, the initial investment for SSCM will be high for companies and the development of the research area is slow. How the MNCs integrate sustainability in their product/service offering and inevitably help their supply chains learn is a very interesting and timely topic to explore.

1.1 Objectives of this research

Based on the above discussions, this research attempts to explore this research question:

> ***How do MNCs assume a supply chain leadership role in facilitating supply chain learning in multi-tier SSCM?***

Jia and Lamming (2013) claim that supply chain learning is more than dyadic learning; if it is difficult for a Tier 1 supplier to learn, it is more difficult for the whole supply chain including more than two tiers to learn. It is even more difficult to learn proactive sustainable initiative or knowledge as there are no set rules such as lean or six sigma in sustainability. Hence, how to implement sustainability or facilitate a supply chain to learn poses a theoretical and practical challenge. Previous studies attempt to explain this adopting a power or trust or coopetition perspective (Pathak *et al.*, 2014; Touboulic *et al.*, 2014; Touboulic and Walker, 2015a). I argue that neither of them can fully explain how MNC facilitate the learning of sustainability in multi-tier supply chains i.e. mechanisms.

I attempt to draw insights from emerging areas of research in SCM, namely: supply chain learning, supply chain leadership and multi-tier sustainable supply chain management (SSCM) for the investigation of the topic and adopt the resource orchestration theory (ROT) (Sirmon *et al.*, 2007, 2011; Sirmon and Hitt, 2009). To the best of my knowledge, so far there is no previous research studying

SSCM through the lenses of both supply chain leadership and supply chain learning at the same time. Harland *et al.* (2007) and Overstreet *et al.* (2013) argue that the research for supply chain leadership is 'dearth', also little empirical work has been conducted for supply chain learning after Bessant *et al.* (2003) (Jia and Lamming, 2013; Silvestre, 2015; Gosling *et al.*, 2016). Since academic and anecdotal evidence show that MNCs are leaders of their supply chains in China; many Chinese suppliers and customers are attempting to learn sustainability initiatives of MNCs. But research is silent on how MNCs' supply chains learn SSCM practice in China and how the leadership role of MNCs facilitates their learning of SSCM practice in China.

Resource Orchestration Theory (ROT) is an emerging theory in strategic management developed from Resource Based View, which received attention from OM (Operations Management) scholars in past few years. The theory suggest that "holding valuable and rare resources is a necessity but insufficient condition for achieving a competitive advantage" (Hitt, 2011, p. 9), resources should also be managed effectively to generate synergistic effects. MNCs potentially need to orchestrate resources both internally and externally to make the sustainable initiatives succeed and facilitate the supply chain learning of sustainability, thus ROT theory is appropriate to be the underpinning theory for this study. Recently, Wong *et al.* (2015) also adopt this theory to develop a conceptual framework on green supply chain integration.

This study could contribute to the SSCM literature in the following ways: *first*, it may be the first attempt that investigates multi-tier SSCM through supply chain learning and supply chain leadership angles adopting a ROT perspective. This help to explain how MNCs implement sustainable initiatives in China; *second,* it contributes to supply chain learning literature by differentiating supply chain learning stages and learning content in terms of focal company knowledge resources and supplier learning complexity to explain the implementation of SSCM initiatives; *third,* leadership at an individual level is well researched and understood but it is not the case for organisational level leadership. This research enriches our understanding of the role of organisational leadership in MNCs' SSCM; *fourth,* the research contributes to multi-tier SSCM with a focus on both supply chain governance mechanisms and supply chain structure; *fifth*, this

research extend ROT from within an organization context to supply chains and include three aspects: breadth (resource orchestration across the scope of the supply chain including both internal and external breadth); depth (resource orchestration across multi-tiers of the supply chain); and project lifecycle (resource orchestration at various stages of supply chain learning stages); *finally*, a complete theoretical framework is developed to tie together the constructs of supply chain learning, supply chain leadership, multi-tier SSCM with ROT.

Methodologically, the data were collected from multi-tiers of the three MNCs' supply chains. The depth of each case (sustainable initiatives implemented in multi-tier supply chain) provides a comprehensive view of the whole chain as well as stakeholders and very rich data for analysis. With the help of WWF and close relationship with the case companies, I was given full access to the data required. The data are so rich that I plan a publication or a teaching case for each of the three cases.

In practice, first this research propose a supply chain learning process framework to help MNCs implement sustainable initiatives. Second, the research provide some 'best practices' of leading MNCs in China, which could be references for other MNCs and to apply their supply chain leadership. Third, this research also provides advice to suppliers and third parties especially NGOs in implementing sustainable initiatives.

1.2 Structure of this dissertation

Figure 1-1 presents the whole structure of this dissertation. After this introduction, Chapter 2 provides a literature review on the research that has been done on the key concepts. Chapter 3 explains the details on the methodology of this research. Chapters 4-6 provide the within case analysis of Tetra Pak, Nestlé and IKEA on how they implemented their corresponding sustainable initiatives in their multi-tier supply chains. Chapter 7 makes a cross case analysis on the three cases regarding the similarities and differences and identifying patterns, discusses the case findings against the reviewed literatures and develop a number of propositions. Finally, Chapter 8 provides a summary of the whole PhD project,

theoretical and practice contributions, acknowledges limitations of the research and point out the future research directions.

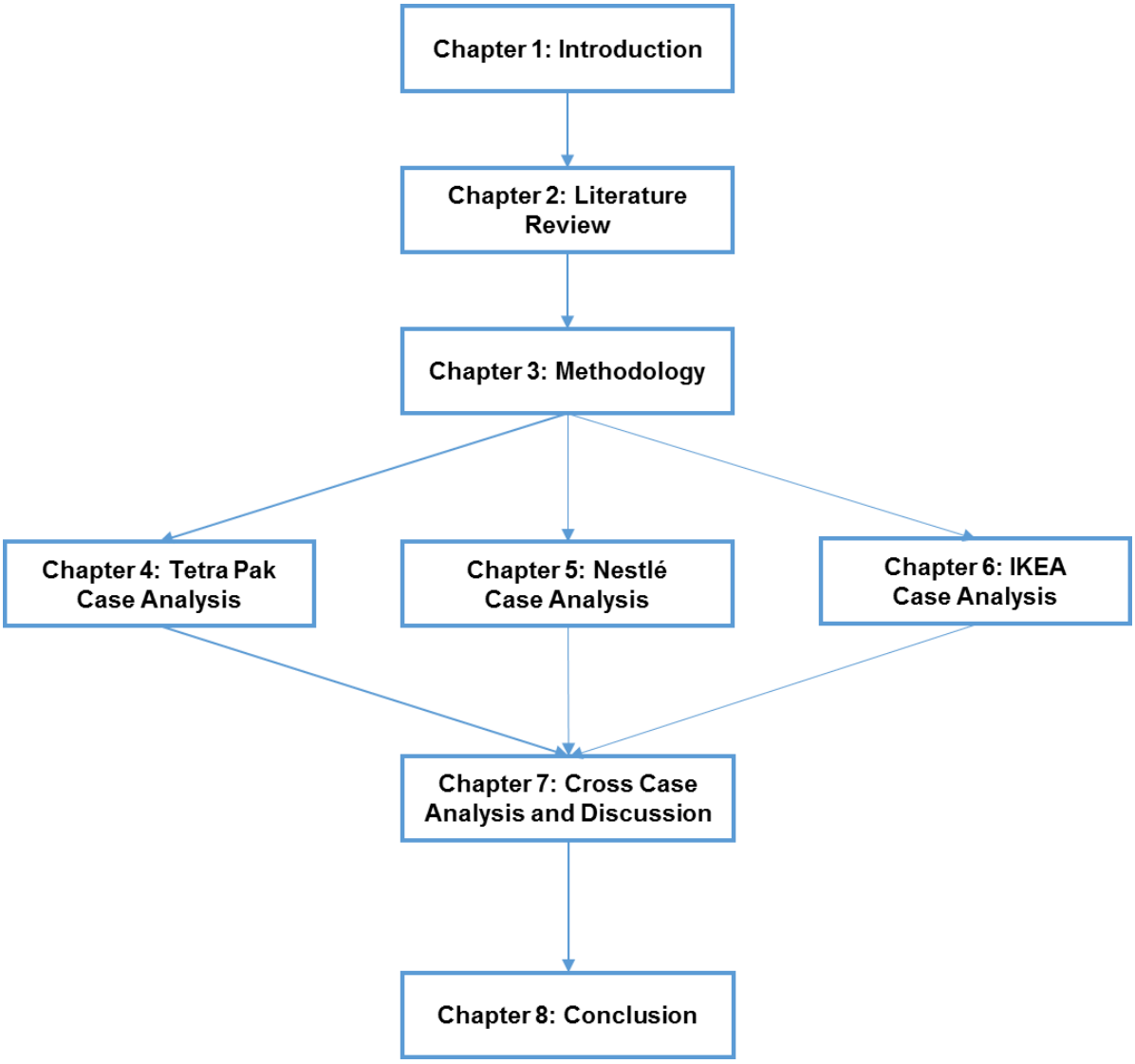


Figure 1-1 Dissertation structure

Chapter 2 Literature review

This chapter presents the findings of the literature reviews. It starts with a discussion of the literature review method. And then sustainability in multi-tier Supply Chain Management (SSCM) is comprehensively reviewed, which is followed by the review of two important concepts used in this study i.e. supply chain learning and supply chain leadership. Resource Orchestration Theory (ROT) is found to be suitable for providing a theoretical foundation and tying all these concepts together and therefore reviewed. Finally a conceptual framework was proposed in the summary of this chapter as a guide for data collection and analysis.

2.1 Literature review method

A content-based method is performed to review the relevant research conducted. Seuring and Gold (2012) state that content-based literature review is an effective tool to examine research work in a systematic way. Content-based literature review applies content analysis tools and may be considered a branch of systematic literature reviews (Jia *et al.*, 2014a), while the dimensions and analytic categories can be either deductive based on theories or inductive based on reviewed materials. With the limited number of studies for each of the three streams of multi-tier SSCM, supply chain learning and supply chain leadership, this review mainly adopt an inductive approach.

The literature review includes three main bodies as in Figure 2-1: review on multi-tier supply chains and sustainability (section 2.2), which include a sub-section or a separate review of SSCM literature reviews, and review on multi-tier SSCM, supply chain learning (section 2.3) and supply chain leadership (section 2.4). Section 2.5 reviews the ROT which forms a theoretical foundation and ties the aforementioned constructs together.

As a supplement to the review of multi-tier SSCM, the review of previous literature reviews on SSCM serves to provide a general overview of SSCM research and helps elucidate the review of multi-tier SSCM. Supply chain learning was identified as the most relevant body of literature to which this study contributes

and reviewed thoroughly. Supply chain leadership has also been discussed and a key construct in supply chain learning research. ROT is adopted as an underpinning theory for this study and therefore reviewed.

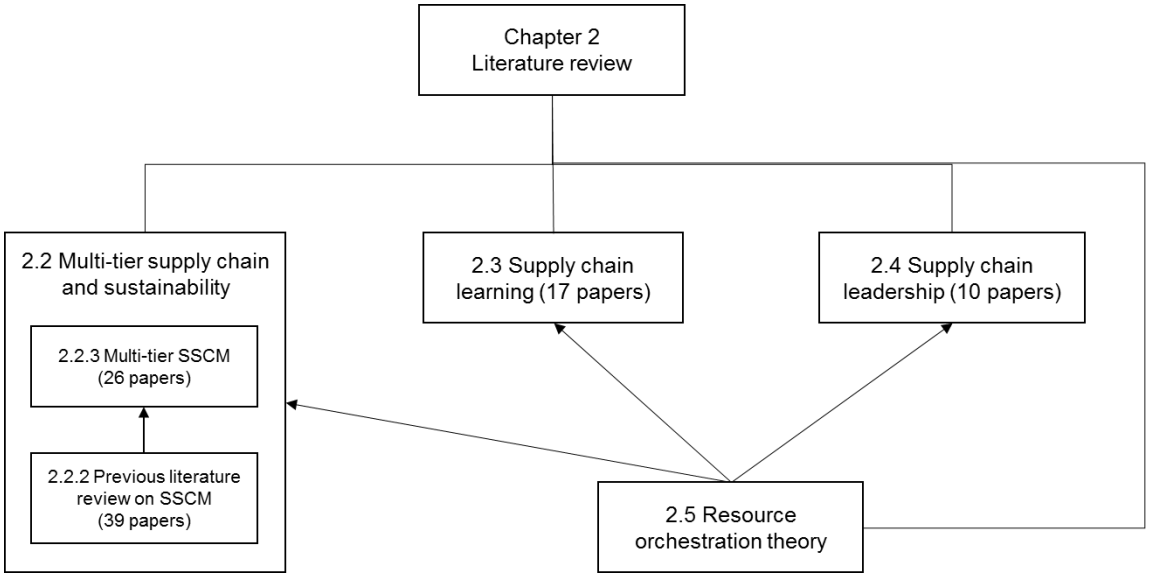


Figure 2-1 The structure of literature review streams

Resource orchestration theory (ROT) stipulates that simply possessing resources does not guarantee better performance for an organization, resources should be adequately accumulated, combined, and leveraged to generate synergistic effects (Sirmon *et al.*, 2007, 2011; Sirmon and Hitt, 2009). This theory has recently been extended to a supply chain level (Ketchen *et al.*, 2014; Wong *et al.*, 2015; Liu *et al.*, 2016). The argument for this study to adopt this theory is that multi-tier supply chains are difficult to manage and it is even more difficult to implement SSCM initiatives. The key is how the focal companies make their multi-tier supply chains learn sustainability content of the initiatives. ROT provides a proactive approach of integrating/orchestrating internal and external resources of the focal companies to help their multi-tier supply chains learn sustainability to do this, the focal companies need to orchestrate the supply chains by leveraging resources from vertical supply chain members (through different tiers) and horizontally from stakeholder (e.g., government and industrial association) who help implement the sustainable initiatives (Wong *et al.*, 2015). In this process, the focal companies may also need to adopt different leadership styles to accommodate the needs of managing different tiers' suppliers.

Thus, four reviews were carried out to capture all the relevant studies including 1. Review of SSCM reviews; 2. Multi-tier SSCM; 3. Supply chain learning; 4. Supply chain leadership. Review on previous reviews of SSCM was conducted by searching string of “sustainable supply chain OR green supply chain” AND “literature review”. After examining these previous reviews, the research methods was learnt and applied to conduct the research on multi-tier SSCM. Key words were identified through the existing reviews on multi-tier level studies of SSCM such as Miemczyk *et al.* (2012) and Tachizawa and Wong (2014) which lead to three streams of key words on multi-tier, supply chain and sustainability respectively. The literature review on supply chain learning and supply chain leadership was undertaken by entering the searching strings of “supply chain” and “learning” and “supply chain” and “leadership” in the titles and abstracts.

The four search strings used were as follows:

Review on SSCM reviews: AB (sustainable supply chain OR green supply chain) AND AB (literature review)

*Review on multi-tier SSCM: AB (sub-supplier OR second-tier supplier OR subcontractor OR tier-n supplier OR supplier’s supplier OR extended supply chain OR *tier*) AND AB (suppl* OR purchasing OR procurement OR sourcing Or value chain) AND AB (green OR environment* OR eco OR sustainab* OR social Or CSR OR responsib*)*

Review on supply chain learning: AB (supply chain) AND AB (learning)

Review on supply chain leadership: AB (supply chain) AND AB (leadership)

These four searches were conducted in the same database of EBSCO Business Source Complete which has also been applied in Carter and Easton (2011). After the keywords search, papers were first examined through their titles and abstracts to keep only the relevant ones, and then were reviewed through their full contexts to check whether they fulfil the inclusion and exclusion criteria as in Table 2-1. Special attention was then paid to their reference lists to check whether any papers not been identified through the key words search (such as Dyer and

Nobeoka (2000) was selected for supply chain learning papers). Expert advice were also followed to include any papers which contribute to the four streams (such as Porteous *et al.* (2015) was selected for supply chain leadership papers).

Literature reviews	Inclusion Criteria	Exclusion Criteria
Previous SSCM literature reviews	Literature review on GSCM or SSCM; Published in ABS ranking journals or Journal of Cleaner Production ; Between the years of 2007-2016;	Literature review is not the main methodology; Published in other journals not on ABS ranking list nor Journal of Cleaner Production; Years before 2007 or after 2016;
Multi-tier SSCM	Focus on multiple tiers of supply chain; Focus on SSCM;	Focus on focal company; Focus on supply chain networks/industry level without focal companies;
Supply chain learning	Focus on learning at supply chain level;	Focus on organizational learning of a single firm; Purely focus on knowledge, knowledge management; Focus on supply chain education; Focus on buyer supplier dyadic learning;
Supply chain leadership	Focus on organizational leadership in supply chain management.	Focus on individual leadership in supply chains; Focus on price leadership, cost leadership, Stackelberg leadership and quality leadership.

Table 2-1 Inclusion and exclusion criteria for the literature reviews
(Note: ABS ranking is short for Associate of Business Schools ranking)

All the results are limited to peer reviewed articles published in English language journals to the end of 2016, thus book chapter, conference papers were not included. ABS journal ranking was applied on previous literature review of SSCM given the large number of papers on the topic to control the review quality, the only exception is *Journal of Cleaner Production* which have a significant impact on SSCM. For multi-tier SSCM, supply chain learning and supply chain leadership, only papers were discussing at a supply chain level were included according to Miemczyk *et al*.'s (2012) level of analysis. These papers discuss the phenomenon at supply chains levels which centred with a focal company, papers with a dyadic focus or industrial network focus are excluded.

Figure 2-2 presents the overall selection process and the corresponding number of papers. The final number of selected papers are 39 literature reviews on SSCM,

26 papers on multi-tier SSCM, 17 papers on supply chain learning and 10 papers on supply chain leadership.

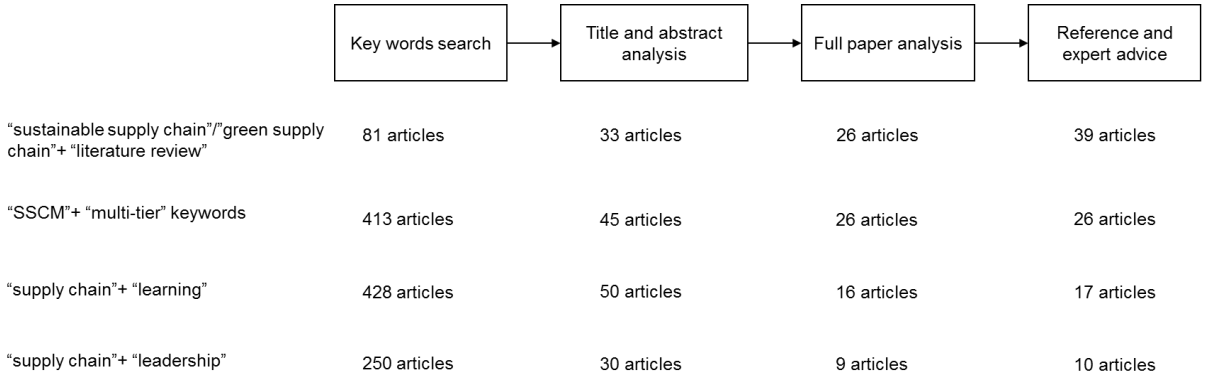


Figure 2-2 Literature review screening methodology

2.2 Multi-tier supply chains and sustainability

This section presents the literature review on SSCM. After providing various definitions of SSCM, previous literature reviews on SSCM are summarized, then it presents the research on multi-tier SSCM.

2.2.1 Definitions of SSCM

Sustainability has been a hot topic since the end of last century. A widely quoted definition of sustainability is by Brundtland Commission (WCED, 1987, p.8), "*development that meets the needs of the presence without compromising the ability of future generations to meet their needs*". This definition is addressed at macro-economic level and thus is difficult for organizations to apply as it provides little guidance (Carter and Rogers, 2008). At a micro-economic level, the triple bottom line, developed by Elkington (1998) is widely accepted. It simultaneously considers and balances economic, environmental, social goals – also recognized as 3P (profits, planet and people) or 3E (economics, environment and equity).

The most been cited definition of sustainable supply chain management (SSCM) is by Seuring and Muller (2008, p. 1700):

"The management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements."

Another highly cited definition is by Carter and Rogers (2008, p. 368):

"The strategic, transparent integration and achievement of an organization's social, environmental, and economic goals in the systemic coordination of key inter-organizational business processes for improving the long-term economic performance of the individual company and its supply chains."

By summarizing the previous definitions on green supply chain management and SSCM, Ahi and Searcy (2013, p. 339) provide an aggregate definition for SSCM:

"The creation of coordinated supply chains through the voluntary integration of economic, environmental, and social considerations with key inter-organizational business systems designed to efficiently and effectively manage the material, information, and capital flows associated with the procurement, production, and distribution of products or services in order to meet stakeholder requirements and improve the profitability, competitiveness, and resilience of the organization over the short- and long-term."

Comparing the above three definitions, one can find that Carter and Rogers (2008) is focused on the focal companies' perspective, while Ahi and Searcy (2013) emphasis the integration of different functions, stakeholder requirements. Seuring and Muller (2008) suggest the importance of chain members and indicate that in order to remain in the chain, supply chain members are also need to fulfil the social and environmental criteria, be competitive to meet customer and stakeholder needs and achieve economic targets. This research adopts Seuring and Muller's (2008) definition in the discussion.

2.2.2 Previous literature reviews on SSCM

Along the hot debate on SSCM researches, there are a large number of literature reviews on SSCM which have been conducted by scholars in recent years. This section summarizes these previous literature reviews, which form the basis for the discussions on multi-tier SSCM.

Appendix A provides a summary of the literature reviews on SSCM, listed by their author names and years, title, journal, number of paper reviewed, year coverage and their main focus. In total, 39 review papers were found by the end of 2016. These works were published at 14 different academic journals, with *Supply Chain Management: An International Journal* publishing the most with eight papers, followed by *Journal of Cleaner Production* with seven papers and *International Journal of Physical Distribution & Logistics Management* with six papers.

Beside the year of 2009, the literature reviews have been published in all the other years from 2007-2016. 2015 marked the peak for these literature reviews with 11 papers published in that single year. The number of reviewed papers varied among these reviews from a minimum of 36 papers (Seuring, 2013) to the maximum of 884 papers (Fahimnia *et al.*, 2015) with a bibliometric review method, the average number of reviewed papers is 176. The majority researches reviewed papers starting from 1990s.

After examining the reviewed topics and focus, it can be found that the research on SSCM shows following features:

- The literature reviews shift from early years' focus on conceptual framing (Carter and Rogers, 2008; Seuring and Muller, 2008; Carter and Easton, 2011) to establishing the research domains (Ashby *et al.*, 2012; Winter and Knemeyer, 2012; Ahi and Searcy, 2013);

- From green, environmental focus (Srivastava, 2007; Abbasi and Nilsson 2012) to sustainability in all three pillars (Ashby *et al.*, 2012; Hoejmose and Adrien-kirby, 2012; Eskandarpour *et al.*, 2015) and specifically focusing on social aspects (Ahi and Searcy, 2015b);

- Discuss SSCM with different topics such as inter-organizational resources (Gold et al., 2010), dynamic capabilities (Beske *et al.*, 2014), base of the pyramid (Khalid *et al.*, 2015), stakeholder pressure (Meixell and Luoma, 2015), supply chain learning and leadership (Gosling *et al.*, 2016), product development (Kremer *et al.*, 2016) and link with other disciplines such as business ethics field (Quarshie *et al.*, 2016);

- To focus on performance measurements/management (Hassini *et al.*, 2012; Schaltegger and Burritt, 2014; Ahi and Searcy, 2015a; Beske-Janssen *et al.*, 2015; Tajbakhsh and Hassini, 2015; Taticchi *et al.*, 2013, 2015; Schoggl *et al.*, 2016) and quantitative models (Herva and Roca, 2013; Seuring, 2013; Brandenburg *et al.*, 2014);

- From focal companies' perspective (Gimenez and Tachizawa, 2012; Igarashi *et al.*, 2013) to multi-levels (Miemczyk *et al.*, 2012; Eskandarpour *et al.*, 2015), multi-tiers (Tachizawa and Wong, 2014), and the proactive integration with various stakeholders (Wong *et al.*, 2015);

These previous literature review papers suggest that SSCM has gradually become a mature research topic. The research has now been focusing on the implementation of SSCM and the integration of supply chain and non-supply chain members to achieve sustainability in multi-tier supply chains (Miemczyk *et al.*, 2012; Tachizawa and Wong, 2014; Wong *et al.*, 2015). This research follows this research thread and the following section zooms in on the multi-tier SSCM papers.

2.2.3 Multi-tier SSCM

As shown by the case examples presented in the introduction chapter, focal companies realize that their supply chain risk sources are concentrated normally on their sub tier suppliers, to which previously they had not paid much attention. To implement proactive sustainable supply chain initiatives successfully, focal companies need to engage with various tiers of suppliers. Researchers have

closely followed the practical trends and have increasingly paid attention to these phenomena and tried to develop multi-tier SSCM theories (Mena *et al.*, 2013; Grimm *et al.*, 2014, 2016; Tachizawa and Wong, 2014; Wilhelm *et al.*, 2016a, b).

2.2.3.1 Overview of multi-tier SSCM

Focal companies gradually realize that in order to create sustainability in their supply chains, they have to apply not only assessment e.g. hands-off approaches but also collaboration e.g. hands-on approaches to diffuse sustainability into its supply chains (Gimenez and Tachizawa, 2012) and the focus is not only on Tier 1 suppliers, but also on sub tier suppliers including lower tier suppliers (Grimm *et al.*, 2016).

Sustainability risks normally emerges in the lower tier suppliers, however focal companies need to bear the undesired consequences caused by these lower tier suppliers' unsustainable behaviours, i.e. the so called 'chain liability' effect (Hartmann and Moeller, 2014). Some examples are Mattel's recall of toys because of Tier 2 suppliers' application of toxic paint (Wilhelm *et al.*, 2016b); the environmental misbehaviour of Nestlé's sub-supplier forced Nestlé to change its sourcing decisions (Grimm *et al.*, 2016).

However, the challenges to implement sustainability initiatives along multi-tier supply chains is also well documented. The factors include the lack of direct contractual agreements; power asymmetries (such as small purchasing value from lower-tier suppliers); lack of information on sub-suppliers; the geographically and institutionally distance; and cost (Awaysheh and Klassen, 2010; Grimm *et al.*, 2014, 2016; Hartmann and Moeller, 2014; Tachizawa and Wong, 2014; Wilhelm *et al.*, 2016b).

There are two streams, which have been discussed in multi-tier SSCM research. One stream on multi-tier SSCM discuss the implementation of code of conducts or standards such as ISO14001, SA 8000, FSC Forest Stewardship Council and FLA the Fair Labor Association (Mueller *et al.*, 2009); WEEE (Waste Electrical and Electronic Equipment) and RoHS (Restriction of the use of certain Hazardous

substances) (Koh *et al.*, 2012); and the application of due diligence on conflict minerals (Hofmann *et al.*, 2015).

Another stream of research on multi-tier SSCM discuss the proactive sustainable initiatives implemented in multi-tier supply chains (Plambeck and Dened, 2011; Lee *et al.*, 2014; Plambeck, 2012; Grimm *et al.*, 2014; Ablander *et al.*, 2016). Among these, Planbeck and colleagues conduct a series of studies on Walmart which they believe Walmart played a leadership role in conducting proactive sustainable initiatives together with third parties (i.e. NGOs) which cover its multiple levels of supply chain members. Plambeck *et al.* (2012) also suggest that it is important for focal companies to learn from suppliers and facilitate learning among suppliers. The discussion provide evidence for both supply chain learning and supply chain leadership.

2.2.3.2 Governance mechanisms and structure of implementing multi-tier SSCM

Two papers on multi-tier supply chains are particularly useful to this study which discussed the governance and structure of multi-tier SSCM: Having identified the approaches which focal companies can use to extend sustainability to Tier 1 and Tier 2 suppliers, Mena *et al.* (2013) propose three types of triad supply chain structures i.e., open triad, transitional triad and closed triad. An open triad is a traditional supply chain through which information and product flow is linear and there is no direct connection between a buyer and Tier 2 suppliers. Focal companies could delegate the authority to Tier 1 suppliers to manage Tier 2 suppliers (Wilhelm *et al.*, 2016a, b). On the other hand, a closed triad represents a situation where the buyer has an established and direct connection with Tier 2 suppliers. Finally a transitional triad is at a state between these two in which a buyer reached out to Tier 2 suppliers (such as through providing training and direct sourcing) to build connections in order to become a closed triad.

Mena *et al.* (2013, p. 70) propose that "*a buyer who wants to influence key product characteristics needs to connect directly with its supplier's suppliers who works with undifferentiated resources*", so that focal companies tend to create a

closed triad in implementing sustainable practices. Mena *et al.* (2013) also suggest that the forms of triad are linked with management resources (e.g., investments of time and money), while an open triad requires fewer management resource, a closed triad require additional resources.

Tachizawa and Wong (2014) further develop Mena ***et al.'s*** (2013) work on multi-tier supply chain to a SSCM context by systematically reviewing 39 papers with the focus on lower-tier suppliers (going beyond the focus only Tier 2 suppliers in Mena *et al.*, 2013). The 39 reviewed papers are all published between 2000 and 2014, with the majority of 59% published after 2011, reflecting the fact that multi-tier supply chain has received increasing attention in recent years.

Tachizawa and Wong (2014) propose that there are four governance mechanisms – "direct", "indirect", "work with third party" (such as NGOs, government, competitors etc.) and "don't bother" for focal companies work with lower tier suppliers on SSCM. They point out that the four approaches may complement each other and that a firm may simultaneously rely on more than one approach for a specific supplier or material (ibid).

Several contingency factors such as power, stakeholder pressure, the industry, material criticality, dependency, distance and knowledge resources affect the approaches in which focal companies choose towards lower-tier suppliers (Tachizawa and Wong, 2014). Specifically on knowledge resources, Tachizawa and Wong (2014) suggest that the probability of the lead firm adopting the "direct" approach is positively affected by its knowledge resources (proposition 3 on p. 658), the probability of the lead firm adopting the "work with third party", "indirect" and "don't bother" are negatively affected by its knowledge resources (propositions 4, 5, & 6 in p. 658-659). Here the knowledge resources mean whether the focal company have the relevant sustainable knowledge, technique expertise etc. Wilhelm *et al.* (2016b) argue that one should not only look at focal companies' knowledge resources, but should also focus on Tier 1 suppliers who assume a double-agency role and shift their sustainability strategy from an environmental focus to also embrace social aspects.

It can be seen that multi-tier SSCM research is still in its infancy but started

receiving increasing attention. This is reflected in the number and quality of papers published to date. However, there is still much space for further empirical research.

2.3 Literature review on supply chain learning

As discussed in section 2.2.2, the research on SSCM has been observed that focal companies tend to interact with supply chain members on sustainability initiatives. Through various supplier development programs such as training, workshops, investment, and joint product development, learning is happening along with these activities (Vachon and Klassen, 2006, 2008; Kovacs, 2008; Plambeck *et al*., 2012; Grimm *et al.*, 2016). To survive in the fierce competition, organizations need to foster learning capabilities. Some literature focus on organizational level (Carter, 2005; Oelze *et al.*, 2016), while some authors discuss learning at inter-organizational (Knoppen *et al.*, 2010; Mariotti, 2012; Jia and Lamming, 2013) and network levels (Hakansson et al., 1999; Bessant and Tsekouras, 2001; Morris *et al.*, 2006).

At the end of 1990s, “learning organizations” was a hot topic, with organizations trying to find out the long lasting success secret (Senge, 1990). Bessant and Tsekouras (2001) find that among the top 12 companies which made up Dow-Jones Index in 1900, only one company, GE, survived. For these long lasting companies and one thing in common is their ability is to adapt and learn to deal with a changing and uncertain environment. This ability is based on two points. First is accumulation and development of the core knowledge base, and second is the long-term development for learning, which requires continuous improvement across the whole organization and even the whole supply chain.

Bessant *et al*. (2003, p.167) summarize that *“… firms operate within value streams involving many firms in supply chains within a supply network, and that the competitive performance of the value stream depends upon learning and the development of the whole system…*” Pagell and Wu (2009) and Silvestre (2015) further propose that supply chains can only achieve sustainability through learning and innovative solutions.

After conducting the literature review and applying the inclusion and exclusion

criteria, six themes emerged (Table 2-2) from the 17 papers identified on supply chain learning, which include definitions of supply chain learning; antecedents of supply chain learning; outcomes of supply chain learning; process of supply chain learning; leadership role in supply chain learning; and finally supply chain learning on SSCM.

No	Authors	SCL definition	SCL antecedents	SCL outcomes	SCL process	Leadership role	SSCM
1	Dyer and Nobeoka (2000)					*	
2	Spekman *et al.* (2002)		*	*			
3	Bessant *et al.* (2003)	*			*	*	
4	Hult *et al*. (2003)		*	*			
5	Dyer and Hatch (2004)					*	
6	Flint *et al*. (2008)	*			*		
7	Sambasivan *et al*. (2009)		*				
8	Lambrechts *et al.* (2010)					*	
9	Thakkar *et al.* (2011)		*				
10	Biotto *et al.* (2012)					*	*
11	Lambrechts *et al.* (2012)	*			*	*	
12	Loke *et al.* (2012)		*				
13	Golgeci and Arslan (2014)		*	*			
14	Silvestre (2015)				*	*	*
15	Gosling *et al.* (2016)					*	*
16	Ojha *et al*. (2016)			*			
17	Willis *et al.* (2016)			*			

Table 2-2 The themes of supply chain learning

2.3.1 Definitions of supply chain learning

Supply chain learning derives from inter-organizational learning, whereby organizational members act jointly to create collective knowledge. It is a process through which network actors learn to collaborate, share and create knowledge (Mariotti, 2012).

Bessant and Tsekouras (2001) are among the first to review learning at a network level. By learning network they mean “a network formally set up for the primary purpose of increasing knowledge” (Bessant and Tsekouras, 2001, p.88). The learning networks are formally established and defined, have a primary learning target, and are structured with boundaries and are operating on a learning cycle

– experience, reflection, concept formation and experimentation (Kolb and Fry, 1975) – and with measurement providing feedback for any future formal arrangements. Bessant and Tsekouras (2001) also suggest that supply chain learning is one type of the network learning.

Bessant *et al.* (2003) further take a close look at supply chain networks. Based on two dimensions of learning complexity (simple or complex) and scope of interaction (dyadic or network), they identify four modes of supply chain learning: 1) simple and dyadic learning mode (e.g., the transmitting of new specifications or regulations); 2) simple and learning network (e.g., implementing new procedures common to all suppliers); 3) complex and a dyadic learning mode (e.g., new procedures regarding a new process or product); and 4) complex and learning network (e.g., implementing lean production within and between firms). However, Bessant *et al.* (2003) doesn't provide a formal definition for supply chain learning but refer it as learning behaviours in an inter-organisational context, observing that, despite a growing interest in inter-organizational application of such principles, literature had focused on intra-organizational learning.

Later, Flint *et al.* (2008, p.264) is trying to distinguish inter-organizational learning and supply chain learning: the former is a broader concept and can be limited to any two partner organizations, while the later "*as the degree to which firms look both up and down their supply chains to manage and monitor learning processes within and outside of the firm*". A formal definition for supply chain learning is provided as: "*ensuring that one's own firm as well as suppliers and customers are actively managing the learning process aimed at supply chain management issues*" (Flint *et al.*, 2008, p. 264); *"Multiple supply chain partners engaged in interaction where learning occurs and is focused on supply chain issues and solutions"* (Flint *et al.*, 2008, p. 274).

Lambrechts *et al.* (2012, p. 628) propose a definition on joint supply chain learning, "*building the capacity to create new knowledge and possibilities together through a process where actors can learn collectively how to rethink and renew their supply chain frame*".

Comparing the above definitions, one can find that Bessant *et al.* (2003) focus on

inter-organisational or dyadic learning of best practices, while Flint *et al.* (2008) focus on supply chain partners' learning of supply chain issues and solutions which may beyond dyads, and finally Lambrechts *et al.* (2012) emphasize the joined learning process which lead to supply chain innovation. This research adopts Flint *et al.'s* (2008, p. 274) definition and focus on learnings happening among multiple supply chain members in order to solve supply chain issues and solutions.

2.3.2 Antecedents of supply chain learning

Spekman *et al.* (2002) suggest that learning is a key component of supply chain competency, and that supply chain can be seen "as a vehicle for gathering knowledge and learning" (Spekman *et al.*, 2002, p. 42). It identifies six pre-conditions to supply chain learning.

The first one is *trust and commitment*. "Trust is the belief that one's partner will act in a predictable manner, will keep his/her words, and will behave in a way that will not negatively affect the other"; while "commitment is simply one partner's willingness to devote time, energy, and/or resources to the alliance" (Spekman *et al.*, 2002, p. 44). The second is *communications*, the communication frequency, depth and content of information will impact the learning effect. The third factor is supply chain partners' *relationship* types. When a relationship is more informal and people co-mingle, knowledge transfer tends to be more frequent and deeper. The fourth factor is *decision-making* style. Flexible, adaptive and open organizations with transparent decision-making style are more willing to learn. The fifth factor is partners' *culture*, the culture that encourages continuous learning, questioning behaviour and reward information acquiring could bring more benefits to supply chain members. The final factor is the degree of partners' support of *win-win orientation,* whether supply chain partners emphasis mutual success and don't behave opportunistically. Among these factors, the joint decision marking, taking a win-win approach to supply chain relationships and having a shared culture are the most effective factors (Biotto *et al.*, 2012).

Hult *et al.* (2003) argue that learning among supply chain members may be seen

as a strategic resource that provides a bonding effect to enhance a supply chain's success. It summarize four orientations/learning routines for supply chain learning in a supply management context – team orientation, systems orientation, learning orientation and memory orientation. Thakkar *et al.* (2011) and Ojha *et al.* (2016) further elaborate that: team orientation emphasize supply chain members collaborate and cooperate in carrying out supply chain activities and joint decision making; system orientation encourage supply chain organizations consider the larger supply chain organizational interest instead of individual interests; learning orientation emphasize the learning attitude and behaviour toward solving supply chain issues; lastly, memory orientation suggest that supply chain members disseminate the knowledge within supply chain.

Some other researchers identified other factors such as integration, knowledge management and information acquisition as the antecedents of supply chain learning. Sambasivan *et al.* (2009) provide an additional one of integration mechanism which refer to the processes and structures that link the supply chain partners. They suggest that the stronger the linkages, the more effective for firms transferring both implicit and explicit knowledge in supply chains which is vital for supply chain learning. Loke *et al.* (2012) suggest that knowledge management and total quality management are significantly positively related to supply chain learning. Golgeci and Arslan (2014) conceptually discuss supply chain learning of the internationalization of firms from emerging economies. They suggest that relational capability and information acquisition capabilities are positively associated with supply chain learning.

2.3.3 Outcomes of supply chain learning

Spekman *et al.* (2002) suggest that learning could have a positive impact on performance measures which are related to end-customer satisfaction and being a more market-focused supply chain. Based on an organizational learning perspective, Hult *et al.* (2003) propose that the four antecedents (team orientation, systems orientation, learning orientation and memory orientation) collectively contribute to the creation of a strategic resource, which further leads to ten consequences in four categories. The four categories are: learning, supply

management, management and performance consequences. Learning consequences include information acquisition, knowledge distribution, information interpretation and organizational memory. Supply management consequences include relationship commitment and customer orientation. Management consequences include innovativeness and entrepreneurship. Performance consequences include cycle time and overall performance.

From a complex adaptive system perspective, Lambrechts *et al.* (2012) summarise five outcomes for supply chain learning: interdependent system optimization and development both in operation and strategy level; joint competence development which more adaptable to external changes and complexity; creation of unique mutual knowledge and expertise; whole system awareness concern each other fostering more mutual understanding, and finally transforming the essence or identity of the chain such as new goals, policies, business models and norms. Based on an institutional perspective, Golgeci and Arslan (2014) suggest that supply chain learning could be positively associated with the conformance to both formal and informal institution pressures.

Coming from an innovation perspective, Ojha *et al*. (2016) take a special look into trust, supply chain learning, entrepreneurial emphasis and innovativeness and suggest that supply chain learning is strongly associated with trust and supply chain organizations could promote supply chain learning based on trust, which could lead to supply chain entrepreneurial emphasis and innovativeness.

Finally, Willis *et al*. (2016) discuss supply chain learning, integration and flexibility performance (in terms of product and services offerings) and empirically find that supply chain learning is positively related to both internal and external integration; internal integration is a pre-requisite for developing effective external integration, and external integration have a positive relationship with flexibility performance.

2.3.4 Processes of supply chain learning

Grounding their work in innovation literature, Bessant *et al.* (2003) divide supply chain learning into three phases. ‘set up’ which is for establishing a set of

procedures to promote supply chain learning; 'running' or 'operating', to translate the procedures to routines and norms which govern the behaviour between and within firms and 'sustaining', to deal with management processes for the needs of continuous learning such as measurements and benchmarking. At set up stage, triggers need to be identified to promote a learning environment either under crisis or find new opportunities. This stage is normally promoted by a core company or a third party. At the operation stage, Bessant and Tsekouras (2001) and Morris *et al.* (2006) list eight core processes at a network learning level shown in Table 2-3 which highlight the leadership role in the learning process:

Process	Underlying questions
Network creation	How the membership of the network is defined and maintained;
Decision making	How (where, when, who, etc.) decisions get taken;
Conflict resolution	How (and if) conflicts are resolved;
Information processing	How information flows and is managed;
Knowledge management	How knowledge is articulated and captured to be available for the whole network;
Motivation/commitment	How members are motivated to join/remain in the network - e.g. through active facilitation, shared concerns for development;
Risk/benefit sharing	How the risks and benefits are shared;
Integration	How relationships are built and maintained between individual representatives in the network.

Table 2-3 Eight core processes in the operating stage
(Source: Bessant and Tsekouras, 2001 and Morris *et al.*, 2006)

At sustaining stage, mechanisms need to be identified to sustain the learning process or close the processes, such as measurements or benchmarking. One example is that Toyota set up the supplier association, conductive to long term sustained learning (Dyer and Nobeoka, 2000).

While Bessant *et al*. (2003) analyse supply chain learning stages, there are other papers (Flint *et al.,* 2008; Lambrechts *et al.*, 2012; Silvestre, 2015) suggest that supply chain learning is one process of supply chain learning/innovation loops. Flint *et al.* (2008, p. 258) propose that supply chain learning is aiming for "*the development of innovations for the management of product and information flows that better serve changing downstream customers' needs*". They summarize that

supply chain learning is embedded in a continuous innovation loop including the processes of: setting the stage, customer value insights (customer clue gathering activities and negotiating, clarifying, and reflecting activities), and supply chain learning and innovation management. Different from Bessant *et al*. (2003), which focus on measurements and benchmarking, here the 'sustaining' stage is continuously driven by customer value inputs and emphasizes the innovation loop.

Lambrechts *et al.* (2012) propose that the relationship building of leading facilitator actor and other actors leads to in-depth joint learning which further leads to system-level generative outcomes. Lastly, Silvestre (2015) propose the concept of supply chain learning loops towards sustainability, i.e., supply chain members jointly learn how to build capabilities for innovations of sustainability which will help the entire supply chain to be more sustainable. Two factors of environmental turbulence and institutional voids (e.g. formal rules, informal norms) could prevent supply chains learning and the influence is stronger in developing and emerging economies such as Brazil.

2.3.5 Leadership role in supply chain learning

It is interesting to notice that papers discuss the leadership role of organizations rather than individuals in supply chain learning, although none of these papers indicate the application of leadership theories besides Gosling *et al.* (2016).

Dyer and Nobeoka's (2000) well known case of Toyota provides a notable study on the leadership role of Toyota in supply chain learning. As the supply chain leader, Toyota initiates and facilitates the learning network and solves three learning dilemmas of how to motivate self-interested members to actively participate in the learning network; how to avoid 'free rider' problems (members enjoy the collective benefits without contribution); and how to maximize the efficiency of knowledge transfer. Toyota has done this by creating a strong network identity with rules for participation and entry into the network. Most importantly, production knowledge is viewed as the property of the network. Toyota's highly interconnected, strong tie network has established a variety of

institutionalized routines that facilitate multidirectional knowledge flows among suppliers, these are mainly achieved by supplier associations, consulting groups and learning teams and inter firm employee transfer (Dyer and Nobeoka, 2000; Dyer and Hatch, 2004).

Bessant *et al*. (2003) emphasize the importance of the leadership role in supply chain learning process, finding that even if the leader does not attend to detailed discussions, their appearance has a positive effort on other members in buyer-supplier interaction context. Leaders will be more positively assessed if they can learn from other members (mutual learning). However, the leadership role may change over time since at the 'sustain' stage of supply chain learning, members may need to share the leadership role, e.g., be responsible for their own direction and alignment (Bessant *et al.*, 2003). Here, Bessant and colleagues highlight the dynamic nature of supply chain leadership in the supply chain learning process.

Lambrechts *et al.* (2010) discuss how Vovlo Cars Gent (VCG) and its suppliers succeed in a shared collaborative forum toward human resource management (HRM) issues. Regarding the leadership styles, Lambrechts *et al.* (2010) propose that the forum should not be managed by formal contracts and procedures but in an informal way and members need to take the shared responsibility. However, in another paper building on Lambrechts *et al.* (2010), Lambrechts *et al.* (2012) focus on in-depth joint supply chain learning and emphasise that even a strong single party cannot succeed in this without other parties' involvements and contribution. This kind of learning needs time, effort and discipline and in particular leadership. Learning will not occur by itself but needs careful designing and facilitating normally by a leading company in the supply chain. To be more effective, leadership may change over time from an 'up-front' role to a 'stand-back' role in which other members actively take part, the concept of "shared leadership" (Lambrechts *et al.*, 2012, p.631). This point echoes Bessant *et al.* (2003) argument.

Biotto *et al.* (2012) provide a single case study of Illycaffè Group's coffee supply chain practice, which is focused on quality management and gradually establishing a culture of quality along the supply chain. The shared culture of quality in turn minimized the coordination efforts and resource utilization through

self-selection of suppliers for better quality coffee beans; self-alignment to quality standards by different actors e.g., suppliers, logistics operators and customers; and generative learning (the ability to step back and reframe the problem and generate new practices) e.g., the emergent behaviour toward sustainability. Although Illycaffè has been assumed a facilitative leadership role in the joint learning process, the research doesn't discuss its leadership styles explicitly.

Finally, Gosling *et al.* (2016) may be the first study integrating supply chain learning, supply chain leadership and SSCM and conceptually propose that supply chain leadership styles of transformational and transactional leadership have an influence of supply chain learning of sustainability. This paper is conceptual in nature and needs further empirical work to validate the model.

All the aforementioned researches emphasise the importance of supply chain leadership role (organizations instead if individuals) in the supply chain learning processes, it is important for supply chain leaders (normally focal companies) to take the lead to make learning happen (all the above papers), making rules to facilitate the learning to be more efficient and effectively (i.e. Dyer and Nobeoka, 2000; Dyer and Hatch, 2004; Lambrechts *et al.*, 2012), let supply chain members take the shared responsibility (Bessant *et al.*, 2003; Lambrechts *et al.*, 2010; 2012), design mechanisms to sustain the learning (Bessant *et al.*, 2003; Biotto *et al.*, 2012) and create a learning culture to maintain the learning efforts (Bessant *et al.*, 2003; Biotto *et al.*, 2012; Lambrechts *et al.*, 2012). What is missing in the studies is that leadership styles has not been explicitly discussed and none of these researches applied the leadership theories.

2.3.6 Supply chain learning on SSCM

Several papers discussed supply chain learning in the context of sustainable supply chains. The early version of this literature review lead to the journal paper of Gosling *et al.* (2016), which integrate supply chain learning and supply chain leadership lenses into SSCM and propose a conceptual framework. Base on organizational learning theories and inspired by the research of Van Hoof (2014), the research suggest that three types of SSCM governance mechanisms

(assessment, involvement and collaboration) could lead to three levels of supply chain learning (single-loop learning, single-loop learning plus and double-loop learning), transactional and transformational leadership tend to mediate the relationship, the three types of learning shall lead to different levels of SSCM performance of meet compliance, beyond compliance and SSCM innovation. Similar to Van Hoof (2014), the research still focus on an organizational learning level and emphasis the dyadic buyer-supplier relationships.

Another paper discussed the supply chain learning on economic sustainability. Biotto *et al*. (2012) discuss the case of Illycaffè and suggest that the use of quality control practices, the diffusion of knowledge/know-how and a shared culture can lead to economically sustainable supply chain learning.

Finally, Silvestre (2015) explores how supply chain sustainability can be implemented and managed by a focal company in a developing and emerging economies, focal companies need to play an even critical role in facilitating supply chain learning toward supply chain sustainability performance. The three papers suggest that sustainability can be a supply chain learning context and it could lead to more sustainable supply chains. The finding is echo to Lambrechts *et al.* (2012) which suggest that in-depth joint supply chain learning is a good way to address sustainability issues because of its ill-defined problems, complex and multiple stakeholders.

2.3.7 Summary of supply chain learning

After an extensive review of supply chain learning literature, it is found that little empirical research has been conducted after Bessant *et al.* (2003), with a few exceptions (e.g. Biotto *et al.*, 2012; Jia and Lamming, 2013; Silvestre, 2015). These previous works focus on the first tier suppliers, however there is a lack of research on the second and sub-tiers and few studies are focused on learning of sustainability in the supply chain (Biotto *et al.*, 2012; Silvestre, 2015; Gosling *et al.*, 2016).

Bessant *et al.* (2003) propose that future research should examine supply chain

learning on a platform of “good practice” supplier management, and more research are needed to examine on the leadership/governance role in supply chain learning. Flint *et al*. (2008, p.274) suggest that “supply chain learning is an area wide open for future research”. This study answers these calls.

Supply chain learn and evolve just as organizations do (Silvestre, 2015). The reviewed papers highlight the importance and possible dynamic nature of the leadership role. These findings should also be applicable for learning specifically focussing on sustainability (Silvestre, 2015; Gosling *et al.*, 2016); however further studies on the role of supply chain leadership in supply chain learning are needed to address questions such as “who emerges as the facilitative leading role, when and how does the leadership develop over time” (Lambrechts *et al.*, 2012, p.633).

2.4 Literature review on supply chain leadership

This sub section presents the findings of the literature review on supply chain leadership. After providing a general review on individual leadership theories, papers discussing supply chain leadership at an organizational level are identified and summarized under three themes including: general review of supply chain leadership; definitions of supply chain leadership; supply chain leadership styles.

2.4.1 General review of individual leadership theories

Traditionally leadership focuses on individuals, and various leadership theories have been generated, such as trait theories, behaviour theories, situational theories, contingence theory, leader-member exchange (LMX) theory and multifactor-leadership theory. Traits are the attributes that include aspects such as values, needs, motives and personality; behaviour theories focus on what leaders do and how they act to influence their subordinates; situational theory of leadership is develop from behaviour theory and argue that leadership should change according to different situations; contingency theory of leadership is assuming that leaders styles are relatively stable and need to be matched with the most appropriate situation; leader-member exchange (LMX) theory focuses on the dyadic relationship between a leader and each of his/her followers (Yukl,

1998).

Multifactor leadership theory has been the most widely discussed and applied leadership theory which composed of transformational leadership style and transactional leadership style. This is adopted by this study. Burns (1978) first identify transformational and transactional leadership, using them to describe political leaders. Bass (1985, 1990, 1999) further built the framework for transformational and transactional leadership, which has subsequently been operationalized by Avolio *et al.* (1999). Transformational leadership focuses on transforming followers' self-interest to the collective interest, while transactional leadership maintains the traditional leadership focus on contract or agreement, built upon exchange and is task driven.

Transformational leadership has four dimensions: intellectual stimulation, individualized consideration, idealized influence and inspirational motivation (Avolio *et al.*, 1999). Intellectual stimulation means leaders stimulate followers to challenge old methods and think about new ways to solve problems. Individual consideration means leaders consider individuals' needs and make specific coaching and mentoring plans. Idealized influence means leaders are admired, respected and trusted by followers for their personality and character. Inspirational motivation represents leaders' appealing vision and behaviour, and function as a role model to influence followers.

Transactional leadership on the other hand, contains two dimensions: contingent reward and active management by exception. Contingent reward indicates that followers will be rewarded on their expected performance and be punished if a target is not achieved. Active management by exception asserts that leaders point out followers' mistakes and take actions when needed.

2.4.2 General review of supply chain leadership

As above leadership theories mentioned, leadership can be used to emphasise how the characteristics and behaviour of individuals affect organizations' decision making and performance. Individual level leadership is believed to be a key

contributor to organizational success and a strategic source of competitive advantages (Bass, 1990; Waldman *et al.*, 2001).

Research in supply chain management also suggest that leadership could be applied to organizational levels (Cooper *et al*., 1997; Lambert *et al.,* 1998). The classic works are assuming the disproportionate power and ability of supply chain organization to dominate other supply chain organizations are identified as supply chain leaders. For example, Hall (2000) claims that power can be applied by channel leaders to influence suppliers toward sustainability. Power has been introduced in market channel literature to describe how any industry is probably dominated by two or three major competitors (Daugherty, 2011). The exercise of power or lack of power can affect the level of commitment of other channel members; however forced participation will encourage exit behaviour if given the opportunity (Cooper *et al*., 1997). Cox (2001) and Cox *et al*. (2004) discuss the different types of power relationships between buyers and suppliers.

In parallel, some early researches in operations and supply chain management have also paid attention to the concept and attempt to apply leadership concept at an organizational level, such as Lambert *et al.* (1998), who point out that unless one organization adopts the leadership role to take responsibility for strategic supply chain decisions, supply chain risk will occur and lead to a stage of chaos. Supply chain leadership is also considered as an important precondition of supply chain management success (Bowersox *et al.*, 1995).

Defee *et al.* (2009a) may be the first to strongly argue that leadership can also be applied to supply chain organizations, and may describe the relationship between a supply chain leader organization and other supply chain member organizations. Furthermore, in SSCM studies, Ahi and Searcy (2013) stress the voluntary character of SSCM and claim that power may not be able to fully explain proactive SSCM behaviours. Focal companies collaborate with suppliers on SSCM initiatives, in which suppliers may be driven by leader's sustainable vision, a characteristic of leadership (Ahi and Searcy, 2013). Echoing this, Defee *et al*. (2009a) argue that power should not be viewed as the sole source of supply chain leadership; other aspects of leadership should be taken into consideration.

After applying the literature review method in section 2.1, in total ten papers are identified which discuss supply chain leadership at organizational levels. Table 2-4 provides an overview of these papers. Among these works, Harland *et al*. (2007) argue that the fact that downstream larger businesses don't assume supply chain leadership poses a barrier for SMEs adopting e-Business (information technology based business). Defee *et al*. (2009a) claim that transformational supply chain leadership moderates the relationship between sustainability drivers and closed-loop supply chain orientation. Transformational leadership is also found to positively influence dyadic relationship commitment (Hult *et al.*, 2000a). There is also positive relationship between transformational leadership and organizational performance such as purchasing cycle time (Hult and Nichols, 1999; Hult *et al.*, 2000b), efficiency and effectiveness (Defee *et al.*, 2009b, 2010).

Author	Research type	Leadership styles	Main findings
Hult and Nichols (1999)	Survey	Transformational leadership	Team orientation is influenced by transformational leadership and strategic business unit (SBU) user's mental models which in turn affects customer orientation, relationship commitment and cycle time.
Hult *et al*. (2000a)	Survey	Transactional leadership, transformational leadership	Transformational leadership behaviours have a positive influence on building commitment in the dyadic relationships between (1) internal users and buyers and (2) buyers and external suppliers.
Hult *et al*. (2000b)	Survey	Transformational leadership	Organizational cultural factors which including localness, transformational leadership and openness will influence organizational learning in the purchasing process, organizational learning has a positive effect on information processing which in turn has a positive effect on the cycle time of the purchasing process.
Harland *et al.* (2007)	Case study	NA	Examine the barriers for small and medium enterprises' (SMEs) to embrace e-business, one of the barriers is downstream larger business not providing supply chain leadership.
Hult *et al*. (2007)	Survey	Transactional leadership, transformational leadership	Transformational leadership has a positive moderating effect on the relationship between the value of the corporate buying centre and performance, while transactional leadership has a negative effect on the relationship.
Defee *et al*. (2009a)	Conceptual paper	Transformational leadership	Transformational supply chain leadership may facilitate the creation of closed-loop supply chain orientation.
Defee *et al*. (2009b)	Conceptual paper & Survey	Transactional leadership, transformational	Follower is critical to overall supply chain performance, especially in a transformational environment.

		leadership	Transformational supply chains significantly function better than transactional supply chain on effectiveness and efficiency.
Defee *et al*. (2010)	Conceptu al paper & Simulation	Transactional leadership, transformational leadership	Theory building for transformational supply chain leadership and transformational supply chain followership, relate to three forms of supply chain structure (information availability, communication and rewards), supply chain followers may have greater influence over operational performance than supply chain leaders.
Porteous *et al.* (2015)	Survey	Transactional leadership	Focus on buyers' transactional leadership behaviours, discuss the relationship between buyer's supplier incentives and penalties for the supplier's social and environmental compliance.
Gosling *et al.* (2016)	Literature review & conceptua l paper	Transformational leadership	Propose a conceptual framework for SSCM by integrating constructs of SSCM drivers, strategy, governance, performance, and suggest that supply chain leadership and supply chain learning are two importance constructs to observe SSCM.

Table 2-4 A summary of papers on supply chain leadership

2.4.3 Definitions of supply chain leadership

Of the reviewed papers, Defee *et al.*'s (2009b) attempt to distinguish supply chain leadership and supply chain followership, is among the first to define supply chain leadership and may be the first significant empirical study developed in this research area. Defee *et al.* (2010, p.766) further develop the theory and propose a formal definition on supply chain leadership,

> *"[…] a relational concept involving the supply chain leader and one or more supply chain follower organizations that interact in a dynamic, co-influencing process. The supply chain leader is characterized as the organization that demonstrates higher levels of the four elements of leadership in relation to other member organizations (i.e. the organization capable of greater influence, readily identifiable by its behaviours, creator of the vision, and that establishes a relationship with other supply chain organizations)."*

Gosling *et al.* (2016) identify another definition on supply chain leadership by Lockstrom *et al*. (2010, P. 275) which based on Northouse (1997) and Yukl (1998) but from an individual leaders' perspective,

"[…] the ability to influence one's own organisation and the suppliers' organisations in order to establish and accomplish common goals and objectives."

This definition implies that individual leaders can not only influence one's own company but also cross firm boundaries to the supply chain context. From the above definitions, it can be concluded that 'supply chain leadership' is yet to emerge as a research topic, shown by the number of publications and the time period in which the papers were published, and the few definitions provided. Harland *et al*. (2007) echo that there is a dearth of publications and empirical studies devoted to leadership in the supply chain domain. The possible explanation is that leadership is a mature subject and a complex discipline which together with supply chain management makes the research even more complex.

2.4.4 Supply chain leadership styles

It can be found in Table 2-4 that the majority of the papers applied transformational/transactional leadership styles, reflecting that transformational leadership theory is a mature concept and which has been predominant in the leadership research field over the past two decades (Bass, 1999). Notably, Porteous *et al.* (2015) doesn't mention the term leadership at all, but discussed how buyers' "carrot and stick" behaviours influence suppliers' social and environmental compliance which is a typical transactional leadership style.

In a supply chain context, Defee *et al.* (2009b) argue that both transactional and transformational leadership operate via contingent reward and management-by-exception, while transformational leadership more frequently exhibits inspiration, intellectual stimulation and individualized consideration. Contingent reward indicates that followers will be rewarded on their expected performance, management by exception implies that leaders point out followers' mistakes and take actions when needed (Bass and Avolio, 1993).

Defee *et al.* (2009a) explain inspirational behaviour as an articulation of a

collective mission; a vision of desirable futures and the definition of the path to achieve the vision. Intellectual stimulation occurs where leaders call on followers to be more innovative and creative to provide better solutions to problems. Individualized consideration refers to a leader's ability to recognize each individual follower's unique skills and development needs.

Defee *et al.* (2009b, P.67) define transformational leadership as

> *"[…] a style of leadership in which leaders form a mutually defined relationship with followers and exhibit inspiration, intellectual stimulation and individualized consideration behaviours."*

While transactional leadership is defined as

> *"[…] a style of leadership in which leaders establish follower performance standards for each exchange and incentive performance through the use of rewards".*

Transformational leaders focus on developing long-term relationships and do not seek to control followers' behaviour through the use of contingent rewards, but manage in a more holistic way (Avolio *et al.*, 1999; Bass, 1985).

In section 2.3.5, this research identified the leadership's role in supply chain learning, although the majority research doesn't apply the leadership theory. However, these studies could find evidence for transactional/transformational leadership styles. Such as Dyer and Nobeoka (2000) and Biotto *et al.* (2012), applying case study method and illustrate supply chain learning of Toyota and Illycaffè respectively. The focal companies' leadership styles can be summarized as below:

- Both companies exhibit transactional supply chain leadership style. For Toyota if suppliers violate the rules, Toyota has the ability to impose economic sanction. Suppliers willing to receive help from the network also need to agree to help others in the network, which is related to a principle of reciprocity, a character of transactional leadership (Defee *et al.*, 2009a).

Illycaffè rewards the growers through tangible and intangible recognitions, such as rewarding best growers with premium price if they have attained the requested quality level, and intangible awards such as the best Brazilian green coffee growers.

- Both companies exhibit transformational supply chain leadership style. Toyota set up a supplier association to embrace suppliers for a shared purpose (e.g. to achieve manufacturing excellence) which is inspirational. Through voluntary learning teams, Toyota encourage its suppliers to be innovative and creative to solve problems which is intellectual stimulation. Through consulting teams, Toyota can help with each supplier's specific needs which is individualized consideration. All the three characters are summarized by Defee *et al.* (2009a) under transformational supply chain leadership. Illycaffè also exhibit some characteristics of transformational supply chain leadership. It emphasis the quality of coffee in the whole chain as a competitive strategy (inspiration), growers are encouraged to be innovative to improve quality and maintain high standards (intellectual stimulation).

The above studies suggest that the concept of transformational and transactional leadership styles can be applied not only at individual levels, but also at supply chain organizational levels. Focal companies' leadership styles can be analysed by their behaviours associated with supply chain members.

2.5 Resource orchestration theory

As identified by previous literature reviews on SSCM (section 2.2.2), there are two papers conducting reviews on the theory application in GSCM (Sarkis *et al.*, 2011) and SSCM (Touboulic and Walker, 2015b). Sarkis *et al.* (2011) specifically focus on organizational theories in GSCM and suggest that diffusion of innovation theory, path dependency theory, social embedded theory, structuration theory and agency theory are promising organizational theories which could apply on GSCM studies. Touboulic and Walker (2015b) carry out a systematic literature review of 308 articles on SSCM and find that several macro theories have

dominated the research field such as resource-based theory (RBT), stakeholder theory and institutional theory, while theory-building efforts are needed in SSCM researches.

This research adopted the resource orchestration theory which is identified suitable to link the three research lenses of multi-tier SSCM, supply chain learning and supply chain leadership. Resource orchestration theory (ROT), an extension of resource-based theory (RBT) (Barney, 1991), is an emerging theory which received attention from OM (Operations Management) scholars in past few years. Compared to RBT, which stipulates that firms could gain competitive advantages based upon valuable, rare, inimitable and non-substitutable resources, ROT scholars suggest that "processing resources alone does not guarantee the development of competitive advantage" (Sirmon *et al.*, 2011, p.1391), "holding valuable and rare resources is a necessity but insufficient condition for achieving a competitive advantage" (Hitt, 2011, p. 9), resources should also be managed effectively to generate synergistic effects. ROT is "the combination of resources, capabilities, and managerial acumen that ultimately results in superior firm performance" (Chadwick *et al.*, 2015, p.360).

Sirmon *et al*. (2007, 2011) are among the early works to develop ROT emphasising the roles of managers on structuring, bundling and leveraging firm resources. At a firm level, ROT could be further elaborated in three aspects: breadth (resource orchestration across the scope of the firm, e.g. horizontal integration); depth (resource orchestration across managerial levels of the firm: top, middle and operational); and lifecycle (resource orchestration at various stages of firm maturity: start-up, growth, maturity, and decline) (ibid). The breadth and depth constructs are akin to internal integration which has two dimensions/directions i.e., horizontal (integrating with other functional departments) and vertical (integrating with different hierarchical levels within the same function) (Trent and Monczka, 2003). The difference lies in that Sirmon *et al*. (2007, 2011) emphasize managers' strategic vision and planned proactivity of structuring, bundling and leveraging firm resources.

Several works apply ROT in supply chain management. Hitt (2011), Crook and Esper (2014) and Hitt *et al*. (2016) suggest that ROT is a promising theory which

could be applied in operations management research. Ketchen *et al*. (2014) propose four types of product recalls in reverse supply chains based on the level of adequacy of the resource endowments and resource orchestration: precise recall, overkill recall, cascading recall and incomplete recall. Liu *et al*. (2016) propose that ROT is particularly useful for understanding the deployment of resources and capabilities in the areas of supply chain integration (SCI) and IT competency. They suggest that the fit between SCI and IT competency as a "moderation" approach that IT competency could strengthen the relationship between SCI and both operational and financial performance (ibid).

Recently researchers have also applied this theory in SSCM studies. Wong *et al*. (2015) adopt both stakeholder theory and ROT in their conceptual framework of green supply chain integration (GSCI). They propose that ROT is an appropriate theory to examine the integration of environmental management in supply chains, "*internal, supplier, customer, and community GSCI in organizations enables acquiring, bundling, and leveraging resources and capabilities internally and externally, increasing the success of environmental management*" (Wong *et al.*, 2015, p. 58). Furthermore, Wilhelm *et al.* (2016b, p. 210) state that "*no firm is powerful enough to orchestrate the entire multi-tier supply chains, but that buying firms can and do exercise control, even to the level of secondary suppliers (Tier 2 suppliers), through formalization and delegating authority.*"

As this research is focusing on the focal companies' proactive SSCM initiatives which cover multi-tier suppliers, focal companies potentially need to orchestrate resources both internally and externally to make the initiatives success and facilitate the supply chain learning of sustainability, thus ROT theory is well positioned to be selected to explain the phenomenon and answer the research questions.

2.6 Summary of the literature review towards an initial framework

After reviewing various streams of literature on SSCM with a particular focus on multi-tier SSCM, supply chain learning, supply chain leadership, this section is to summarize the findings and aim to develop an initial conceptual framework, which

is used to guide the data collection and data analysis.

Based on the comprehensive literature review, it is found that SSCM in multi-tier supply chain is identified as an important albeit under researched topic in supply chain management literature. Theory building is needed in this research theme. ROT is justified as an appropriate theoretical lens to observe proactive focal companies' roles in multi-tier supply chain learning of sustainability. Supply chain learning is also an underdevelopment research phenomenon. Supply chain learning is discussed and embedded in such research themes as supply chain collaboration, supplier development; however there is a lack of intellectual depth for this concept and short of empirical evidence to show how supply chains learn. Supply chain leadership is an underdevelopment concept as well since few research has been found focusing on supply chain leadership. This may be because it is difficult to measure leadership at a supply chain level.

There is a lack of supply chain learning and supply chain leadership research in SSCM studies, not to mention multi-tier SSCM. The introduction and literature review justify why they are important constructs to investigate multi-tier SSCM. The existing studies are focusing on how focal companies could do to achieve sustainability and provide various mechanisms in multi-tier supply chains. Almost all of them adopt a static or snapshot view of SSCM. A process view may provide more significant insights to understand the phenomenon. Implementing SSCM projects could be considered a learning process for both focal companies and their supply chains. The question of how a focal company extends their sustainable practices to multi-tier supply chain and facilitate supply chain members' learning still remains unanswered.

Based on above argument, an initial conceptual model is developed as in Figure 2-3. It is suggested that supply chain learning has a positive relationship with multi-tier SSCM. Supply chain leadership may be a mediating factor between supply chain learning and multi-tier SSCM. Supply chain learning content include both focal company knowledge resources and supplier learning complexity. Multi-tier SSCM also include two factors of multi-tier supply chain governance mechanisms and multi-tier supply chain structure. Lastly, supply chain learning is a dynamic process. During the learning process, the learning content, the supply

chain leadership and multi-tier SSCM may change along in the learning stages. Table 2-5 lists the key themes and their key authors.

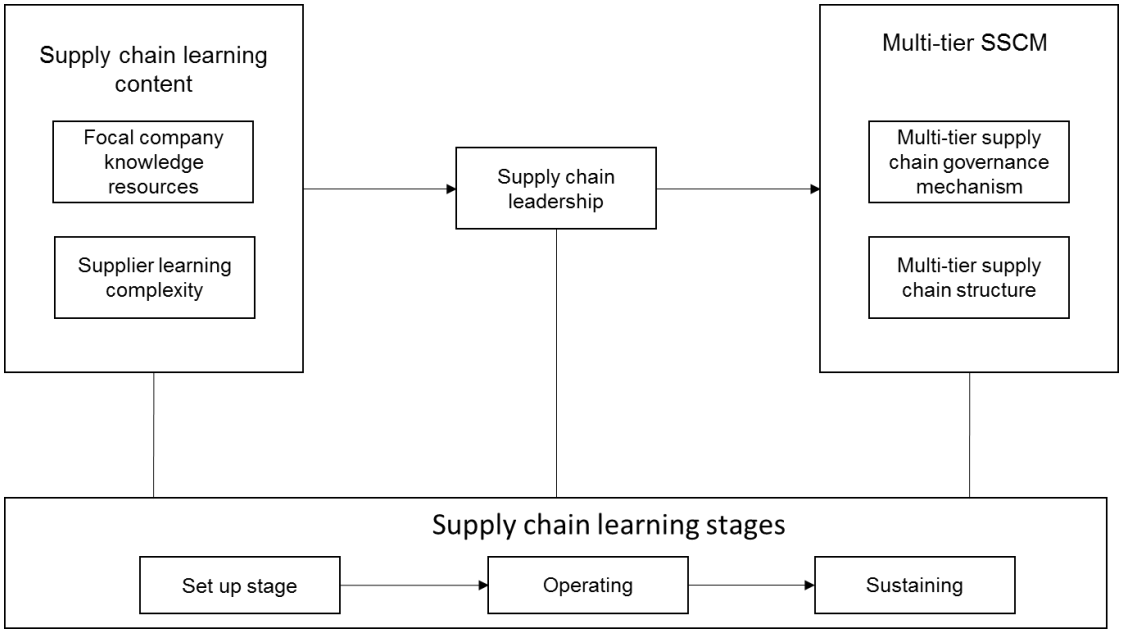


Figure 2-3 Initial framework based on literature review

Research question	Key themes	Sub themes	Key authors
How do MNCs assume a supply chain leadership role in facilitating supply chain learning in multi-tier SSCM?	Supply chain learning	Supply chain learning stages	Bessant and Tsekouras (2001); Bessant *et al.* (2003); Morris *et al.* (2006); Flint *et al.* (2008); Lambrechts *et al.* (2012); Silvestre (2015)
		Supply chain learning content	Dyer and Nobeoka (2000); Spekman *et al.* (2002); Bessant *et al.* (2003); Dyer and Hatch (2004); Sambasivan *et al.* (2009); Biotto *et al.* (2012); Lambrechts *et al.* (2012); Tachizawa and Wong (2014); Silvestre (2015);
	Supply chain leadership	Transformational leadership	Bass and Avolio (1993); Avolio *et al.* (1999); Hult and Nichols (1999); Hult *et al.* (2000a, b; 2007); Defee *et al.* (2009a, b; 2010); Porteous *et al.* (2015); Gosling *et al.* (2016);
		Transactional leadership	
	Multi-tier SSCM	Multi-tier supply chain governance mechanisms	Tachizawa and Wong (2014); Wilhelm *et al.* (2016b)
		Multi-tier supply chain structure	Mena *et al.* (2013); Wilhelm *et al.* (2016a, b)
	ROT	breadth/depth/life cycle	Sirmon *et al.* (2007, 2011); Sirmon and Hitt (2009); Hitt (2011); Crook and Esper (2014); Ketchen *et al.* (2014); Wong *et al.* (2015); Hitt *et al.* (2016); Liu *et al.* (2016).

Table 2-5 Key themes and key authors

Chapter 3 Research Methodology

This chapter explains in details the research method adopted in this research. Before moving on to the justification of the case study approach, the research philosophy is discussed in section 3.1. Section 3.2 details the case study research method and its justification, section 3.3 discusses the case selection process, followed by section 3.4, which presents the data collection process. Section 3.5 is focused on coding and data analysis, finally section 3.6 examines the reliability and validity of the case method.

3.1 Research philosophy

Research philosophy can be defined as "*a system of beliefs and assumptions about the development of knowledge*" (Saunders *et al.*, 2015, p.124). Saunders *et al.* (2015) state that researchers' personal beliefs and assumptions about what is important affects the decisions we make, and have a profound impact on the research we decide to pursue and the methods we use. Easterby-Smith *et al.* (2012) suggest that philosophical issues have important impacts on the quality of management research and are central to the notion of research design. Thus it is necessary to communicate my research philosophy in terms of assumptions and beliefs before I engage in any debate on methodology and methods (Morgan and Smircich, 1980).

In this section, I first discuss the research around research philosophy, then focus on the philosophical stance adopted in this study, and finally discuss the approach to theory development.

3.1.1 The philosophy of management research

Burrell and Morgan (1979) suggest that at every stage of our research we will make a number of assumptions. Gioia and Pitre (1990) classify these assumptions into three types: the nature of organizational phenomena (ontology), the nature of knowledge about those phenomena (epistemology), and the nature of ways of studying those phenomena (methodology). Saunders *et al.* (2015)

further suggest that a well-thought-out and consistent set of assumptions could lead to a credible research philosophy, which guide our methodological choice, research strategy, data collection techniques and analysis procedures.

To be specific, Ontology is associated with the question of being and knowing (Easterby-Smith *et al.*, 2012). With regards to the business and management discipline, the objects could include organizations, management, individuals' working lives and organizational events and artefacts. Ontology could decide how we see the world of business and management and influence our choice of research topic.

Epistemology is the assumptions about knowledge, what constitute acceptable valid and legitimate knowledge, and how we communicate knowledge to others (Burrell and Morgan, 1979). As a multidisciplinary subject, business and management contains various types of knowledge, which could all be considered legitimate, these could range from numerical data to textual and visual data, from facts to interpretations, including narratives, stories and even fictional accounts (Saunders *et al.*, 2015). Saunders *et al.* (2015) argue that our own epistemological assumptions will govern what we consider legitimate in our research.

Finally, **axiology** refers to the role of values and ethics within the research process, it is about how we deal with both our own values and those of our research participants (Saunders *et al.*, 2015). Our choice of philosophy and the choice of data collection techniques are the reflection of our values. Saunders *et al.* (2015) provide an example of collecting data through interviews and indicates that the researcher puts emphasis on the value of interaction with respondents rather than knowing their opinions through an anonymous questionnaire.

Saunders *et al.* (2015) further propose that the three types of assumptions of ontology, epistemology and axiology are scattered along a multidimensional continuum between two opposing extremes: objectivism and subjectivism. Objectivism "*incorporates the assumptions of the natural sciences, arguing that the social reality that we research is external to us and others (referred to as social actors)*" (Saunders *et al.*, 2015, p. 128). Subjectivism, however,

"*incorporate assumptions of the arts and humanities, asserting that social reality is made from the perceptions and consequent actions of social actors (people)*" (Saunders *et al.*, 2015, p. 130).

3.1.2 The author's philosophical position

Various researchers proposed different philosophical perspectives. For instance, Morgan and Smircich (1980) suggest that objectivist and subjectivist as a continuum. Mingers (2003) classify that into three types of positivist, interpretivist and interventionist. Burrell and Morgan (1979) and Gioia and Pitre (1990) classify four research paradigms of interpretivist, radical humanist, radical structuralist and functionalist. Lincoln and Guba (1985) and Guba and Lincoln (1994) also define four paradigms of qualitative research: positivism, post-positivism, critical theory and constructivism. This research follows Saunders *et al.* (2015)'s latest classification that there are five major philosophies in business and management disciplines: positivism, critical realism, interpretivism, postmodernism and pragmatism.

Positivism relates to "*the philosophical stance of the natural scientist and entails working with an observable social reality to produce law-like generalizations*" (Saunders *et al.*, 2015, p. 135). **Critical realism** focuses on "*explaining what we see and experience, in terms of the underlying structures of reality that shape the observable events*" (Saunders *et al.*, 2015, p. 138). **Interpretivism** emphasizes that "*humans are different from physical phenomena because they create meaning*" (Saunders *et al.*, 2015, p. 140). **Postmodernism** emphasizes "*the role of language and of power relations, seeking to question accepted ways of thinking and give voice to alternative marginalized views*" (Saunders *et al.*, 2015, p. 141). Finally, **pragmatism** asserts that concepts are only relevant where they support action (Kelemen and Rumens, 2008).

Saunders *et al.* (2015) make a comparison between the five research philosophies, as shown in Table 3-1. Based on the previous discussion and this comparison, to reflect my own research, the research philosophy adopted by this research is grounded in pragmatism. As a PhD researcher carrying out this PhD

project, I believe that although we need to make contribution to theory, we should generalize our understanding from the real world, real practices and link with the existing theories to provide better guidance to practice.

The belief is rooted in both my education and work experience. Choosing the subject of ‘logistics engineering’ in my undergraduate and ‘logistics and supply chain management’ in my master may well reflect my philosophy and the belief that knowledge should contribute to practice. Three years’ of management consulting work experience further strengthened this belief. The consulting work is practice driven and solve client organizations’ real problems, searching for answers from existing theories and linking the knowledge to organizations’ unique problems.

The ideas are also aligned with Saunders *et al.* (2015, p. 143), who suggest, “*for a pragmatist, research starts with a problem, and aims to contribute practical solutions that inform future practice*”. The research question is initially derived from the practical observations during my consulting work and confirmed to be: *“How do MNCs assume a supply chain leadership role in facilitating supply chain learning in multi-tier SSCM?”* The answer to this research question could not only contribute to theory development but could also contribute to MNCs’ practices in SSCM. There are several advantages for pragmatism researchers, that they are more flexible in their research methods, they strive to reconcile both objectivism and subjectivism, facts and values, accurate and rigorous knowledge and different contextualized experiences (Saunders *et al.*, 2015). Pragmatism tends to apply multiple methods to enable credible, well-founded, reliable and relevant data to be collected that advance the research (Kelemen and Rumens, 2008).

	Ontology (nature of reality or being)	**Epistemology** (what constitutes acceptable knowledge)	**Axiology** (role of values)	**Typical methods**
Positivism	Real, external, independent; One true reality (universalism); Granular (things); Ordered;	Scientific method; Observable and measureable facts; Law-like generalisations; Numbers; Causal explanation and prediction as contribution;	Value-free research; Researcher is detached, neutral and independent of what is researched; Researcher maintains objective stance;	Typically deductive, highly structured, large samples. Measurement, typically quantitative methods of analysis, but a range of data can be analysed;
Critical realism	Stratified/layered (the empirical, the actual and the real); External, independent; Intransient; Objective structures; Casual mechanisms;	Epistemological relativism; Knowledge historically situated and transient; Facts are social constructions; Historical causal explanation as contribution;	Value-laden research; Researcher acknowledges bias by world views, cultural experience and upbringing; Researcher tries to minimise bias and errors; Researcher is as objective as possible;	Retroductive, in-depth historically situated analysis of pre-existing structures and emerging agency. Range of methods and data types to fit subject matter;
Interpretivism	Complex, rich; Socially constructed through culture and language; Multiple meanings, interpretations, realities; Flux of processes, experiences, practices	Theories and concepts too simplistic; Focus on narratives, stories, perceptions and interpretations; New understandings and worldviews as contribution;	Value-bound research; Researchers are part of what is researched, subjective; Researcher interpretations key to contribution; Researcher reflexive	Typically inductive. Small samples, in-depth investigations, qualitative methods of analysis, but a range of data can be interpreted
Postmodernism	Nominal; Complex, rich; Socially constructed through power relations; Some meanings, interpretations, realities and dominated and silenced by other; Flux of processes, experiences, practices;	What counts as 'truth' and 'knowledge' is decided by dominant ideologies; Focus on absences, silences, and oppressed/repressed meanings, interpretations and voices; Exposure of power relations and challenge of dominant views as contribution;	Value-constituted research; Researcher and research embedded in power relations; Some research narratives are repressed and silenced at the expense of others; Researcher radically reflexive;	Typically deconstructive - reading texts and realities against themselves; In-depth investigations of anomalies, silences and absences; Range of data types, typically qualitative methods of analysis;

Pragmatism	Complex, rich, external; 'Reality' is the practical consequences of ideas; Flux of processes, experiences and practices.	Practical meaning of knowledge in specific contexts; 'True' theories and knowledge are those that enable successful action; Focus on problems, practices and relevance; Problem solving and informed future practice as contribution.	Value-driven research; Research initiated and sustained by researcher's doubts and beliefs; Researcher reflexive.	Following research problem and research question; Range of methods: mixed, multiple, qualitative, quantitative, action research; Emphasis on practical solutions and outcomes.

Table 3-1 Comparison of five research philosophies in business and management research
(Source: Saunders *et al.*, 2015, p. 136)

3.1.3 Approach to theory building

Another key aspect of research is the use of theory and the approaches to theory development. Researchers starts with a theory (Handfield and Melnyk, 1998). It is based on researchers' cognitive frame or lens to observe the selected environment (Amundson, 1998).

Bacharach (1998, p. 496) define that "A theory is a statement of relations among concepts within a set of boundary assumptions and constraints". Gioia and Pitre (1990, p. 587) refer theory as "any coherent description or explanation of observed or experienced phenomena" and theory building as "the process or cycle by which such representations are generated, tested, and refined". Lynham (2000) define theory building as "the purposeful process or recurring cycle by which coherent description, explanations, and representations of observed or experienced phenomena are generated, verified, and refined". Easterby-Smith *et al.* (2012) highlight the importance of being familiar with the extent theories in the field of research that a profound understanding of the literature could help the research findings to be located back to existing literature and demonstrate how a theoretical contribution is made.

Ketokivi and Mantere (2010) propose that there are three approaches to theory development: deductive, inductive and abductive. They suggest that deductive reasoning occurs when the conclusion is derived logically from a set of premises being true when all the premises are true; inductive reasoning occurs when there is a gap in the logic argument between the conclusion and the premises observed, the conclusion being 'judged' to be supported by the observation made; finally abductive reasoning begins with a 'surprising fact' being observed, the surprising fact is the conclusion rather than a premise.

Saunders *et al.* (2015) suggest that when research starts from theory which is developed from reading of the academic literature and the research strategy aims at testing the theory, then it is the deductive approach; if the research starts by collecting data to explore a phenomenon and generate or build theory then this is an inductive approach; lastly if the research starts from collecting data to

explore a phenomenon, identify themes and explain patterns, to generate a new or modify an existing theory, the research then subsequently test through additional data collection then this is an abductive approach.

Based on the discussion, this research mainly adopts a combination of inductive and deductive approaches, or 'retroduction', identified by Harrison (2002, p. 159) as "*the strategy that is used to describe the interplay of induction and deduction*". It is also a combined strategies of research-to-theory and theory-to-research approach for theory building (Lynham, 2002). This research starts with systematic literature reviews of the academic literature, thus theories are deductively summarized during the comprehensive reading. Through data collection and data analysis, theory inductively developed (Colquitt and Zapata-Phelan, 2007; Eisenhardt and Graebner, 2007) by the fact that multi-tier SSCM, supply chain learning and supply chain leadership are underdeveloped concepts.

This combination approach is also supported by Miles *et al.* (2013) in that moving back and forth between empirical data, literature and theoretical framework through constant theorizing with the aim of developing more refined analytic categories, make this research rigorous.

3.2 Case study method

Yin (2008) claim that case study is one of the ways of conducting social sciences research, the other methods include experiments, survey, historical and the analysis of archival data. This section highlights the strength of the case study method and exhibits the best practices of the method. The rest of the sections in this chapter provide the details on the case study design. With a practical focus, Table 3-1 suggests that case study method fits well with pragmatism.

3.2.1 The strength of case study method

"*A case study is 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, 2008, p.13). It is a

research strategy which focuses on understanding the dynamics present within single settings (Eisenhardt, 1989, p. 534). Voss *et al.* (2002, p.195) claim that "*case study research has been one of the most powerful research methods in operations management, particular in the development of new theory*".

Meredith (1998) cite three outstanding strengths of case research put forward by Benbasat *et al.* (1987): (1) the phenomenon can be studied in its natural setting and meaningful, relevant theory generated from the understanding gained through observing actual practice; (2) the case method allows the question of why, what and how, to be answered with a relatively full understanding of the nature and complexity of the complete phenomenon; (3) the case method lends itself to early, exploratory investigations where the variables are still unknown and the phenomenon not at all understood (Meredith, 1998, p. 444). Ellram (1996) also argues that case study method provides depth and insight into little known phenomenon.

As discussed in Chapter 2, among the main streams of SSCM research, it is surprising (due to its prevalence in practice) that with a few exceptions, the leadership role played by MNCs in their supply chains in an emerging economy has been ignored by researchers. Little is known about how MNCs, assuming leadership in their supply chain, have been doing to facilitate the supply chain members and learn sustainability practices in an emerging economy context. Furthermore, the research on multi-tier supply chain is also not well developed (Mena *et al.*, 2013). Thus it is worthwhile conducting research on multi-tier supply chains through the lenses of supply chain learning and supply chain leadership.

A case study is suitable for this research in that it answers how and why questions; when theory is relatively new. In this case, both supply chain leadership and supply chain learning are scant in literature, and multi-tier SSCM is immature; and finally through observing MNCs' practices, this research can develop and extend current understanding of theories such as ROT. Eisenhardt (1989), Voss *et al.* (2002) and Barratt *et al.* (2011) suggest that case study is particularly suitable for theory building.

3.2.2 Best practices of case study method

Besides the advantages of case study method, lack of rigour in case study process is a core criticism and challenge mentioned by researchers (Stuart *et al.*, 2002; Seuring, 2008). Operations Management Studies applying case study method tend to forget the discussions on several issues: what are the goals of the research; what have the previous research works been done on the topic; what interview protocol is used; how and where the data are collected; how the data are analysed; and how the findings are validated (Stuart *et al.*, 2002).

However, a well-structured and comprehensively documented research process could enable rigor and quality of the research (Seuring, 2008). An explicit discussion on justification and reasoning for case research, adequate framing of the research, specification of the unit of analysis, providing a sampling logic, data source triangulation and both within-case and cross-case analysis and presentation of findings could be methodologically rigorous (Barratt *et al.*, 2011).

Regarding the processes for conducting the case study method, Eisenhardt (1989) provides a roadmap for building theories from case study research which include eight steps: (1) getting started, define research question and possibly a priori constructs; (2) selecting cases, theoretical sampling rather than statistical sampling cases; (3) crafting instruments and protocols; (4) entering the field; (5) analysing data, conduct both within-case analysis and cross-case analysis for patterns; (6) shaping hypotheses, critical discuss the constructs; (7) enfolding literature, compare with similar and conflicting literatures; and (8) reaching closure, theoretical saturation when possible.

Stuart *et al.* (2002) suggest a five-stage research process: forming research questions; instrument development; data gathering; data analysis; and dissemination. The first stage is to define the research question and examine the literatures to create a solid theory foundation; stage two is the development of research instrument especially the case study protocol; the third stage is collecting data from the field; the fourth stage is to make sense of the data such as extract patterns; and finally researchers need to disseminate the research findings.

Holton (2007) suggests that case research must be made transparent by demonstration of what one has done, not by declaring that a formalized process was followed. Ketokivi and Choi (2014, p.234) also highlight the importance of transparency, *"both the process (reasoning) and the outcome (claims) must be explicit and transparent so as to enable a meaningful evaluation of their logical consistency and plausibility."*

Finally, Voss *et al.* (2002) suggest that the fewer the number of cases, the greater the opportunity for the depth of observations, however multiple cases could enhance external validity and guard against observer's bias. By following the above suggestions and processes, a multiple case study approach is selected to explore the relationship between supply chain leadership and supply chain learning in a multi-tier supply chain context, as well as to enhance the applicability and robustness of the findings (Eisenhardt and Graebner, 2007).

3.3 Case Selection

Western MNCs operating in China were selected for this research. China has been the global largest manufacturing base since 2010. At the end of 2014, China surpassed the US in becoming the world's largest economy in terms of purchasing power according to International Monetary Fund. Ten percent of the global revenue of 180 major MNCs was generated in China and this will continue to grow as they source, produce and sell in the growing Chinese market (Beebee, 2007). While at the same time, China suffers from various serious environmental problems such as air pollution, energy waste, and water pollution; some manufactories were criticized as 'sweatshops' because of employees working overtime, being underpaid and extreme working conditions.

Western MNCs are believed to be much more mature than Chinese private or state owned companies in not only supply chain management, but also corporate social responsibility (CSR) (Lam, 2011) and therefore more likely to assume leadership in the supply chain. So this research targeted western MNCs SSCM operations in China with the participation of multi-tier supply chains members

covering at least three levels including focal companies. The sustainable initiatives should be implemented in at least suppliers and suppliers' suppliers. Thus the **unit of analysis** of this research is a sustainable initiative lead by Western MNCs covering at least two tiers of suppliers.

A five-step framework was adopted to conduct the case selection as in Figure 3-1. A sample pool was identified as the starting point. Research cover letters explaining the research purpose and aims were sent to the companies to identify the MNCs' willingness to participate in the research. A first round of interviews were conducted with the senior executives agreeing to take part in order to find out whether the MNCs are fit for the research and identify whether they have proactive sustainable initiatives covering multi-tier suppliers. After identifying, the interviews were conducted with key individuals involved in the selected sustainability initiatives.

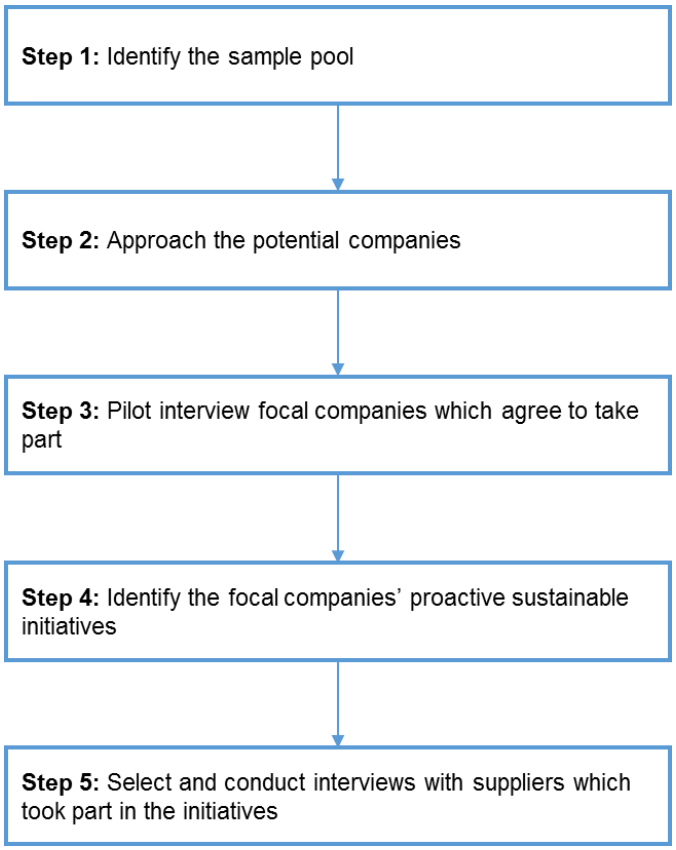


Figure 3-1 A five step framework for case selection

Thanks to a partnership between Exeter and WWF (World Wide Fund for Nature), WWFs' MNCs partners were chosen as the sample pool. WWF tends to collaborate with influential industry leaders who could be considered as supply chain leaders and exemplars in sustainability supply chain management. For example, the climate savers companies are selected from leaders of various industries who not only reduce more CO2 emission than industry average and improve their environmental performance but proactively influence their customers and suppliers to do the same. Other researchers are also focused on studying the exemplar companies such as Pagell and Wu (2009) and Miemczyk *et al.* (2016).

This research followed a theoretical sampling approach which focus on the exemplars MNCs' multi-tier SSCM initiatives. Theoretical sampling means "cases are selected because they are particularly suitable for illuminating and extending relationships and logic among constructs" (Eisenhardt and Graebner, 2007, p. 27). The following criteria were applied to select the MNCs:

(1) Western MNCs that have established corporate sustainability strategy;
(2) Western MNCs that have localized manufacturing and supply chain operations in China;
(3) Western MNCs that conducted proactive sustainable initiatives covering a supply chain of multiple tiers (at least three tiers).

The proactive sustainable initiatives are defined as activities going beyond compliance with government and any other third party organization requirements and show proactivity and importance to the focal companies concerned. Besides the aforementioned criteria, the MNCs could provide access to supply chain members in at least two tiers of suppliers and these companies and their suppliers should also be willing to participate in this research.

In total seven companies were approached for data collection initially. Cover letters (see as in Appendix B) explaining the research aims were sent to the executives with five MNCs agreeing to take part. Two out of the five companies were dropped because, after the pilot interviews with its senior managers, it is found that its upstream supply chain is too short (one tier), therefore the

sustainability initiatives are focused on internal operations (Lafarge, a French cement manufacturer). Another company was dropped in the second round of interviews, due to organizational structure change and its inability to provide further access to its suppliers (SKF, Sweden bearing and seal manufacturer).

The three companies that remain are Tetra Pak, Nestlé, and IKEA (The background information of the three companies are summarized in Table 3-2). Three types of sustainability initiatives were identified after the first round interviews including implementing supplier code of conduct, energy efficiency and unique proactive projects, which require significant efforts from and are critical to the supply chain management of the companies. All the projects were engaging different tiers of suppliers. However, after interviewing the corresponding project managers, it was found that only the unique proactive projects meet the case selection criteria, are comparable to each other and provided rich data. For supplier code of conduct and energy efficiency type of projects, focal companies implemented them sometimes only with one tier of the suppliers in the supply chain. For instance, IKEA has a proactive holistic code of conduct project that aims to facilitate suppliers to fulfil its IWAY requirements and pilot projects have been carried out on the Tier 2 suppliers, whilst Tetra Pak's code of conduct is mainly applied at the global headquarters. On the other hand, for the energy efficiency projects, IKEA implemented with multi-tier suppliers, Nestlé tended to be more ad-hoc and implemented with only one tier of dairy farms.

Company	Industry	Global coverage	No. of Employee	Sales Revenue	Corporate Sustainability Strategy	Proactive project
Tetra Pak	food processing and packaging	>170 countries	23,000	Euro 11.9 billion	Protect What's Good	Creating a recycling chain in China
Nestlé	food and beverage	nearly all countries around the world	335,000	CHF 88.8 billion	Creating Shared Value	Modernizing dairy farmers in China
IKEA	home furnishing	operated in 43 countries	155,000	Euro 31.9 billion	People & Planet Positive	Sustainable cotton initiative

Table 3-2 Basic information of case companies
(Data as in 2015; 1 Euro= 1.12 US Dollar, 1 CHF = 1.02 US Dollar)

Finally the proactive sustainable initiatives selected for each company are: Tetra Pak creating a recycling chain in China, Nestlé's modernizing dairy farmers in China and IKEA promoting sustainable cotton. For the three multi-tier supply chains, the unit of analysis for Tetra Pak is its recycling chain which covering four tiers including recyclers, collection company, individual collectors and consumers (as waste materials providers); the unit of analysis for Nestlé is its modernization of dairy farmers including two tiers of dairy farmers and suppliers to dairy farmers . For IKEA, it is the sustainable cotton project covering six tiers of suppliers including cutting and stitching, dyeing, weaving, spinner, ginner and cotton farmer. Tetra Pak was selected given the fact that closed-loop supply chain or reverse logistics is an important type of SSCM. Hence, two forward supply chains and one reverse chain were selected, to demonstrate comprehensiveness in case selection.

After focal companies and their supply chains, suppliers were further selected to represent different types. For instance, Tetra Pak's recyclers were selected based on their different recycling technologies (e.g. PolyAl separation technology, plastic-wood technology). The field visits of Nestlé's dairy farmers were selected based on their types by Nestlé's internal grading (e.g. A, B, C). Finally IKEA's suppliers were selected based on the level of vertical integration: from fully vertically integrated to multi-tier supply chain with suppliers covering all the six tiers (e.g. a supplier only cover a single stage of the textile supply chain). Figure 3-2 shows a supply network of IKEA with three multi-tier supply chains of IKEA.

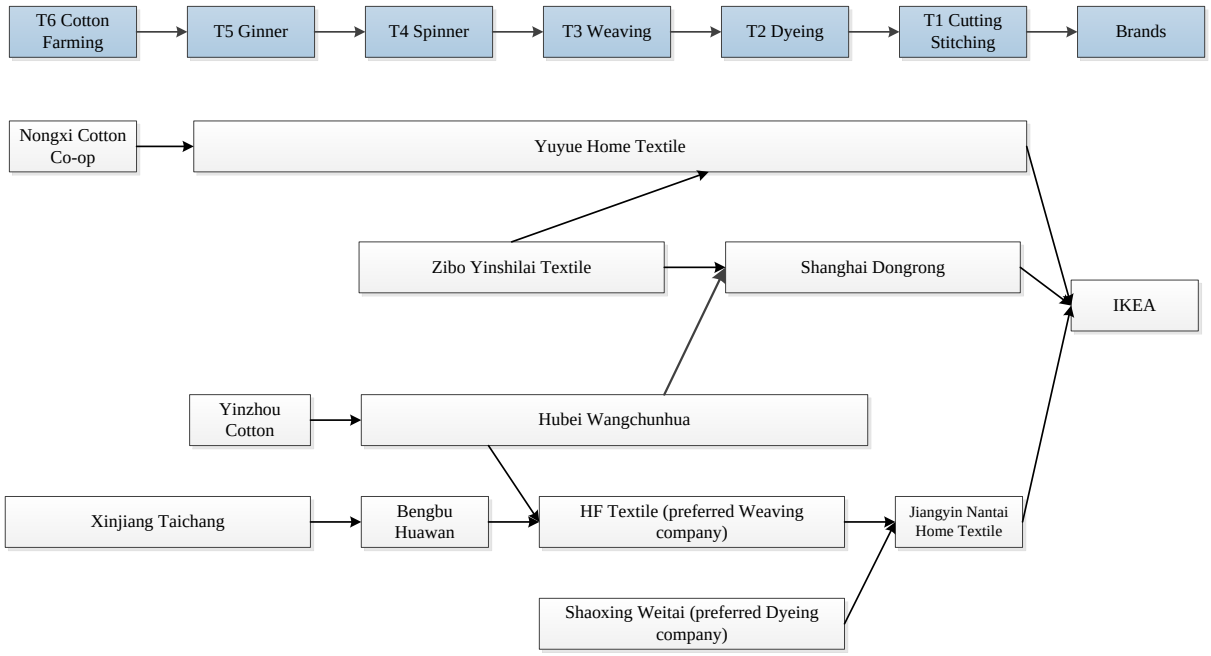


Figure 3-2 Interviews conducted in IKEA's supply chains

Finally data collections were carried out with the three companies and their suppliers. According to Eisenhardt (1989), for multiple case studies a number between four and ten cases is necessary. For fewer than four cases, it is often difficult to generate theory with complexity and for more than ten cases it becomes difficult for researchers' to cope with the complexity and volume of data.

However, Voss *et al.* (2002) also record that multiple case studies could range from three to 30 cases. It is also normal for studies focusing on multi-tier supply chain to do so with fewer cases, Grimm *et al.* (2014; 2016) and Miemczyk *et al.* (2016), for example, all selected two cases, while Mena *et al.* (2013) selected three cases. Given the fact that this research is focusing on multi-tier supply chain, with each focal companies' several supply chains, the number of cases is valid for its complexity. Furthermore, several supply chains of each focal companies are selected and are considered embedded cases.

3.4 Data Collection

Semi-structured interviews were conducted as the primary data source. Eisenhardt and Graebner (2007) suggest that interviews are a highly efficient way to gather rich, empirical data especially when the phenomenon of interest is

highly episodic and infrequent. To reduce respondents' bias, multiple interviewees with knowledge of the sustainable supply chain initiatives are interviewed from multiple perspectives including focal companies' senior executives, middle managers and operational staff, different tiers of suppliers (Tier 1, middle tier and extreme upstream), government agencies, NGOs or other third partiers with knowledge of the sustainable supply chain initiatives. Data from multiple sources provide the opportunity to triangulate the information collected (Eisenhardt, 1989). One of the strength of this study is that a full access to the sustainable initiatives including interviews with personnel from focal companies, their multi-tier suppliers and key stakeholders, is granted by the three cases.

An interview protocol was customized for each company and updated after each interview (see Appendix C). The interview protocol is a major approach to increase the reliability of case study research (Yin, 2008). It could help researchers stick to the research topic; anticipate potential problems which may happen in the collection process and assist the write up of the case report. In total more than 60 formal interviews were conducted for the three cases, 43 quality interviews are finally used here with a focus on the three sustainable initiatives (formal interviews on other sustainability initiatives are removed from the list). A summary of the interview list is in Table 3-3.

No	Supply chain	Chain level	Title	Date	Location
1	Tetra Pak	Focal company	VP Corporate Communication	20140922	Shanghai
2	Tetra Pak	Focal company	Senior Environmental Engineer	20141008	Shanghai
3	Tetra Pak	Recycler	General Manager	20141011	Shanghai
4	Tetra Pak	Recycler	General Manager	20141016	Beijing
5	Tetra Pak	Focal company	VP Corporate Communication	20150408	Shanghai
6	Tetra Pak	Recycler	General Manager	20150412	Fuyang, Zhejiang
7	Tetra Pak	Focal company	Cluster Environmental Director	20150420	Shanghai
8	Tetra Pak	Recycler	General Manager	20160121	Beijing
9	Nestlé	Focal company	VP Corporate Affairs	20140926	Beijing
10	Nestlé	Focal company	Corporate Affairs	20140926	Beijing
11	Nestlé	Focal company	General Manager DFI	20141020	Shuangcheng, Heilongjiang
12	Nestlé	Focal company	Business Development Manager	20141021	Shuangcheng, Heilongjiang

13	Nestlé	Focal company	Fresh milk procurement & agriculture service manager	20150424	Shuangcheng, Heilongjiang
14	Nestlé	Focal company	Milk district TA supervisor	20150424	Shuangcheng, Heilongjiang
15	Nestlé	Focal company	DFI business development manager	20150424	Shuangcheng, Heilongjiang
16	Nestlé	Focal company	Milk district TA supervisor	20150425	Shuangcheng, Heilongjiang
17	Nestlé	Tier 1	Cow farm owners	20150425	Shuangcheng, Heilongjiang
18	Nestlé	Focal company	Milk district TA supervisor	20150427	Shuangcheng, Heilongjiang
19	Nestlé	Tier 2	Project Manager	20150427	Shuangcheng, Heilongjiang
20	Nestlé	Focal company	Fresh milk procurement & agriculture service manager	20150428	Shuangcheng, Heilongjiang
21	Nestlé	Focal company	Milk district TA supervisor	20150430	Shuangcheng, Heilongjiang
22	IKEA	Focal company	Sustainability Manager	20141023	Shenzhen, Guangdong
23	IKEA	Focal company	Business Development Manager	20141106	Shanghai
24	IKEA	Focal company	Business Development Manager	20141229	Shanghai
25	IKEA	Focal company	Deputy Sustainability Compliance Manager	20150409	Shanghai
26	IKEA	Focal company	Specialist Better Cotton Project	20150416	Shanghai
27	IKEA	BCI	Membership Officer	20150417	Shanghai
28	IKEA	Tier 5	General Manager	20150503	Songzi, Hubei
29	IKEA	Tier 1	Purchasing Manager	20150504	Nanjing, Jiangsu
30	IKEA	Tier 1	Better cotton specialist & Purchasing Manager	20150504	Shanghai
31	IKEA	Focal company	Specialist Better Cotton Project	20151123	Shanghai
32	IKEA	Focal company	Business Development Manager	20151124	Shanghai
33	IKEA	Government	Secretary	20151125	Binzhou, Shandong
34	IKEA	Tier 6	Cooperative director	20151126	Binzhou, Shandong
35	IKEA	Tier 3-4	Deputy General Manager	20151127	Zibo, Shangdong
36	IKEA	Tier 1-5	General Manager of Raw Material Branch	20151128	Binzhou, Shandong
37	IKEA	Tier 5-6	Agriculture technic	20151130	Xinjiang
38	IKEA	Tier 1	Purchasing Manager	20151130	Jiangyin, Jiangsu
39	IKEA	Tier 2-3	Sales Manager	20151201	Jiangyin, Jiangsu
40	IKEA	Tier 2-3	CEO	20151201	Jiangyin, Jiangsu
41	IKEA	Tier 4	Sales Manager	20151202	Bengbu, Anhui
42	IKEA	Tier 2-3	General Manager	20151203	Shaoxing, Zhejiang
43	IKEA	Tier 4	General Manager	20151210	Songzi, Hubei

Table 3-3 List of interviews

Three rounds of data collection were carried out. The first round of data collection was carried out between September and October 2014 with a focus on the senior executives of each focal company on the overall sustainability strategy. Suppliers were also interviewed when available with a focus on Tetra Pak. The second round of data collection was carried out between April and May 2015 with a focus on Nestlé's operations. The third and final round data collection was carried out between November and December 2015, with the focus on IKEA's lower tier suppliers.

In total 43 interviews are found relevant to the three sustainability initiatives, with eight focused on Tetra Pak, 13 on Nestlé and 22 on IKEA. The majority of interviews were conducted in Chinese, with two in English. All the interviews were recorded except for one in which interviewee did not agree to be taped. Detailed notes were taken during this interview. 37 of the interviews were conducted face to face in 11 cities (as in Figure 3-3), and six interviews were conducted via telephone either due to distance or interviewees' time schedule conflict. Field notes were taken along with these interviews to record immediate reflections and key information.

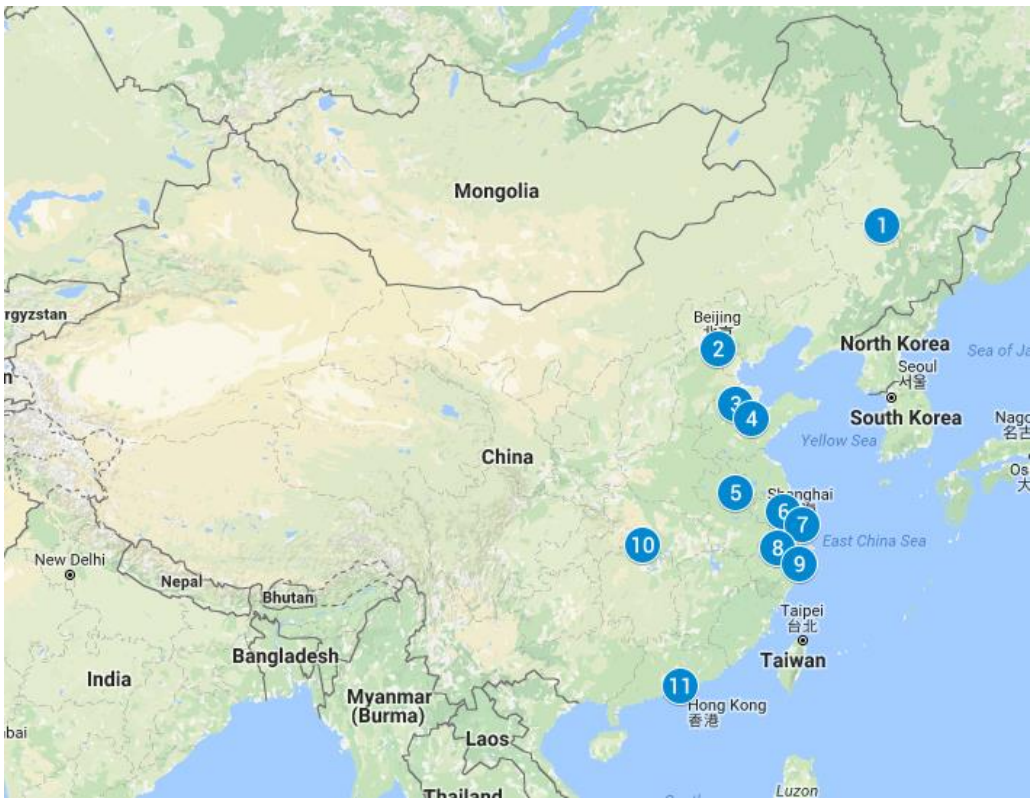


Figure 3-3 Cities visited for data collection in China

(1. Shuangcheng, Heilongjiang; 2. Beijing; 3. Binzhou, Shandong; 4. Zibo, Shandong; 5. Bengbu, Anhui; 6. Jiangyin, Jiangsu; 7. Shanghai; 8. Fuyang, Zhejiang; 9. Shaoxing, Zhejiang; 10. Songzi, Hubei; 11. Shenzhen, Guangdong)

Almost half of the interviews were conducted with the focal companies by the fact that these focal companies initiated these projects and could provide more complete information. These interviews lasted from 18 minutes to 240 minutes, with an average of 62 minutes. The interviewees include senior managers such as Vice Present Corporate Communication, Vice Present Corporate Affairs, Sustainability Manager at IKEA (senior manager in Swedish terms); middle managers such as Business Development Manager, Senior Environmental Engineer; and frontline personnel such as Milk District Technical Assistant Supervisor and Specialist Better Cotton Project.

Another 21 interviews were carried out with focal companies' suppliers. Nine interviews were conducted with the first tier suppliers and the remaining with lower tier suppliers. The length of the interviews with suppliers were last between 21 minutes to 100 minutes with an average of 47 minutes. Interviews were mainly conducted with general managers, purchasing managers and sales managers of the suppliers.

Interviews with suppliers were carried out at two levels of Tetra Pak's recycling chain (enough information was gathered from Tier 1 recyclers). Both Nestlé and IKEA were interviewed with their multi-tier suppliers. The distribution of the interviews at different tiers are summarized in Table 3-4.

	Total	Focal company	T1	T2-T6	NGO	Cotton Association
IKEA	22	7	4	9	1	1
Nestlé	13	11	1	1		
Tetra Pak	8	4	4			
Total	43	22	9	10	1	1

Table 3-4 A summary of interviews at different supply chain levels

22 interviews were conducted in IKEA's multi-tier supply chain. Among them, seven interviews were conducted in IKEA with both the sustainability and

business development teams and further 15 interviews were conducted with multi-tier suppliers mainly with their general managers, purchasing managers and sales managers. One interview was conducted with a BCI (Better Cotton Initiative) membership officer and another one was conducted with a local cotton association secretary.

In total 13 interviews were conducted for Nestlé's supply chain. The majority of interviews were conducted with Nestlé staff including the senior managers at its headquarter, the DFI (Dairy Farming Institute) managers and Shuangcheng milk districts managers and technical assistants. Eight interviews were conducted for Tetra Pak's recycling chain, among them four interviews were conducted with Tetra Pak senior managers and middle managers, another four interviews were conducted with three recyclers' general managers. The interviews stopped when a theoretical saturation is reached (Eisenhardt, 1989) i.e., further interviews would not provide new information to the understanding of the research question.

All the taped interviews were transcribed into Chinese/English with in total more than 440,000 characters/words. I personally transcribed 33 interviews and 10 interviews are transcribed into Chinese by a professional company (http://www.iflyrec.com/). The company follows a highly ethical procedure by assigning the transcription of an interview to two or more people to transcribe and finally an administrator integrates the parts together and send it to me.

Besides these formal interviews, a number of informal interviews were conducted along with the factory/plant tours and training sessions. Factory visits were paid to Tetra Pak's Shanghai plant and three recyclers, ten Nestlé dairy farmers and nine IKEA suppliers with two Tier 1 suppliers, one cotton farm and six other lower tier suppliers (see some photos taken on site in Appendix D). I also attended a three-day training session provided by Nestlé to observe their learning activities.

The data were saved in a database together with any digital information provided by the interviewees. Photos were taken and kept as reminders of the field experience and to provide a different data source. Archival data were also extensively collected including company websites, news coverage, internal company documents and public corporate social responsibility reports. Multiple

sources of data was recommended for case study research as a way for triangulation, these sources provide the corporate sustainability strategies and the initiatives' background and compliment the formal interviews.

3.5 Coding and Case Analysis

After data collection, data were coded and analysed. Based on Miles *et al.* (2013) within-case analysis was first conducted, followed by the cross-case analysis. In order to strengthen the validity of the analysis results, a copy of the within-case results were sent to the senior executives of each focal company for feedbacks, to check accuracy and obtain ethical approval. The cross case results were iteratively discussed with my supervisors who were not involved in the data collection and played a "resident devil's advocate" role to bring a more objective view (Sutton and Callahan, 1987; Jia *et al.*, 2014b).

3.5.1 Coding

Coding is applied only after all data were collected, a way to control for the researcher' bias especially in this research that interviews were carried out by a single researcher. The coding is done via an iterative process with both the interview transcripts and secondary data and followed the coding scheme suggested by Strauss and Corbin (1990).

An open coding is applied in the first step. Attentions are paid to the constructs identified in the literature review of SSCM, supply chain leadership and supply chain learning. For instance, in multi-tier SSCM, the governance mechanisms are used as prior (codes) to reflect focal companies' approach to associate and influence sub-tier suppliers; multi-tier supply chain structure are analysed based on these relationships. Supply chain learning is coded for the project implementing stages and the learning content in terms of focal companies' knowledge resources and the level of suppliers' learning complexity. Finally, behaviours by focal companies that could reflect their leadership styles, and suppliers' comments on focal companies' leadership behaviours are coded for supply chain leadership.

Next an axial coding is applied to put together the data in new ways. This has been applied especially on supply chain leadership constructs. Given the fact that supply chain leadership is an immature concept, the second order constructs of transformational and transactional leadership styles are obtained from various leadership literatures to code the data. Focal companies' behaviours which could reflect the second-order constructs are coded and then put under their corresponding first order constructs, finally tables are made to compare the three companies' leadership styles on different levels of suppliers. Table 3-5 shows the operationalised constructs applied to code supply chain learning, supply chain leadership and multi-tier SSCM.

Constructs	Sub constructs	Operationalised constructs and definitions	Reference
Supply chain learning	**Learning stages**	**Set up stage**, a set of procedures to promote supply chain learning; **Operating stage**, organizations translate the procedures to routines and norms which govern the behaviour between and within firms; **Sustaining stage**, to deal with management processes for the needs of continuous learning.	Bessant and Tsekouras (2001), Bessant *et al.* (2003), Morris *et al.* (2006)
	Learning content	**Focal company knowledge resources**, whether focal companies have the suppliers' needed sustainable knowledge resources; **Supplier learning complexity**, whether the learning is simple (e.g. explicit knowledge) or complex (e.g. tacit knowledge).	Dyer and Nobeoka (2000), Bessant *et al.* (2003), Dyer and Hatch (2004)
Supply chain leadership	**Transformational leadership**	**Inspirational**, A mission and vision of a desirable future and the definition of the path to achieve the vision; **Intellectual Stimulation**, Leaders calling on followers to be more innovative and creative to provide better solutions to problems; **Individualized Consideration**, A leader's ability to recognize each individual follower's unique skills and development needs.	Hult *et al.* (2000a, b; 2007), Defee *et al.* (2009a, b; 2010)
	Transactional leadership	**Contingent Reward**, Clarifying follower expectations and offering recognition and rewards when goals are achieved; **Management-by-Exception**, Leaders either closely monitoring followers problems or wait problem arise before take any corrective actions.	Bass and Avolio (1993), Avolio *et al.* (1999).

Multi-tier SSCM	**SSCM governance mechanisms**	**Direct**, focal company have a direct access to lower-tier suppliers; **Indirect**, focal company contact with lower-tier suppliers indirectly through another supplier; **Work with third party**, lead firms collaborate or delegate responsibilities to other organizations (e.g. NGOs, competitors, firms from the same industry, standards institutions, etc.); **Don't bother**, focal company focus on first-tier suppliers and have neither information about lower-tier suppliers nor intention to influence them.	Tachizawa and Wong (2014), Wilhelm *et al.* (2016b)
	Multi-tier SSCM structure	**Open triad**, a traditional supply chain where information and product flows are linear and there is no direct connection between the buyer and the supplier's supplier, giving the supplier in the middle a mediating role; **Transitional triad**, the buyer and the supplier's supplier stretch out to each other and begin building a link and initiating a move toward a closed triad; **Closed triad**, the buyer and the supplier's supplier have established a formal link and are directly connected to each other.	Mena *et al.* (2013), Wilhelm *et al.* (2016a, b)

Table 3-5 The coding scheme for data analysis

3.5.2 Case analysis

The case analysis include two parts of within-case analysis and cross case analysis. The within-case analysis is aimed to summarize the key data and constructs as objectively as possible for each case. This helped to understand the research question in a single context before generalising across cases (Eisenhardt, 1989). In this research the within case analyses (Chapters 4, 5, 6) are presented in a structure way of starting with the background of the focal company and the proactive sustainable initiative, supply chain learning, supply chain leadership, multi-tier SSCM and finally the summary.

Cross-case analysis is aimed at identifying the patterns in different settings and seeks to increase the internal validity of the findings. A variety of tools could be used to reduce the amount of data and to display the data in a meaningful fashion (Miles *et al.*, 2013). The cross case analysis is primarily done through categorization and pattern matching, from the case by case format to restructure by construct format (Pagell and Wu, 2009). The whole process is an iterative process that simultaneously draws comparisons with the literature. This research follows the case analysis techniques in Table 3-6. Eisenhardt (1989) emphases that the essential feature of theory building from case study research is comparison of the emerging concepts, theories or hypothesis with the literature to answer what is similar, what is conflicting and why. The conclusion chapter makes a comparison for the findings with existing literature.

Techniques for case analysis	Explanation	Representation
Chronologies	Narratives of the events that took place organized by date	Case diary and field notes
Coding	Sorting data according to concepts and themes	Coding list
Clustering	Categorizing cases according to common characteristics (size, the best and worst)	Cluster contextual variables
Matrices	Explaining the interrelationship between identified factors	Within and cross case analysis
Pattern matching	Comparison between a predicted and an empirically based pattern	Within and cross case analysis

Table 3-6 Case study analysis techniques
(Source: Ghauri, 2004)

3.6 Reliability and validity of this research

Yin (2008) suggest that there are four tests commonly applied to establish the quality of any empirical social research. Construct validity refers to the establishment of correct operational measures for the concepts being studied; internal validity refers to the establishment of causal relationships; external validity refers to the establishment of the domain to which a study's findings can be generalised beyond the immediate case study; and finally reliability refers to the demonstration of the operations of a study can be repeated with the same results. This research is validated according to Yin's (2008) four tests as shown in Table 3-7.

Tests	Application in this study
Construct validity	• Multiple sources of evidence including semi-structured interviews, secondary data; • A chain of evidence: multiple informants in focal companies, and multiple informants at suppliers/ non-traditional supply chain partners; • Review of findings by uninvolved senior academics; • The senior managers of each focal company review the draft within case analysis with feedbacks.
Internal validity	• Structured data coding and analysis; • Development of propositions based on a chain of evidence.
External validity	• Theoretical sampling approach; • Thick descriptive data; • Site visits to various suppliers (Tetra Pak: three recyclers; Nestlé: ten dairy farms; IKEA: two Tier 1 suppliers and seven lower tier suppliers); • Participate in focal companies' training sessions.
Reliability	• Use case study protocol to guide field research and analysis; • Develop case study database including recordings, transcripts, field notes, sustainability reports, internal documents, academic case studies, news coverage; • Iterative discussion with uninvolved senior academics.

Table 3-7 Reliability and validity in case research
(Source: Yin, 2008)

Chapter 4 Tetra Pak: Creating a Recycling Chain in China

This is the first of three within case analysis chapters. In this chapter, first the background of the company and the proactive SSCM initiative are described, then the case is analysed along three themes: supply chain learning, supply chain leadership and multi-tier SSCM including governance mechanisms and supply chain structure. The other two chapters (Nestlé and IKEA) also follow the same structure. The aim of these within case analysis chapters is to provide a full account of the sustainable initiative and the analysis of the constructs (supply chain learning, supply chain leadership, multi-tier SSCM of supplier governance mechanisms and supply chain structure) within each case.

4.1 Background information

This session provides the background information on Tetra Pak, Tetra Pak China (short for TP thereafter) and the multi-tier recycling chain initiative.

4.1.1 Company Background

Tetra Pak is the world's leading food packaging and processing company. By April 2017, it operated in more than 175 countries, employing 24, 100 staff and with a net sales of 11.4 billion Euros in 2016. It has 11 technical training centres, six dedicated R&D (research and development) units and 32 production plants for packaging material. In 2016, Tetra Pak sold 188 billion packages worldwide (Tetra Pak, 2017). Besides the well-known Tetra Pak package for the public, it also provides filling machines, processing equipment, distribution equipment and service products to business customers in the food industry such as the dairy, cheese, ice cream, beverage and prepared food sectors.

Tetra Pak was founded in Lund, Sweden in 1951 by Dr. Ruben Rausing, who holds a belief that a package should save more than it costs, in terms of both savings for the environment and customers. Tetra Pak effectively and efficiently use the raw materials, and through its aseptic technology the packaging prevents food losses, makes food safe and increases availability.

Tetra Pak realizes the importance of conducting business in a sustainable manner and taking full account of social and environmental responsibilities. Growth, innovation, environment, and performance are the four corner stones of Tetra Pak's strategy. In terms of environment, as early as the 1980s, it conducted life-cycle analysis (LCA) research for its operations from design, purchasing of materials, manufacturing, transport, filling and consumption through to the end of the life of the package. Since 2004 Tetra Pak became a member of the UN Global Compact, which brings together companies, UN agencies, labour and civil society to support ten principles in the areas of human rights, labour, the environment and anti-corruption. Tetra Pak also cooperates with NGOs such as WWF and the Forest Stewardship Council (FSC) on climate change and forestry management respectively.

4.1.2 Tetra Pak in China

In 1979, Tetra Pak began its operations in China, when the first Tetra Pak filling machine was put into use in Guangzhou. At that time milk was a luxury product which was only affordable for the rich. Pasteurized milk products dominated the milk market, however due to its distribution restrictions, these products only produced and sold in a few big cities or at regional levels. Thanks to the Ultra Heat Treatment (UHT) technology Tetra Pak brought to China, together with the aseptic packaging, it made possible for the milk to be distributed from the major northern production provinces to the southern consuming provinces. With the protection of Tetra Pak packages the UHT milk could then last for up to one year on the self without chilling.

The consumption of the dairy products showed a rapid growth in China for the past two decades, according to the Food and Agricultural Organization (FAO), China's dairy industry grew at 20% annually in the first decade of 2000s. Yili and Mengniu the previous two regional players have become the two biggest UHT milk producers and national brands in China. To date, UHT milk accounts for 80% of the consumer milk market, with pasteurized milk taking the other 20% market share. Concentrating on the UHT milk in the China market, Tetra Pak expanded successfully along with this market trend. It currently has four packaging plants, in Beijing, Foshan, Kunshan and Hohhot, with a capacity of 60 billion packs a

year. According to Tetra Laval's (Tetra Pak's parent company) 2014/2015 annual report, China is the largest market in terms of the quantity of packages sold in 2014 (Tetra Laval, 2014/2015).

4.1.3 Sustainable initiative: creating a recycling chain in China

For Tetra Pak case, the initiative of creating recycling chain in China is selected because: 1) Tetra Pak is the first company to conduct the recycling initiative in China; 2) The initiative covers a five tier recycling chain. A standard Tetra Pak aseptic carton is made of 75% of paper, 20% of polyethylene and 5% of aluminium. The package structure is a six-layer composite, from the external to the internal are polyethylene, paper, polyethylene, aluminium, polyethylene and polyethylene respectively (as in Figure 4-1). This unique structure effectively prevents air and light to protect milk from deterioration.

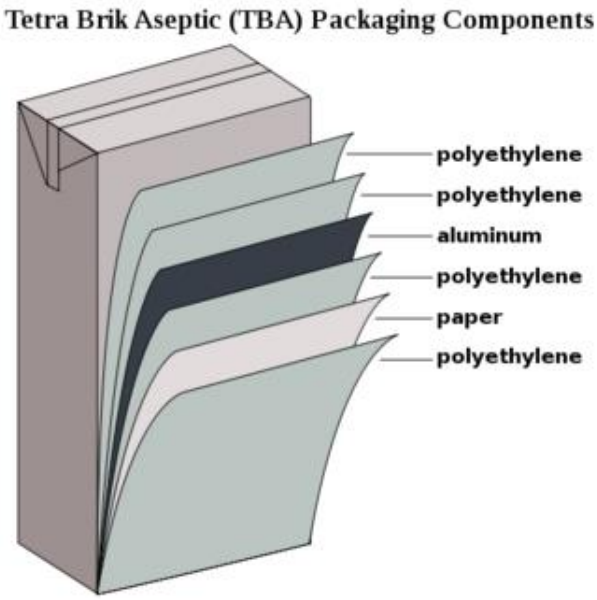


Figure 4-1 The components of a typical Tetra Pak package

(Source: https://commons.wikimedia.org/wiki/File:TBA_packaging_components.svg)

Compared to alternative packaging such as plastic and glass bottles, carton packages have lower carbon footprints. Some researchers suggest that the carbon dioxide emission for one litre Tetra Pak carton is 60-90 grams while the same volume of plastic package is 115-199 gram and 230-250 grams for a glass

package. Carton packages also have advantages in other environmental performances from a lifecycle point of view, such as higher storage volume, ease for packing, transportation and storage, and protection of food for a longer period of time. Tetra Pak claims that the cartons are 100% recyclable, and have the above advantages in the environmental performance. However, due to the same unique structure, Tetra Pak cartons have been criticized for being more difficult to recycle than its alternatives and for not being bio-degradable especially in the early 2000s. The recycling of the cartons requires special facilities not available in most developing countries in the last century. In China for example, before 2004, few used beverage cartons (UBC, Tetra Pak's term to describe the packages after consumed) were recycled, and most of them either ended up in landfill or incinerated.

With a large market share in the early 2000s in the aspartic packaging industry in China, Tetra Pak feels there is a responsibility for it to look into the end of life recycling practices even though there are no legal requirements for it to do so. As Jiayu Wan, Environmental Director of Tetra Pak Great China said,

> *"There are three drivers for our recycling practices, the first is Tetra Pak's social responsibility, Northern European companies have a long tradition in this aspect, this is a very important driver, so we put the environmental protection in a high priority; secondly, risk management, although there are no legal requirements in China, from a global perspective we implement it in China in advance, to provide practical case and policy reference to the government for a comprehensive waste management legislation; thirdly we do this to enhance our product competitiveness in comparison to other packaging format."*

In 1998, TP set up its Environmental Department, in about 11 years, TP created a UBC recycling value chain in China. During this period, TP in total invested over 150 million RMB in recycling. Both the recycling amount and recycle rate (recycle amount for TP divide by TP production amount) in China has shown a gradually increase in the recent years as shown in Figure 4-2. In 2015, both Tetra Pak and TP met the target to recycle 28% of UBCs. Tetra Pak has further made an ambitious target that by 2020 the recycle rate will reach 40% globally. As China

is the largest packaging market for Tetra Pak, TP fully realize the importance of recycling practices, *"if China cannot meet the target, our global target will be affected."* Said Rendy Ren, Environmental Engineer of Tetra Pak China. TP set the recycle rate in its key performance indicators (KPI) for the whole region, so the target is not only the Environmental Department's but also the whole company's.

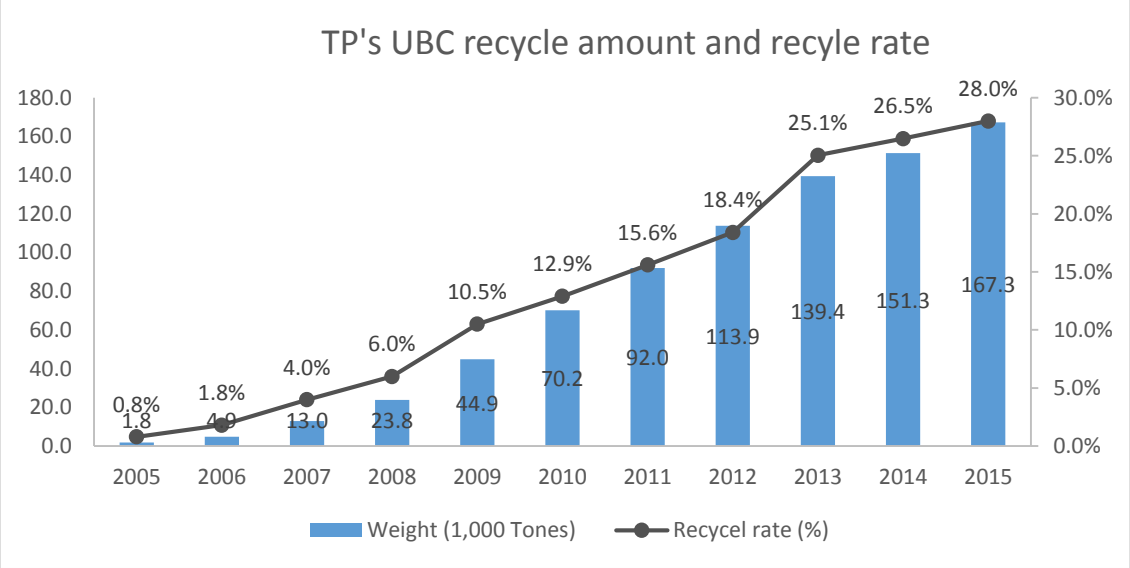


Figure 4-2 Tetra Pak China's recycling amount and recycle rate

(Source: TP internal data)

4.2 Supply chain learning in creating a recycling chain in China

It took over ten years (1998-2009) for TP's recycling chain to take shape in China. At the beginning, the Environmental Department of TP was a small department with a manager and three environmental engineers, one of their key responsibilities was to develop a sustainable recycling value chain. The department reports to Corporate Communication in China and to Global Environmental Department. Overall, the establishment and development of the recycling chain could be divided into three learning phrases with different learning targets adopting the terms proposed by Bessant *et al.* (2003). Set up stage (1998-2004) when TP conducted recycling chain scanning and engaged recycling partners; operating stage (2005-2009) when TP provided a holistic solution to recyclers to create the recycling chain; sustaining stage (2010 onwards) when TP continuously developed the recycling chain.

4.2.1 Set up stage

At this stage, TP mainly conducted two activities to trigger the recycling chain: recycling chain mapping, and engaging recycler partners.

4.2.1.1 Recycling chain mapping

At the beginning, the Environmental department examined the recycling market. The environmental engineers visited various cities in China following the life of the UBCs. They tracked the recycling route i.e. after consumers finished the drink, how they disposed of the UBC and how it entered into a dumpster, to the landfill site, how many people touched it and how many processes did it go through before it is eventually dissembled or gone to landfill, and whether there were any companies recycling and reusing it.

TP realized that the challenges for the recycling are at the two ends: first, at the consumer (front) end, there was no waste separation system in China, the majority UBCs were mixed with other household waste; second, at the recycling (back) end, there were a limited number of companies capable of recycling the UBCs. Related to the front end, they also found that the main recycling force were the thousands of waste pickers and cleaners (labelled as ‘collectors’ thereafter) who have a high efficiency and motivation to collect valuable waste such as PET bottles, medals to sell them to secondary market and make money. Some even make a living through this business. However to these collectors, UBC is a low value material and few recyclers accept it. The finding from the scanning was that 1) there was no recycling chain in existence for UBCs in China but; 2) If there were enough market value, it would be possible to build the recycling chain.

4.2.1.2 Engaging recycling partners

After scanning the recycling market, TP decided to help create a recycling chain in China. They first needed to look for recycling partners. TP realized that if recycling capacity existed in the market, then these recyclers could collect the waste materials from TP plants and from dairy companies and could purchase UBCs in the market from the collection agency/company (labelled as ‘collection

company' thereafter) who in turn could then be motivated to purchase waste cartons from dispersed collectors.

Since 75% of the TP cartons are made of high quality paper fibre, the Environmental team first approached big paper mills. However, this attempt was unsuccessful. The big mills were reluctant to collaborate with TP, even though they knew they could gain TP's support. Compared to their production lines, the UBC amount is small and not stable, and they would have had to make investment and put extra time into the collection process. *"Later we realize we need to find small companies who wish to be pioneers and have a development potential, who has a passion for environmental protection"*, said Carol Yang when answering an media interview in 2010, former Vice Present and Cluster Leader of Corporate Communications at TP. That is how TP later found its recycling partners. By the end of 2015, TP was working with around eight small and medium privately owned recyclers.

4.2.2 Operating stage

After the set up stage, the next step was to develop the recyclers, enhance their recycling capacity and increase the recycle rate. TP applied a holistic approach to establish the recycling chain: help recyclers to expand the capacity; develop new technologies to enhance the recycle value; create the collection network by collaborating with collection companies and educate individual collectors; and finally educate consumers to increase the public awareness of recycling UBCs.

4.2.2.1 Recycler development

Once TP found its recycler partners, it provided various kinds of support to them. At the beginning one approach was providing the partners with discounted TP factory waste material which could be treated as a form of financial subsidy, because the factory waste are in good quality and clean, so they are an ideal recycling resource. Another one was equipment investment, which is a form of direct transfer the technology know-how to the recyclers. This initial recycling technology could separate the UBCs in a 'hydra-drum' with paper pulp and the mixture product of polyethylene and aluminium which both could sell to industry

customers. Both Fulun, a recycler based in Zhejiang province and Xinhongpeng, another recycler based in Beijing, gained this support.

TP also collaborate with recyclers which has their own technologies. Shanghai Linpai Environmental Technology Company (short for Linpai thereafter) is one of the examples. Linpai starts its business in 1998 with TP sponsored HB Chip-tec board technology in Shanghai and then with TP's help, Linpai developed its own technology and have them patented. Instead of separating the raw material commodities from UBCs, Linpai deal with the entire UBC and transforms them into WPC (Wood Plastic Combination) products. These products include durable waste bins, park benches, fencing and furniture. Linpai's major customers are government and pioneer companies with an environmental attitude.

TP organizes a recycler conference every year. It shares the industry trends and advanced technologies with these recyclers. The conference also provides an opportunity for the recyclers to network. Normally the conference is held at a recycler's site to enable recyclers to visit each other's plants and learn from one another.

4.2.2.2 Enhance the value of the recycling chain

TP has a history of looking into how to enhance the value of the recycled products in which recyclers can generate higher profit from UBCs compared to waste paper, which further motivates the recyclers purchase the UBCs from the market. The initial recycling technology could separate UBCs in a basic way, however, the polyethylene and aluminium mixture (PolyAl) as a recycled product have a lower value than if sold as separate commodities: aluminium and plastic. Separating PolyAl technology is available in other countries. However, the technology needs a high investment which is not feasible in China given the fact that the recyclers are all small and medium companies.

TP then searched around China for the Chinese version of technology to separate the PolyAl. In 2007, TP found its partners. Together with Shandong Tianyi Plastic Co. Ltd (short for Tianyi thereafter) and Shangdong Liaochen University, TP developed local and cheaper technology to separate the polyethylene and

aluminium in China. In 2009, the technology was commercialized in China, and the separating purity achieved 99.5%. TP was also involved with environmental research centres to make sure that the company's whole production process met Chinese environmental legislations. Tianyi later also became a TP recycler.

The technology proved to be economic, efficient and green. Previously the mixture of polyethylene and aluminium could be sold at a price around 1,200 RMB/ton. Now the separated plastic grains can be sold at 2,000 RMB/ton and the aluminium can be sold at 9,000 RMB/ton in 2009. The production line was first installed at Fulun. Jun Yang, Founder and CEO of Fulun, said: *"After we implemented the PolyAl separation line, the value of the UBCs has increased by 30% and our monthly sales increased by 25%."* Now Fulun produces recycled craft paper for wallboard and packaging companies, polymers for plastic recyclers, and aluminium foil flakes which replace virgin material for insulation and fireworks manufacturers. Later Xinhongpeng also installed the production line with TP's support, both Fulun and Xinhongpeng agreed to recycle more UBCs with the extra profit and plan to expand their waste handling capacity.

4.2.2.3 Educating collectors

Besides working with the recyclers, TP also directly collaborate with collection companies at this stage. One collection partner which TP found is Beijing Lianhe Dingsheng Company, the earliest company in Beijing to collect UBCs. TP introduced this company to Xinhongpeng in order for it to quickly gain capacity.

TP also worked with collectors through collection companies at this satge. In reality, the collection network is very complex, the UBCs may start with community cleaners collecting them in communities, or scavengers picking up UBCs on the streets, or collectors collecting at schools or public places. After accumulating to a certain amount, they sell the UBCs to a collection company, who in turn may sell to a bigger collection company or sell directly to the recyclers. In addition, cleaning companies could collect the UBCs in large public places such as train stations, airports and parks, then directly sell them to the recyclers.

After the establishment of the recycling partners, the information that UBCs can be recycled needs to be spread to the large majority of non-organized collectors. The majority of collectors have limited education, and it was very difficult to for them to know one by one using posters. So at the end of 2006, TP together with Lianhe Dingsheng organized a training event for the collectors, to let them understand the value of UBCs, with more than 100 people attending the training. In 2007, they hold another two similar scale training sessions, the participants collect waste for more than 100 local communities in Beijing.

4.2.2.4 Educating consumers

TP launched a series of campaigns, which were organized by Corporate Communications with the support of Marketing and Environmental Departments, to promote public awareness of environmental protection and UBC recyclability. In May 2005, TP together with Shanghai 'Youth Daily' (a newspaper) had held a large scale public event for two months with the theme of "Recycle Tetra Pak UBCs, happy for environmental protection". From 2007, TP launched the "Green life, start from me" recycling education programs for three consecutive years in several primary schools in Beijing. In May 2008, TP donated hundreds of benches made from approximately 120,000 UBCs to National Olympic Forest Park for the Beijing Olympic in Beijing.

In 2009, TP launched another campaign "Green World Expo, proud of me" to support the Shanghai World Expo. Within half a year, the campaign covered the local communities in 12 districts in Shanghai, more than 700,000 people took part in it, in total 113 tons of UBCs been recycled. In the end, the waste cartons were recycled and transformed into 2,000 benches, the menu list on audience hands and the trash bins in the park at the Expo site. This campaign also had an influence on TP's clients, as in the month following the Expo, almost all of TP's clients invited TP to give presentations on environmental protection and provide them some ideas on their own waste recycling. In 2011 May, TP together with Education Centre of the Environmental Protection Department and the Packaging Recycling Union launched "2011 Garbage Classification" public education activity.

These various types of campaigns continues. For TP, the value of these activities is three fold: educating consumers for environmental protection and UBCs recyclability; influencing customers on the importance of recycling; and lastly it supported the recyclers by providing them the recycled materials, and purchased the products made from them.

4.2.3 Sustaining stage

After 2010, recyclers gained the capacity, and the supply chain learning task shifted to increase the recycling amount. Conflicts have been found between TP and its recyclers, which mainly focus on the recycle progress. TP emphasize the sustainable development of the recycling chain, however the recycling target is not that of the recyclers. One recycler expressed,

> *"TP give us lots of help along our development, it also gives us lots of pressure… invest in capacity to recycle more, I have to maintain it, if I can't collect the amount, or I can't sell more products, it means cost to us"; "The company is mine, there are many employees, I have to be responsible…"*.

However, both sides are thinking about new approaches to enhance the recycling amount. For TP side, besides the awareness campaigns, it is also trying to implement some pilot collection projects with the government which it termed as the 'policy driven approach'. The pilot projects are not only focused on UBCs, but also from a wider and general perspective on household waste classification. TP coordinated experts, academics or NGOs to conduct the collection research to help local governments launch a holistic design on how to do separation of, how to transport, how to deal with the rubbish, and what related facilities should be built. From the recycler's point of view, they are stimulated by TP and also trying to identify new recycling approaches such as collaborating with local government and sanitation companies and recycle other types of PolyAl sources such as coffee cups, instant noodle packages. TP took a holistic approach to create the recycling chain as in Figure 4-3, while recyclers made the collection network more solid.

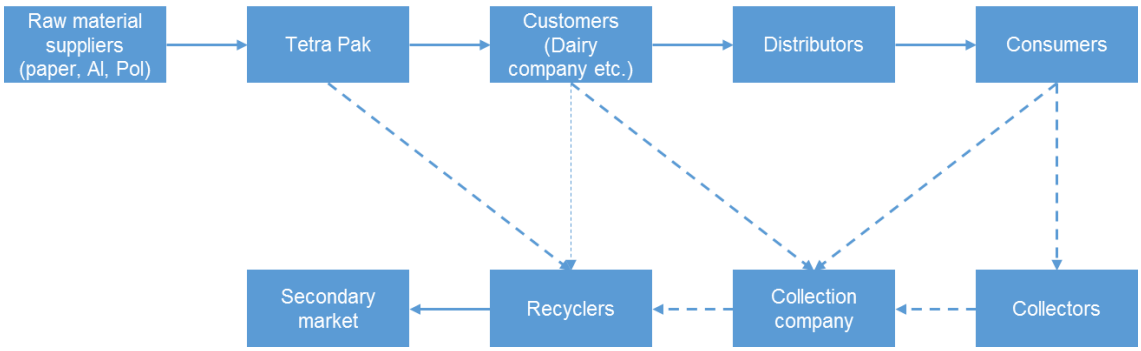


Figure 4-3 Tetra Pak's recycling chain in China
(Source: Compiled based on interviews; Dotted lines represent the collection routes)

4.2.4 Summary of supply chain learning in creating a recycling chain

Table 4-1 summarize the features of the three learning stages in TP's recycling chain.

Learning stages	Learning task	Learning activities	Learning outcome
Set up (1998-2004)	A comprehensive understanding of the UBC recycling market; identify and engage potential recycling partners;	Field visit for the end of life of UBCs; awareness building on recyclers;	Gained the knowledge of the recycling market; Engaged recyclers into the recycling business;
Operating (2005-2009)	Develop recyclers' capacity; Create a recycling chain;	Technology transfer to recyclers through equipment support; Collaborate with partners to invent new recycling technology; Introduce collection companies to recyclers; Educate collectors; Educate consumers;	Developed new recycling technology to add value to the recycling chain; Gained recycling capacity and the recycling chain took shape;
Sustaining (2010 - 2016)	Continuous development of recyclers; Find new ways to collect more UBCs.	Identify new ways to collect UBCs such as TP's policy driven approach, recyclers collect other types of PolyAl products.	Continuous growth of the recycling amount and recycle rate; New approaches to collect UBCs.

Table 4-1 Supply chain learning of Tetra Pak's recycling chain

4.3 Supply chain leadership in creating a recycling chain in China

TP applied different leadership styles along the supply chain learning stages. This

section analysis the different leadership styles at each stage.

4.3.1 Supply chain leadership at the set up stage

TP applied a transformational leadership reflected by the inspiration and encouragement they provided to the recyclers at the set up stage. Fulun provided an example. Jun Yang set up the company in 1994 in Fu Yang (now a district of Hangzhou city), Zhejiang Province. Fu Yang has a long history of paper production spanning more than 1,900 years. Fulun was a tiny player surrounded by more than 300 paper mills at the beginning. Jun Yang has always been creative among his peers. At the very beginning he updated his facility to deal with the used paper tube which others cannot deal with because of its hardness. By chance Jun Yang found that UBC contains high quality paper fibre, and then he modified his equipment to deal with the UBCs in the early 2000s. With the cheap materials Jun Yang gained higher profits compared with competitors, however, with a small scale company Jun Yang always felt the pressure from the government (government policy not favour small paper mills which assume they output more pollution) and wondered what was the development direction for his company not until he collaborated with TP.

In 2004, Jun Yang met TP's former environmental engineer Haibin Zha who represent TP to inspire him to engage in the recycling business.

> *"He talked with me the future of my company, the future of paper industry, what could be the future trends. Companies need to stand from win-win point of view to think about the long term development. If we the small companies could collaborate with the multinational company (like TP), it is like a small boat with aircraft carrier",* recalled Jun Yang.

He totally agreed with Haibin Zha's environmental protection ideas,

> *"I am a local people. After years' development the creek in front my home has been polluted, there were no fish left. Continuing with the traditional development mode is definitely not a sustainable way…"*

Haibin Zha further showed Jun Yang around TP's Kunshan plant, *"It soon changed my mind, compared to the plant ours is just a workshop".* Jun Yang gained confidence after his visit to the plant and decided to collaborate with TP for recycling the UBCs.

4.3.2 Supply chain leadership at operating stage

TP applied a both transformational leadership reflected by intellectual stimulation and transactional leadership reflected by contingent reward and management by exception at this stage on recyclers. TP provided the financial support as a way to seek recyclers' efforts, a sub factor of contingent reward which belong to transactional leadership style. Jun Yang recalled the recycle prices,

> *"At that time their (TP factory waste material) price was very cheap, the market price for waste carton was 1,500 RMB per ton, while their price to me was 450 RMB per ton…why do they let me earn money? I was quite curious at the beginning. Later I realise they wish I could earn the money and then am able to recycle UBCs from the public".*

TP also purchased recycling equipment and let the recyclers use them for free. The ownership of the recycling facilities belongs to TP. One principle was the investment should not go beyond 30% of the whole plant investment, a way to share the operation risk with recyclers. Once a recycler receives the equipment support from TP, they are required to sign a contract and agree to achieve a certain recycling amount in the next few years. They also provide access to third parties representing TP to do the accounting audit which reflect the transactional leadership of management by exception. Every month these recyclers send the monthly recycling data to TP for tracking. For TP, the recycle equipment investment is a support, it doesn't require any financial returns from it. According to Rendy Ren:

> *"We only have requirement on the recycling amount, so I provide you this equipment, I wish you could achieve a certain recycling amount in next few*

years… the continuous increase of recycling amount, actually also help us achieve our recycling target… "

Every year, TP proposes a recycling target with the recyclers, and the target is agreed by both sides. The recyclers are rewarded according to their recycling amount. As outlined by Jiayu Wan:

"Every year we based on the location and other factors allocate the factory waste to different recyclers. Based on the target they achieve, we provide them a corresponding discount for the waste. To be simple… the more you recycled, the lower the price the recyclers need to pay… This incentive is to keep recyclers been positive."

Recyclers fully aware the outcome, as Zhenqi Guo, general manager of Xinhongpeng said:

"(if we don't meet the target) Then when you apply for projects next year, TP will reduce the support, including discount to the factory waste materials"

TP also exhibit transformational leadership style on recyclers reflected in intellectual stimulation at this stage. For example, it encourages the recyclers to set up its own recycle network. After collaborating with TP, Jun Yang met lots of problems in production as the increased capacity, while at the same time he was trying to build up his collection network. *"TP is counting on me"*. At the beginning collectors didn't know the value of UBC, so it was very difficult for him to find collection partners. One thing Jun Yang did was to hold education events at local schools.

"I visited the collectors, but no one willing to do it. Well, we have to build up the recycling chain. Then I am thinking about, who drink the most of milk, children, so I contact with the local Youth League. I teach the kids to change their habit, to finish the milk at home, then squeeze the package and send back to school, then to us…"

With the support of the discounted TP plants' waste material and the extra profits

from the PolyAl separation line, Jun Yang could make a profit and put the profits towards strengthening its collection channels.

TP applied a transactional leadership style on collection companies and collectors reflected in contingent reward at this stage. It supported some free balers to collection companies including Lianhe Dingsheng to help transport the UBCs to recyclers in a more organized manner. In 2009, TP together with some collection companies launched the 'pick-king' assessment activity. The outstanding individual collectors were awarded for picking the highest amount of packages in a given period.

4.3.3 Supply chain leadership at sustaining stage

TP exhibited both transformational leadership and transactional leadership styles on recyclers at this stage. The transformational leadership style could be reflected by inspirational, individual consideration and intellectual stimulation. The transactional approaches at operating stage continues at this stage.

TP believe it played a facilitator role to constantly inspire and encourage the development of recyclers. According to Jiayu Wan:

> *"Relatively speaking, we are not in the recycling business. We are standing far and high. We could help them to see the trend for this industry. We could tell them which direction they should go"; "Sometimes it is unavoidable, many recyclers are small companies, they may in many occasions content with their current situation. They may think I have a capacity of 20,000 tons, I have a profit rate of 10%-12%, which is good enough. Then I will tell them where the industry growth area is, what it will going to be look like, if you hold this opportunity, your business may double etc."*

During the daily operations, TP also provides support to recyclers according to their individual specific needs exhibit transformational leadership reflected by individual consideration.

"According to the different conditions of each recycling partner, we provide specific trainings or hire the related experts to provide consulting projects to solve the corresponding issues. For instance, for the recycling partner in Beijing, because the restrictions of the local environment policy, so its key point is on the upgrading of the current technology to cope with the regulation. We are looking for the related experts, to optimize production, not to develop new technologies but focus on its energy usage, water usage and etc. While on the other hand, Fulun is at a developing stage, it has needs in purchasing and utilizing new facilities, then we could let our supply management department to contact experts who have the experience of the new equipment at other countries to provide some help, another perspective it may need some advice on investment and financing, we could help accordingly." Said Jiayu Wan.

Recyclers such as Fulun has always being praised as an exemplar for others to learn from by TP, a transactional leadership reflected by contingent reward. As outlined by Jiayu Wan:

"Now it has a new plant plan, the investment is very big with over 100 million RMB, why would it willing to do so? He is an entrepreneur with a forward looking and strategic vision, he is considering the development in next ten years…we wish all the recyclers can have a long term view."

Recyclers have also been intellectually stimulated by TP to think of new ways for strengthen recycling collection networks.

"Now I didn't consider the small collection companies. I am looking for sanitation companies, and the incineration plant under sanitation companies. Because this is the trend, you cannot waste the energy to run it… the UBCs must be concentrated for recycling at these types of companies". Said Jun Yang.

Linpai is also looking for new ways, and one approach is by collaborating with local government. According to Sam Tian, CEO of Linpai:

"We wish government could put some resources to increase the collection amount, now we are in a bottleneck. We have collected what we can collect, it is unreal to contrary the market law and pay an extra high price".

Linpai has joined the 'Green account' program launched by the Shanghai government. The program encourages citizens to separate daily waste, and rewards the citizens with bonus points, which they can enter in a draw for prize or exchange the points in collaborating brands. With the help of social media, over one millions citizens joined the account at the end of 2015. The program is beneficial for waste classification and potentially could be Linpai's collection sources.

Although conflicts exist over the pace of the recycled amount, TP and its Chinese recyclers are heading towards the same direction. TP has been highly credited by its partners as a supply chain or even industry leader.

As Jun Yang said, *"I think this company is incredible…it puts its recycling target at a strategic level, it is a very responsible company, it is willing to take the responsibility via making money. The recycling target is totally burning money, others just maximize their profits, as a company to set this target represent its responsibility, other companies should learn from it."*

Sam Tian said, *"To sum up, all of us cannot leave without its help. Without it's more than ten years' support, all of us won't be the same as today."*

Zhenqi Guo said, *"Without TP, few people are willing to do this (the UBC recycling business), its investment return is low, and it is risky and unstable".* As far as Zhenqi Guo knows, *"only TP take the responsibility, not any other of its peers, or even the big dairy companies. Instant food is also a big industry with PolyAl packages, however, no company step out to take the responsibility".*

4.3.4 Summary of TP's supply chain leadership in creating a recycling chain

Table 4-2 in the end of this chapter summarizes TP's changing leadership styles

on recyclers in the supply chain learning stages. It can be found that TP applied a transformational leadership style providing inspiration at the set up stage; a transformational leadership style in terms of intellectual stimulation at the operating stage; a transformational leadership style in terms of inspiration, individual consideration and intellectual stimulation behaviours in the sustaining stage; whilst contingent reward and management by exception have been applied in both operating and sustaining stages.

On the other hand, TP mainly exhibit a transactional leadership styles on collection company and collectors in terms of providing support to them in exchange of their recycle efforts (contingent reward) especially in the operating stage. Finally, based on previous discussion in supply chain learning, TP mainly applied transformational leadership style on consumers in the operating and sustaining stages that it inspires consumers that UBCs can be recycled and be transformed into other products.

4.4 Multi-tier supply chain management in TP's recycling chain

The discussion on multi-tier supply chain governance and structure have been embedded in supply chain learning and leadership parts, this session summarize the features of these two constructs.

At the set up stage, only TP and few recyclers exist in the recycling chain, TP was trying to reach out and build direct links to potential recyclers and develop small and medium enterprises as new recyclers, the relationship between these two is starting.

At the operating stage, TP provides various support to recyclers to gain the recycling capacity. The approaches include: directly collaborate with the collection companies to help recyclers quickly build up recycling capacity, directly promote consumer awareness through various campaigns; indirectly provide trainings to individual collectors via collection companies' organization.

At the sustaining stage, the recycling chain is established and become mature, TP mainly approach the collection companies indirectly through recyclers and apply a 'don't bother' approach on collectors. TP continues approaching

consumers through a direct approach given the fact that TP have more expertise in public relations and have more resources to promote the environmental protection philosophy to the public.

Base on the discussion, Figure 4-4 present the changing supply chain structures of TP's recycling chain in the supply chain learning stages.

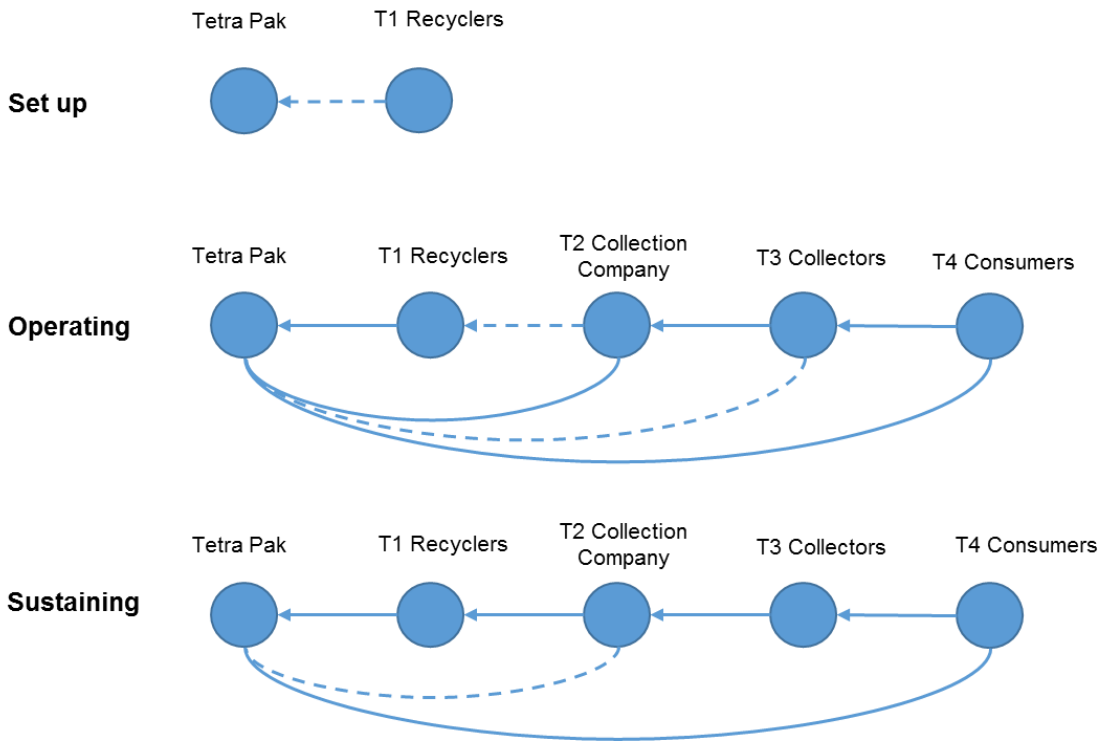


Figure 4-4 TP's recycling chain structure

4.5 Case summary

After the creation of the recycling chain, TP's recycling rate increased from almost nothing in 2004 to about 28% in 2015, approximately 167,300 tones of UBCs were recycled in China, which equivalent to more than 16.7 billion packs of 250ml standard cartons. TP proved that it was possible to build up a recycling chain even without enforcement or supporting legislation in a developing country. This chapter presents TP's approaches to create a recycling chain in China. Supply chain learning, supply chain leadership and multi-tier supply chain governance mechanisms and structures are discussed respectively.

		Supply chain learning stages		
		Set up	**Operating**	**Sustaining**
Transformational leadership	**Inspirational**	"He talked with me the future of my company, the future of paper industry, what could be the future trends. Companies need to stand from a multi win or win-win point to think the question, if we the small companies could collaborate with the multinational company (Tetra Pak), it is like a small boat with aircraft carrier". --- Jun Yang, Founder and CEO of Fulun.		"Relatively speaking, we are not in the recycling business, we are standing far and high, we could help them to see the trend for this industry, we could tell them which direction they should go"; "sometimes it is unavoidable, many recyclers are small companies, they may at many times content with their current situation. They may think I have a capacity of 20,000 tons, I have a profit rate of 10%-12% is good enough. Then I will tell them where is the industry growth area, what it will going to be look like, if you hold this opportunity, your business may double etc." --- Jiayu Wan, Environmental Director of Tetra Pak Great China
	Intellectual Stimulation		"I visited the collectors, but no one willing to do it. Well, we have to build up the recycle chain. Then I am thinking about, who drink the most of milk, children, so I contact with the local Youth League. I teach the kids to change their habit, to finish the milk at home, then squeeze the package and send back to school, then to us." --- Jun Yang, Founder and CEO of Fulun.	"Now I didn't consider the small collection companies. I am looking for sanitation companies, and the incineration plant under sanitation companies. Because this is the trend, you cannot waste the energy to run it… the cartons must concentrated". --- Jun Yang, Founder and CEO of Fulun.
	Individualized Consideration			"According to the different conditions of each recycling partner, we provide specific trainings or hire the related experts to provide consulting projects to solve the corresponding issues. For instance, the recycling partner in Beijing, because the restrictions of the local environment policy, so its key point is on the upgrading of the current technology to cope with the regulation. We are looking for the related experts, to optimize production, not to develop new technologies but focus on its energy usage, water usage and etc. While on the other hand, Fulun is at a developing stage, it has needs in purchasing and utilizing new facilities, then we could let our supply management department to contact experts who have the experience of the new equipments at other countries to provide some help, another perspective it may need some advice on investment and financing, we could help accordingly." --- Jiayu Wan, Environmental Director of Tetra Pak Great China

Transactional leadership	**Contingent Reward**		"At that time their (Tetra Pak factory waste material) price was very cheap, the market price was 1,500 RMB per ton, while their price to me was 450 RMB per ton…why do they let me earn money? I was quite curious at the beginning, later I realise they wish I could earn the money and then recycle UBCs from the public". --- Jun Yang, Founder and CEO of Fulun.	"Now it has a new plant plan, the investment is very big with over 100 million RMB, why would it willing to do so? He is an entrepreneur with a further eye sight, he is considering the development in next ten years…we wish the recyclers can have a long term view." --- Jiayu Wan, Environmental Director of Tetra Pak Great China.
			"We only have requirement on the recycling amount, so I support you this equipment, I wish you could achieve a certain recycling amount in next few years… the continuous increase of recycling amount, actually also help us achieve our recycling target …" Rendy Ren, Environmental Engineer of Tetra Pak China. "We have some incentive actions, for example one key point is, our factory waste material, the materials are in good quality, clean and not consumed, so they are an ideal recycle source. Every year we based on the location and other factors allocate them to different recyclers. Based on the target they achieve, we provide them a corresponding discount. To be simple… the more you recycled, the lower the price the recyclers need to pay… This incentive is to keep recyclers been positive. No matter which method they use, either transfer the value to its collection company which further encourage the collectors to collect more, or collaborate with more collection companies, the final aim should be the same." --- Jiayu Wan, Environmental Director of Tetra Pak Great China	
	Management-by-Exception		"(if we don't meet the target) Then when you apply for projects next year, TP will reduce the support, including discount to the factory waste materials." Zhenqi Guo, General Manager of Xinhongpeng.	

Table 4-2 Tetra Pak's leadership styles on recyclers in the three learning stages

Chapter 5 Nestlé: Modernizing China's Dairy Industry

This chapter introduces Nestlé's sustainable initiative of modernizing China's dairy industry through its rural development strategy. It begins with a background introduction of Nestlé, China's dairy industry, Nestlé's dairy operations in Shuancheng, China before and after 2008 melamine crisis. Then discuss Nestlé's supply chain learning, supply chain leadership and multi-tier supply chain management are discussed respectively.

5.1 Background information

This session provides the background information of Nestlé, China's dairy industry and Nestlé's dairy operations in Shuangcheng before and after 2008.

5.1.1 Company background

Nestlé is the world's largest food and beverage company in terms of revenue in 2015 (McGrath, 2016). It was founded through the merger of the Anglo-Swiss Milk Company and Farine Lactée Henri Nestlé. 2016 marks the 150th anniversary of Nestlé. Headquartered in Vevey, Switzerland, Nestlé has operations in nearly all countries around the world. It has 436 factories in 85 countries and employs 335,000 people. The company achieved total sales of CHF 88.8 billion in 2015 (Nestlé, 2015).

Nestlé has a wide range of products, including baby food, bottled water, breakfast cereals, tea, coffee, confectionery, dairy products, ice-cream, frozen food, pet foods and snacks. It produces more than 2,000 brands of which the well-known brands include Nespresso, Nescafé, Kit-Kat, Smarties, Nesquik, Stouffer's, Vittel and Maggi.

Nestlé has adopted the *"creating shared value"* concept as its sustainability strategy. The business concept was first introduced in the Harvard Business Review article, *"Strategy & Society: The Link between Competitive Advantage and Corporate Social Responsibility"*, by Michael E. Porter and Mark R. Kramer in 2006. The concept aims to create value for the company's shareholders while at the same time for the communities in which it operates. Nestlé focusses upon the three key aspects of nutrition, water and rural development in its creating shared value model.

Nestlé operates through markets which are grouped into three zones, i.e., Zone Asia, Oceania and Sub-Saharan African (Zone AOA), Zone Europe and Zone Americas. The Nestlé Greater China Region (GCR) comprising China's mainland, Hong Kong, Macao and Taiwan belongs to Zone AOA with the head office in Beijing. GCR, also known as Nestlé China, is the second largest market of the Nestlé Group after the United States. Its revenue was CHF 6.638 billion in 2014. As of December 2014, the company employed 53,000 people in the region, with 34 factories and four research and development centres in Shanghai, Beijing, Xiamen and Dongguan.

Nestlé emphasises a local sourcing strategy especially in big markets such as China. Over 90% of products sold in China are produced in the country using local raw materials. Nestlé also prefers to purchase the raw materials directly from farmers. Nestlé has established three milk districts in China: Shuangcheng in Heilongjiang, Laixi in Shandong and Hulunbeier in Inner Mongolia. As early as 1987, Nestlé started building its first dairy plant in Shuangcheng, a small town (now a district of Harbin) in Heilongjiang Province in northeast China. This case focuses on the rural development of upgrading dairy farmers in Shuangcheng, it has been selected before 1) Nestlé has been the first in China

to create a new model of to provide trainings to dairy farmers; 2) the practice covers a three tier dairy supply chain.

5.1.2 China's dairy industry

Research suggests that during the past three decades China's dairy production and consumption shows a rapid growth. From having a population with barely any habits of milk drinking, China has steadily become the world's third largest milk producer. Current predictions are of milk output growing at a rate of 5-7% in the coming years. However, China has not reached a level of self-sufficiency for its dairy products and in 2013 it imported 16.6% of all milk consumed domestically (Goldberg and Niles, 2015).

One reason for the rapid growth is the promotion of the nutritional benefits of milk by China's government. A widely quoted speech was given by Chinese former Premier Wen Jiabao, "*I have a dream and my dream is that each Chinese person, especially the children, can afford to buy one Jin (500 g) of milk to drink every day*".

The 2008 melamine crisis was a turning point for China's dairy industry. There were media reports that milk for infant formula had been tainted with melamine, in an attempt to increase its protein content and, hence, sale price. It was not clear whether the adulteration had been made by the milk collection centres or by middlemen. According to press reports, more than 20 domestic producers were affected, including the market leader, Mengniu and Yili. In total, over 300,000 babies were hospitalised, resulting in the deaths of six infants (BBC, 2008; 2010).

The sector is still recovering from the damaged consumer confidence. People deserted domestic milk for imported alternatives due to product safety concerns.

While Nestlé was not involved in the scandal, however it was also influenced by the incident to the extent that it has to use more imported milk for infants because of consumer preferences. After the scandal, the Chinese government responded by pushing for the consolidation of the dairy industry and it demanded the creation of large scale milk production units and sourcing from large farms. Before the scandal, more than 80% of China's milk was produced by small farms (normally in the backyard of dairy farmers) which have no more than five cows (Sharma and Rou, 2014). The policy has been driven to transit these household farms to medium or large scale farms with a minimum of 100 cows.

Government policy strongly holds an opinion that economies of scale and the industrialisation of production practices would lead to an adequate and safe dairy supply and a better way to monitor both the upstream and downstream aspects of the dairy supply chain. Different tactics such as vertical integration were adopted by Chinese companies by investing in building large farms or through overseas investment. The result of all these activities have been a massive shift away from traditional dispersed dairy production to concentrated and standardised farms (Sharma and Rou, 2014). These modern farms are believed to have more reliable quality, land use and greater labour productivity.

There are now over 50 farms in China with more than ten thousand heads of cattle. The debate concerning large scale farms is still continuing: these large scale farms are believed to be more vulnerable to diseases such as brucellosis, mastitis, foot and mouth disease and anthrax; the cows of these farms are non-indigenous breeds, and in addition, their feed is largely based on imports, which leads to a larger global environmental footprint and increases the vulnerability of the domestic sector to foreign resources (Sharma and Rou, 2014). With the accelerating development of these modern farms, an obvious gap exists as to

the management of talents and knowledge.

5.1.3 Nestlé's dairy operation in Shuangcheng before 2008

In 1990, Nestlé's dairy factory in Shuangcheng went into operation. While preparing the factory, foreign dairy experts were sent to Shuangcheng to teach the local farmers how to raise dairy cows. Nestlé developed a close relationship with dairy farmers and the local government. It has provided thousands of local farmers with free training and technical assistance since the late 1980s and provided credit guarantees for farmers who have showed potential to grow their business. Slowly, Nestlé turned Shuangcheng into one of the largest milk producing regions in China. There were more than 20,000 dairy farmer households in Shuangcheng at its peak.

To govern the fragmented dairy suppliers, Nestlé has applied a '*factory + farm'* model to secure its fresh milk supply. Instead of relying on middlemen or private milk collection channels, Nestlé has set up its own milk collection centres in the villages. Normally the collection centres were within one hour's walking distance from its surrounding dairy farms. Each dairy farm registered in Nestlé's system with a unique number and account. Once farmers collected the fresh milk, they brought the milk to each Nestlé collection centre, where a computerized system sampled, tested and tagged each batch of the milk. Then, the farmers were paid monthly based on the quantity of quality milk they delivered.

To enhance the quality further and to reduce risk, the Fresh Milk Procurement and Agriculture Service Department (short for 'agriculture service department' thereafter) worked closely with the dairy farmers. The Department segmented the milk district into different areas based on geographic, traffic convenience and the number of collection centres. Each Technical Assistant (short for 'TA'

thereafter) supervisor in the department looked after a certain number of farmers and collection centres. They visited the regions frequently so that they knew the farmers and the cows' general conditions and they are responsible for providing technical assistance and training to the farmers with a focus to meet Nestlé's quality and safety requirements.

Continuous training was provided to the farmers in various forms according to seasons and farmers' needs, as outlined by Chongkun Xu, Shuangcheng Milk District TA Supervisor: "*Nestlé emphasises not simply the purchase the fresh milk but we also provide a service to the milk district… Training was provided from the first day.*" And Zhendong Zhang, Fresh Milk Procurement and Agriculture Service Manager of Shuangcheng Nestlé stated: "*Sometimes we organize training in the villages or we invite the dairy farmers to our factory, sometimes we also invite experts, there are various training modes.*"

5.1.4 Nestlé's dairy operation in Shuangcheng after 2008

The *'factory + farm'* model defended Nestlé from involvement in the 2008 melamine crisis. However, changes were being made amongst other dairy producers – they started to build large, or even mega dairy farms (with more than 10,000 cows) themselves to secure the fresh milk supply according to consumers' demands and as a way to respond to government's call for consolidation. Consumers and Government were in favour of the modern farms. In combination with rapid urbanisation and the downturn of the economy, these factors saw many small dairy farmers quit the industry – dairy farmers raise less than five cows treat it as an add on to their revenue, right now they could work in the cities and earn more. The number of dairy farmers in the Shuangcheng district has also fallen sharply during the last decade.

Despite a slow start, Nestlé responded to the transformation positively. Nestlé

agreed to partner with the Shuangcheng Government to increase the level of training and technical assistance it had already provided to the local farmers. At the end of 2011, the two parties, as a first solution, distributed 1,000 free milking machines to those farmers who milked the cows by hand.

Debates have been held within Nestlé on the right approach to transformations in Shuangcheng – should Nestlé also build mega farms and raise cows itself? How about the traditional dairy farmers? Jonathan Dong, Vice President of Corporate Affairs at Nestlé China said,

> "*After our discussion, we decided to respond to the Government's call positively and do it in a way where Nestlé can add more value*. *We can also build farms, but can we do something others cannot do or have not done in order to truly play a role as the industry leader? Our proposal was to build the Nestlé Dairy Farming Institution (DFI). The DFI is open to the whole industry and can provide the much-needed training to address new changes in managing a modern farm, such as farm efficiency, environmental impact etc.*"

Nestlé planned to help the farmers upgrade to medium and large-scale farms. It planned to build DFI – three different sizes of dairy farms together with a learning institute, from middle of 2012. The farmers could visit the demonstration farms and decide which model is more suitable for them and they could upgrade to their corresponding levels, more importantly, they could receive training on modern farming at the institute by paying the tuition fee.

Upgrading dairy farmers is not an easy task. The small dairy farmers lack capital, land, and especially modern farming knowledge. "*From five, ten cows to hundreds of cows, it is completely two different worlds*", said Zhengdong

Zhang. Nestlé has taken three stages to help its dairy farmers upgrade to modern farmers – set up stage (before the construction of DFI, from 2008 to 2012), operating stage (the construction of DFI, from 2013 to 2014) with focus on capacity building and lastly sustaining stage (after the opening of DFI, from 2015 onwards) focus on providing modern dairy farming training in DFI.

5.2 Supply chain learning in modernizing China's dairy industry

This section introduces Nestlé's supply chain learning activities, the rest three subsections explains how supply chain learning took place along the upgrading process.

5.2.1 Set up stage

Nestlé carried out two activities at this stage: dairy farmer survey and awareness building for both internal employees and dairy farmers. The aim of this stage is to persuade the traditional farmers to upgrade and let Nestlé employees' be prepared for the change. The agriculture team made a comprehensive survey at the beginning to gain a thorough understanding of the dairy farmers, especially in terms of their willingness to upgrade, their capabilities and needs. Farms with a daily supply of more than certain amount (hide the exact number due to confidential agreement) are selected as 'key dairy farms', which are recognized to have more potential to upgrade to modern farms.

The supplier survey has helped Nestlé to identify potential and capable dairy farmers who are willing to upgrade. It also helped them to identify their specific needs, such as the lack of capital, lack of land to expand and the need to purchase modern facilities. Before Nestlé began working with the dairy farmers

on upgrading, the business also faced a lot of internal challenges – employees had been working on the traditional model for more than 20 years with some of them resistant to change. Employees also had to learn new things, similarly to farmers, who had to adopt their knowledge of livestock management from several cows to dozens and hundreds. According to Zhendong Zhang: "*From our perspective, all of us started to learn. What is the most suitable farm design? How does it look like? How do we build the farms? We invited professional companies to teach us….*"

Zhendong Zhang sent some TA supervisors to other regions of China to learn the best practices of modern dairy farming. These people then shared their experiences with the rest of their team members after they came back. The idea of DFI is developed at this stage and Nestlé set up the DFI department to be responsible for the initiative.

5.2.2 Operating stage

At the stage, Nestlé is trying to motivate as many farms as possible to shift into medium and large farms according to China governments' requirement. During this stage, Nestlé emphasizes training throughout. The traditional training continues but with focus shifting towards knowledge of upgrading to medium and large farms. The learning activities are carried out in various forms: study groups, learning from peers, supplier conferences and learning best practice from DFI.

Study groups are organized by the TA supervisors' requirement, said Chongkun Xu: *"Now each supervisor is in charge of a certain number of direct dairy farms. They organize a gathering almost every week or two weeks either around the farms or at one farm to discuss the trends and the situation of each farm*".

Another learning activity is learning from peers. At the beginning, whenever a new milking parlour is built by a farm, the supervisors pay a visit with a group of the key dairy farms to discuss the advantages and disadvantages of the design. Training is also provided to the farmers wherever Nestlé provides support to any facilities in order to let farmers know how to use them and in an effective way. Another learning activity is leading the participation of dairy farmers to external dairy conferences, symposia and forums. Farmers are also encouraged to take part in government-organised trainings.

DFI's construction also serves as a good resource for learning. The Agriculture Service Team leads dairy farmers to review the construction process almost every month. The dairy farmers get a vivid picture of the creation and operation of a world class dairy farm. Zhendong Zhang still remembers the effect on the farmers, "*It was an eye-opening experience. Their many years of experience suddenly proved to be outdated."*

On the other hand, quality is still at the heart of Nestlé. Posters are sent to farmers from time to time with information regarding best practice as well as explanations about incorrect feeding methods. Quarterly meetings are also held for all the direct farms to share the economic trends, international dairy prices and the efficiency of each farm. At the end of the year, an annual conference was held to summarize the dairy farms' whole year performance and reward the farms with good operations.

5.2.3 Sustaining stage

This stage is termed with the opening of DFI. Dairy farmers now could receive formal modern dairy farming trainings at this new institute. Nestlé invested

around CHF 30 million in the DFI, which is one of Nestlé's biggest dairy investments. It formally opened to the public in October 2014. Located in Shuangcheng, the 600,000 square metre institute includes classrooms, dormitories and laboratories. Besides these facilities, there are also three demonstration farms of different sizes. The smallest one is designed for 200–400 cows which serves as a demonstration for small farms. The other two with 600–1,200, aim to help medium and large dairy farmers to expand and improve.

The aim of DFI is to modernise China's dairy farming practices to meet the fast-growing demand in a sustainable manner. The institution is not only open to Nestlé dairy farmers in its three milk districts, but also to other dairy farmers not supply Nestlé and people in the whole dairy industry such as students, government officers and dairy farm managers. The learners can gain practical experience in expanding their farm business, improving productivity and providing high quality milk.

Nestlé invites various partners into this platform which covers all main aspects of dairy farming and production, the majority of them belong to Tier 2 suppliers which Nestlé didn't have close relationship before, and some of them belong to non-traditional supply chain members such as academic institutions. It looked for partners which are capable and highly respected in their fields. Because these partners are leaders in their respective areas of the dairy value chain, thus they help to fulfil DFI's mission to provide world-class training to the students.

The first group of business partners are Nutrition partners *Alltech* and *Land O'Lakes*; Milking and Reproduction partners *Alta Genetics*, *GEA*, *SCR*; Animal Health partners *Boehringer Ingelheim*, *Elanco*, *Zoetis*; Farm Facility and Equipments partner *Avery Weigh-Tronix*, *East Rock*, *Foester Technik*, *Goke*

Stoti; and Academic partners include the University of Wisconsin Madison, Northeast Agriculture University in Heilongjiang Province and International Farming Comparison Network (IFCN) (see figure 7 in Appendix D).

The business partners can provide their expertise in their specific areas and the academic partners are responsible for the design, delivery and measurement of the training programs both at a global and regional level. The design of DFI enables trainees to experience both classroom teaching and hands-on training at the demonstration farms.

After opening for one year, to the end of 2015, the training institute has provided training to more than 800 people. The training courses included the prevention and control of diseases, increasing milk production of each herd, improving milk quality and saving feed, all topics that were relevant to the farming practices. The trainees activity took part in the training course and provide feedback to the content which then further altered to meet their needs. At the one year ceremony, another six companies became DFI's partners.

Learning success stories were promoted by Nestlé and through media. For example, Xue Jiangang, who attended the milking and milk quality course in March, 2015, gave feedback to Nestlé that his farm's performance improved – the milking speed increased and the incident of cow mastitis dropped from 5% to 1%.

5.2.4 Summary of supply chain learning in modernizing China's dairy industry

Table 5-1 makes a summary on supply chain learning of the three learning stages.

Learning stages	Learning task	Learning activities	Learning outcome
Set up (2008 - 2012)	Dairy farmer survey, awareness for upgrading	Conduct survey to understand dairy farmers' upgrading needs; Explain the government policy and market trends to dairy farmers for the urgency of upgrading; Awareness building and training for Nestlé internal agriculture service department staff;	Dairy farmers and Nestlé internal staff gained awareness for upgrading;
Operating (2013 -2014)	Upgrading to medium and large farms	Group learning; Learning from peers; Learning from the construction of DFI; Quarterly, annual meetings; Take part in external and government organized conferences and trainings;	Take action to upgrade the dairy farms;
Sustaining (2015 - 2016)	Learn the modern dairy farming knowledge	Nestlé and DFI partners jointly design the training material which is suitable for the local conditions; Dairy farmers, managers, students, government officials receive training in DFI.	Nestlé and DFI partners gained more knowledge on trainees' learning needs; Trainees learnt different levels of modern dairy farming knowledge.

Table 5-1 Supply chain learning in the three learning stages

5.3 Supply chain leadership in modernizing China's dairy industry

Nestlé exhibit different leadership styles on dairy farmers and on DFI partners. This subsection discusses this construct under the three supply chain learning stages.

5.3.1 Supply chain leadership at set up stage

Nestlé mainly applied the transformational leadership of inspiration and individualized consideration at this stage. The farmers' awareness of the changes is built along with the supplier survey and day-to-day communications with the TA supervisors. The TA supervisors let the dairy farmers know the latest government policy, the new technologies, and most importantly the need to upgrade for survival and further improvement. Support is provided to the farmers according to their needs base on the survey.

As outlined by Zhendong Zhang: "*At the end of 2012 we had made a list of these dairy farmers and visited them door by door. We have a team to find out those interested in upgrading. They also explain to the farmers the benefits of a modern farm and they did a very good survey. They selected the key farmers and we arranged specific TA supervisors to follow them and encourage them.*"

Besides the farmers' existing scale, there are also other criteria identified by Nestlé to select the farmers, Chongkun Xu stated: "*To select the key farmers… you first have to select people who are committed to sustainable dairy farming. The farmers have to demonstrate entrepreneurship and willingness to accept new ideas. Then support will be provided accordingly.*" Not every dairy farmer (or even the selected key dairy farmers) was motivated to upgrade, some farmers moves fast while some wait and see the change happening.

Nestlé also started looking for DFI partners at this stage. The partners need to fulfil several criteria set by Nestlé such as industry experience, technical capability, and commitment to China's dairy industry. As outlined by Hans Johr, Corporate Head of Agricultural at Nestlé:

"*In looking at what companies to get involved in the Institute, we didn't want*

to bring someone fresh into the market. We wanted relevant companies in the market, and a leader that was able to offer products and services that were relevant to the actual farm. We were also looking at what their competitive advantages was and a company's commitment to the market and their commitment to China. Technical capabilities, not just products and services, but willingness to train farmers and developing or bringing technical capabilities to China is the purpose. Another factor was to a certain degree the maturity of the products. Quality and food safety is something that experienced companies have developed and it's worth it to pay the additional amount to ensure that you can do the job on the farm properly and safely" (Quotation from Goldberg and Niles, 2015, p. 4).

Thus DFI partners should align with Nestlé on the sustainable development of dairy industry. A manager from GEA, one of DFI's partners which take the lead for milking said:

"*DFI makes good business sense. It is a showcase of corporate social responsibility. We also have an obligation: our ultimate goal is to improve the levels of dairy farming. With DFI, we are on track to achieve this goal.*"

5.3.2 Supply chain leadership at operating stage

Nestlé took various actions to support the upgrading happening at this stage mainly through a transactional leadership style: adopting a price differentiation strategy, providing financial support, liaising with government and providing facility support. Transformational leadership of inspiring and intellectual stimulation were also found at this stage.

5.3.2.1 Price differentiation

Nestlé set up a grading scheme for the key dairy farms. The farms which have a daily supply above 500 kilograms are called Direct Suppliers. These farms are further classified into four types – A, B, C, and D (A<B<C<D), according to their scales, facilities, fresh milk quality and overall farm management. A different purchasing price is paid according to the grades which reflect the transactional leadership of contingent reward. Nestlé arranges free transportation to these Direct Suppliers. As outlined by Zhendong Zhang: "*The purpose of the grading scheme is to reward those farmers who invest in better farm management. 'A' types of farms are paid much higher than the guidance price. There are slight differences between each grade, each grade is higher than its lower grade…we classified them into A, B, C, D to incentivize them. With a bigger scale, higher grade, you will pay more and have a higher profit rate…it has different levels and is progressive.*"

Quality incentives are also provided to the farmers: "*All milk meets the quality standard. The reward scheme is to encourage continuous improvement. For example total mixed ration[1] (TMR) has a big impact on the milk's fat protein component. We consider this in our pricing table… There is a higher price for a better performance. All our work is encouraged to let everyone focus on improvement. It is important for them to have the motivation.*"

Whenever a farm applies for a grade, the Department will conduct an on-site audit, together with Finance Department and Quality Assurance Department. If it fulfils the standards then it can be upgraded. If not, an improvement plan is

[1] Total mixed ration (TMR) is a method of feeding dairy cattle, which can be defined as "the practice of weighing and blending all feedstuffs into a complete ration which provides adequate nourishment to meet the needs of dairy cows", by Wikipedia in https://en.wikipedia.org/wiki/Total_mixed_ration.

given to the farm.

The grading and incentives have a positive effect on the farmers and some farmers with required resources try to become A-types. Other small farmers who lack resources but are willing to continue are encouraged to join the bigger farms (exhibit the transformational leadership of intellectual stimulation) – a model called *'*Cow Hotels*'* – where one party owns the land and invests in the facilities but do not own or have enough cows, and other parties who lack land and facilities, but own cows, rectify the cow shortage of the first party.

Cow Hotels normally belong to A or B grades – collectively the farmers are paid higher than if they individually deliver milk to Nestlé. Although a transitioning solution, it provides a pragmatic and inclusive approach to consolidation and transformation: small dairy farmers paid higher through cow hotels and the owners of the cow hotels could gain extra profits by charging an administration fee from the farmers and by the price difference giving to farmers.

5.3.2.2 Financial support

In 2012, Nestlé invested one million RMB for silage[2] allowance. Whenever farmers bought silage, Nestlé helped by paying for one third. In this way, it enhanced farmers' understanding of the new feeding materials.

A big challenge for the dairy farmers is lack of capital. Nestlé collaborated with the local government and a local bank to provide support to the farmers. In 2013, Nestlé and the local government each invested one million RMB in the Bank of Harbin to create a guarantee platform for the farmers. Based on the guarantee,

[2] Grass or other green fodder, compacted and stored in airtight conditions, typically in a silo, without first being dried, and used as animal feed in the winter, is a perfect feeding material for dairy cows

the Bank decided to provide 200 million RMB credit to dairy farmers. As outlined by Zhendong Zhang:

> "*Because we have the details about how much money they need as well as whether they need a milking parlour or a cooling tank, we can help the bank to get a better estimate of the capital that is needed. We helped coordinate this issue and within just six months, the bank approved lending to around 60 farmers with more than 60 million RMB…the farmers do have confidence in development and do want to grow bigger*".

> "*We have also done a financial support demonstration project. We have a dairy farm locally with 100 cows. The owner wants to grow and we feel he has the potential. So we are thinking about how could we help it develop, then we invite the experts who are helping design DFI at that time….With a bank loan of five million RMB the farmer has grown from less than one ton fresh milk per day to more than three tons. The five million was spent in building a standard cowshed and buying cows*".

5.3.2.3 Liaising with government

Nestlé also liaised with government for farmers' land and electricity use. Dairy farmers previously raised cows in their backyard, with the expansion of farm-size, land became a constraint for their further development. Zhendong Zhang said:

> "*It is not easy for farmers to get suitable land, so we communicate with the government whether they could give priority to dairy farmers… for electricity, the milking parlour needs to use three-phase electric and we coordinate with the government again on whether the electricity department could give a discount to the farmers*".

5.3.2.4 Facility support

In 2014, Shuangcheng Nestlé invested ten million RMB in purchasing facilities for the dairy farmers, through which farmers need only pay 40% of the facility price before tax. Nestlé pays for the further 60% and extra 17% tax. Whenever a new milking parlour is built by a farm, the supervisors pay a visit with a group of the key dairy farms, one purpose is learning from peers, another purpose is to exhibit a transformational leadership of inspiring. According to Zhendong Zhang: *"Through the success story of some farms, we let other farmers know that it is not a dream to succeed and if one farm could achieve its goals, then why not the rest?"*

Instead of paying cash, the farmers could pay the 40% through future milk payments which is a big support to the farmers. Once the farmers utilize the facility, they may upgrade from A to B, with the increased milk price, it largely covers the payment. Depending upon the milk volume, normally, the money is repaid within three to six months.

5.3.3 Supply chain leadership at sustaining stage

Nestlé mainly applied a transformational leadership style of intellectual stimulation on farmers at this stage. With the establishment of DFI, its training provide a way to shifting dairy farmers' mental modes. And Ning Ma, Shuangcheng Nestlé TA supervisor:

> "*One big challenge (for upgrading) is the mind-set. Actually land, capital, and skills are all problems, but they are not the most important. Their mind-set is very difficult to change. Quite a lot of them have raised cows for more than 20 to 30 years. They believe that their model was satisfactory, however*

it is not the same now. They were fascinated by what they saw. This is exactly where DFI can play a very useful role, i.e., to show our farmers how a modern farm is managed with good results. It changed their mind-set."

The facility support reflect the transactional leadership of contingent reward continues as stated by Zhendong Zhang:

"*We still plan to invest five million RMB this year on facilities. Because the farmers lack of understanding on the new equipment, it takes time. So for instance, this year we plan to purchase the reclaim machine to get silage – a new tool that none of the farmers in Shuangcheng have used before…and also cow brush, which we have in DFI. We think how to introduce it to them to increase animal welfare. These could have a pull effect on them and let them feel someone is helping them. It is a leading effect"*.

Nestlé applied a transformational leadership style on DFI partners through inspiration, intellectual stimulation and individualized consideration. At this stage, Nestlé collaborates with the DFI partners closely. DFI partners are involved in the decision making process, an aspect inspirational which emphasis the collective mission. According to Shiping Wang, Business Development Manager at Nestlé DFI: "*Here in DFI the management model is that of membership – you see in our office all the members are here. It is like an Operations Committee, all of us could participate – not only Nestlé makes the decision but all of us push for the development*".

These partners play a key role in the training courses offered by the DFI, asserted the technical manager of Land O'Lakes: "*Nestlé hope to apply the advantages of different partners, and we will then apply our strengths to participate to design a training course according to our feature.*" This reflect the

individualized consideration which Nestlé emphasis each DFI partner's strength.

Various collaborations are emerging in the process which reflect the transformational leadership of intellectual stimulation, the activities also bring benefits to DFI partners through transactional leadership of contingent reward. Shiping Wang said: "*Together we are designing training materials, writing standard operation guidelines…visiting key customers…we are also presenting in conferences together. We took them to each milk district to give lessons to the milk district. To DFI partners, they could set up the collaboration relationship and identify the potential customers - this is what they want, to promote their brands…. To DFI, we link all the parties, this is a win-win to Nestlé and our partners*".

Suppliers are also glad to partner with Nestlé in the process. The DFI partners quickly gain a reputation as being a partner. According to Yongxin Liu, Project Manager of East Rock: "*We hope to help the farmers in the transformation…Secondly it is a win-win situation … our reputation enhanced quickly into another level. Compared with other companies in the industry, although they started early, we grow much faster*".

Nestlé also influenced the DFI partners through intellectual stimulation. DFI works closely with the partners, they hold conferences quarterly to review progress and discuss potential collaboration opportunities.

> "*This project is like operating a smartphone. At the beginning we may not be good at many functions, but slowly we think what other functions can add to the mobile.... DFI is just like this, it is a new staff*", (Shiping Wang).

> "*It is just beginning, I feel there are more and more works emerging, many*

ideas will be put into implementation," (Zhendong Zhang).

5.3.4 Summary of Nestlé's supply chain leadership

Tables 5-2 and 5-3 in the end of this chapter summarize Nestlé's leadership styles on dairy farmers and DFI partners respectively.

For dairy farmers, it can be found that Nestlé mainly applied a transformational leadership style of inspirational and individual consideration on them at the set up stage. It mainly applied a transactional leadership style on dairy farmers at the operating stage with a focus on contingent reward through various kinds of support, evidence also found for transformational leadership of inspirational and intellectual stimulation. Finally, Nestlé mainly applied a transformational leadership of intellectual stimulations at the sustaining stage, to keep challenging dairy farmers' traditional dairy farming habits to following the modern approach, transactional leadership of contingent reward was also found. The transactional leadership of management by exception is found in all three learning stages that dairy farmers need to obey Nestlé's quality and safety requirement at all the times.

For DFI partners, Nestlé mainly applied a transformational leadership of inspirational at both set up and operating stages. DFI partners share a collective mission with Nestlé. Nestlé also applied a transformational leadership of all three aspects of inspirational, intellectual stimulation and individualized at the sustaining stage. The transactional leadership of contingent reward is found in all three learning stages.

5.4 Multi-tier supply chain management in modernizing China's dairy industry

This section summarizes Nestlé's dairy supply chain governance mechanism

and supply chain structure. It can be found that at the set up stage (2008 - 2012), Nestlé have a close relationship with dairy farms which are mainly small ones, Nestlé also reach out directly to potential DFI partners at later of this stage.

At the operating stage (2013 - 2014), Nestlé provided all kinds of support to dairy farms to facilitate them upgrading to medium and large ones. DFI is under construction at this stage, Nestlé directly work with these partners and introduce them to dairy farms. For example, East Rock is responsible for the design of DFI and it introduced by Nestlé to support a demonstration farm.

At the sustaining stage (2015 - 2016), dairy farmers and managers, students, government officials are receiving training at DFI. Nestlé collaborate closely with DFI partners and these partners also create direct relationships with the Tier 1 dairy farms. Figure 5-1 presents the triadic supply chain structure in the three learning stages.

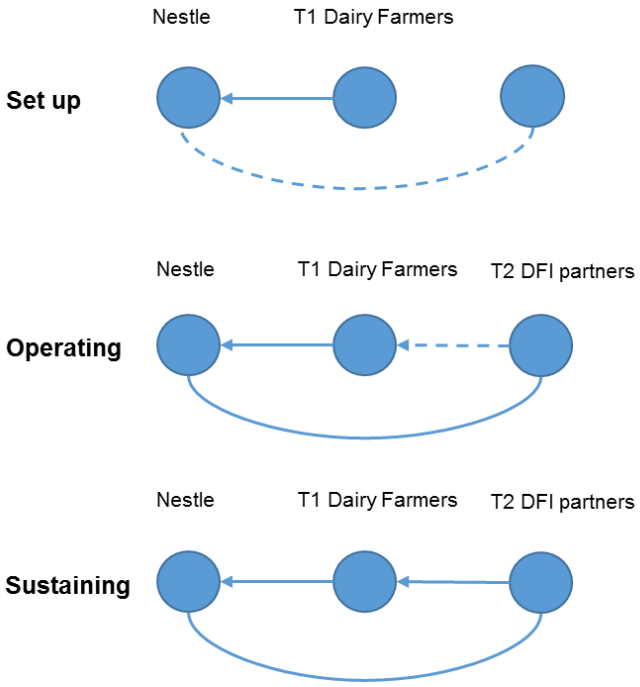


Figure 5-1 Nestlé's multi-tier supply chain structures in implementing dairy farmer upgrading initiative

5.5 Case summary

Nestlé has continued to practice the *Creating Shared Value* philosophy. Helping the farmers to upgrade to the modern way once again demonstrates the *Creating Shared Value* viewpoint. Although it is a harsh reality that if the smallholders don't scale up, they would squeezed out of the market and carry out other business to make a living. Nestlé provide opportunity/solutions for the ones capably and willing to stay in the market by helping them upgrade to economically viable larger dairy farms or join 'cow hotel'. As outlined by Robert Erhard, former General Manager of DFI:

> "*We know where the suppliers are, we know what they do, we involve in operations, we visit them regularly, we build a relationship, they know our quality standards. It is also social responsibility. I don't think it's right that we as a company to simply just say there is a new model now but we don't give them opportunity to be involved and drop them even though they've been with us for 25 years. We don't tell them that we don't care about them anymore…We don't drive people away – those want to leave on their own will. For the others we tell them if you want to stay in the industry, you have to grow, this is the criteria.*"

The transformation, the training and all the activities not only benefit the dairy farmers but also Nestlé and, ultimately, the consumers. To respond to the government-initiated transformation efforts, Nestlé worked with its business partners to build a world-class training centre. Together, they are transforming traditional dairy farmers to modern professionals. DFI partners have gained reputation in a short time and approached the dairy farmers more effectively. With safer and better raw milk, Nestlé is also strengthening consumer trust in its products.

		Supply chain learning stages		
		Set up	**Operating**	**Sustaining**
Transformational leadership	**Inspirational**	Nestlé explain the government policy to dairy farmers and suggest them to look into the long term development.	"Through the success story of some farms, we let other farmers know that it is not a dream to succeed and if one farm could achieve its goals, then why not the rest? If they have any questions, we help them and encourage them to develop". ---Zhendong Zhang, Fresh Milk Procurement and Agriculture Service Manager of Shuangcheng Nestlé	
	Intellectual Stimulation		Dairy farmers are encouraged to apply various forms to upgrade such as join cow hotel.	"One big challenge is the mind-set. Actually land, capital, and skills are all problems, but they are not the most important. Their mind-set is very difficult to change. Quite a lot of them have raised cows for more than 20 to 30 years. They believe that their model was satisfactory, however it is not the same now. They were fascinated by what they saw. This is exactly where DFI can play a very useful role, i.e., to show our farmers how a modern farm is managed with good results. It changed their mind-set." -- Ning Ma, Technical Assistant Supervisor of Shuangcheng Nestlé

	Individualized Consideration	"At the end of 2012 we had made a list of these dairy farmers and visited them door by door. We have a team to find out those interested in upgrading. They also explain to the farmers the benefits of a modern farm and they did a very good survey. They selected the key farmers and we arranged specific TA supervisors to follow them and encourage them." --- Zhendong Zhang, Fresh Milk Procurement and Agriculture Service Manager of Shuangcheng Nestlé.		

Transactional leadership	**Contingent Reward**		"Because we have the details about how much money they need as well as whether they need a milking parlour or a cooling tank, we can help the bank to get a better estimate of the capital that is needed. We helped coordinate this issue and within just six months, the bank approved lending to around 60 farmers with more than 60 million RMB…the farmers do have confidence in development and do want to grow bigger" "We have also done a financial support demonstration project. We have a dairy farm locally with 100 cows. The owner wants to grow and we feel he has the potential. So we are thinking about how could we help it develop, then we invite the experts who are helping design DFI at that time….With a bank loan of five million RMB the farmer has grown from less than one ton fresh milk per day to more than three tons. The five million was spent in building a standard cowshed and buying cows" "It is not easy for farmers to get suitable land, so we communicate with the government whether they could give priority to dairy farmers… for electricity, the milking parlour needs to use three-phase electric and we coordinate with the government again on whether the electricity department could give a discount to the farmers".	"We still plan to invest five million RMB this year (2015) on facilities. Because the farmers lack of understanding on the new equipment, it takes time. So for instance, this year we plan to purchase the reclaim machine to get silage – a new tool that none of the farmers in Shuangcheng have used before…and also cow brush, which we have in DFI. We think how to introduce it to them to increase animal welfare. These could have a pull effect on them and let them feel someone is helping them. It is a leading effect."

			"The purpose of the grading scheme is to reward those farmers who invest in better farm management. 'A' types of farms are paid much higher than the guidance price. There are slight differences between each grade, each grade is higher than its lower grade…we classified them into A, B, C, D to incentivize them. With a bigger scale, higher grade, you will pay more and have a higher profit rate…it has different levels and is progressive." "All milk meets the quality standard. The reward scheme is to encourage continuous improvement. For example total mixed ration (TMR) has a big impact on the milk's fat protein component. We consider this in our pricing table… to let them have motivation to raise cows better. Having more milk is one thing and higher protein is another perspective…. There is a higher price for a better performance. All our work is encouraged to let everyone focus on improvement. It is important for them to have the motivation." --- Zhendong Zhang, Fresh Milk Procurement and Agriculture Service Manager of Shuangcheng Nestlé	

	Management-by-Exception	"If it is adulteration, they must be fired immediately, we won't collaborate again. The dairy farmers' registration numbers are unique, they can't registry again once been fired." ---Zhendong Zhang, Fresh Milk Procurement and Agriculture Service Manager of Shuangcheng Nestlé

Table 5-2 Nestlé's leadership on dairy farmers

		Supply chain learning stages		
		Set up	**Operating**	**Sustaining**
Transformational leadership	**Inspirational**	"We wanted relevant companies in the market, and a leader that was able to offer products and services that were relevant to the actual farm. We were also looking at what their competitive advantages was and a company's commitment to the market and their commitment to China. Technical capabilities, not just products and services, but willingness to train farmers and developing or bringing technical capabilities to China is the purpose." Hans Johr, Corporate Head of Agricultural, Nestlé		
				"Here in DFI the management model is that of membership - you see in our office all the members are here. It is like an Operations Committee, all of us could participate - not only Nestlé makes the decision but all of us push for the development" --- Shiping Wang, Business Development Manager at Nestlé DFI
	Intellectual Stimulation			"This project is like operating a smartphone. At the beginning we may not be good at many functions, but slowly we think what other functions can add to the mobile.... DFI is just like this, it is a new staff." "Together we are designing training materials, writing standard operation guidelines…visiting key customers…we are also presenting in conferences together. We took them to each milk district to give lessons to the milk district." --- Shiping Wang, Business Development Manager at Nestlé DFI

	Individualized Consideration			"Nestlé hope to apply the advantages of different partners, and we will then apply our strengths to participate to design a training course according to our feature." ---Technical Manager of Land O'Lakes.
Transactional leadership	**Contingent Reward**	"We have collaborated with the farmers for more than 20 years. The relationship is way over and above simple commercial relationships of buying and selling fresh milk…Many brands say I am one of DFI's partners, then it has a higher reputation." --- Zhendong Zhang, Fresh Milk Procurement and Agriculture Service Manager of Shuangcheng Nestlé		"To DFI partners, they could set up the collaboration relationship (with dairy farms) and identify the potential customers - this is what they want, to promote their brands" -- Shiping Wang, Business Development Manager at Nestlé DFI "We hope to help the farmers in the transformation…Secondly it is a win-win situation … our reputation enhanced quickly into another level. Compared with other companies in the industry, although they started early, we grow much faster." --- Yongxin Liu, Project Manager of East Rock.

Table 5-3 Nestlé's leadership on DFI partners

Chapter 6 IKEA's sustainable cotton initiative in China

This chapter discusses IKEA's sustainable cotton initiative in China. It begins with the background information of IKEA, its sustainable cotton activities at the globe level and in China. The proactive initiative is then analysed along three constructs of supply chain learning, supply chain leadership and multi-tier SSCM. Finally this chapter ends with the case summary.

6.1 Background information

This section provides the background information of IKEA, the cotton industry in China and IKEA's sustainable cotton practices. This case is focusing on IKEA's sustainable cotton initiative by the fact that: 1) IKEA has been the pioneers in promoting sustainable cotton farming in China and been the first to be 100% sourcing from more sustainable sources; 2) the cotton-textile supply chain is a seven tier's multi-tier supply chain.

6.1.1 Background of IKEA

IKEA is the world's largest furniture retailer. It was founded more than seven decades ago by Ingvar Kamprad. As of FY15 (financial year of 2015, from September 1st, 2014 to August 31th, 2015), IKEA operated in 43 countries with 155,000 co-workers. It has 328 stores in 28 countries and 27 trading service offices in 23 countries. It achieved total sales of 31.9 billion Euros and a net profit of 3.5 billion Euros in FY15 (IKEA Group Sustainability Report FY15).

By the end of FY15, IKEA had 978 home furnishing suppliers in 50 countries with around one-quarter of the suppliers based in China. IKEA emphasizes on long-term relationships lasting for an average of 11 years with its suppliers

(IKEA Group Sustainability Report FY15).

The vision of IKEA is to create a better life for the many people and it adopts a 'People & Planet Positive' strategy to work toward this vision. The strategy focuses on three aspects: inspiring and enabling millions of customers to live a more sustainable life at home; striving for resource and energy independence as well as taking a lead in creating a better life for the people and communities impacted by its business (IKEA Group Sustainability Report FY15).

In terms of natural resources IKEA has applied a 'going all-in' (achieve 100% sustainable) approach. For example, as of August 2015, all of the cotton that IKEA uses for its products comes from more sustainable sources including cotton grown according to the Better Cotton Standard, by farmers working towards Better Cotton, and more sustainable cotton from the USA.

6.1.2 Cotton production in China

Cotton is grown in around 80 countries over the world. However, it is also well-known for its associated sustainability issues, such as the excessive use of water and pesticides, bad labour conditions, and being a cause of farmers' indebtedness and poverty. Cotton is a thirsty plant and in order to produce 1kg of cotton lint, it requires 7,000 to 29,000 litres of water (WWF, 1999). Studies also show that cotton is grown on just 2.5% of the world's cultivated land, but consumes 25% of the world's insecticides and more than 10% of all pesticides (insecticides, herbicides and defoliants). Also, the exposure to pesticides causes health problems to cotton farmers and with cotton production costs soaring in the past decades, the drop in yields has worsened the indebtedness and poverty of farmers. This has become a serious issue as it is estimated that around 99% of the world's cotton farmers and 75% of world cotton production are from developing countries (Rai, 2011).

China is an extremely important contributor to the global cotton industry. It currently is the largest cotton producer, importer and consumer in the world. In 2013, the area allocated to cotton plantation in China was 4.35 million hectares with a total output of 6.30 million tonnes (National Bureau of Statistic of China, 2015). There are three major cotton growing areas in China – the northwest inland cotton region (e.g. Xinjiang), the Yellow River valley region (e.g. Shandong, Hebei) and the Yangtze River valley region (e.g. Hubei, Anhui) – while downstream textile production is mainly located in the east coast regions (See Figure 6-1).

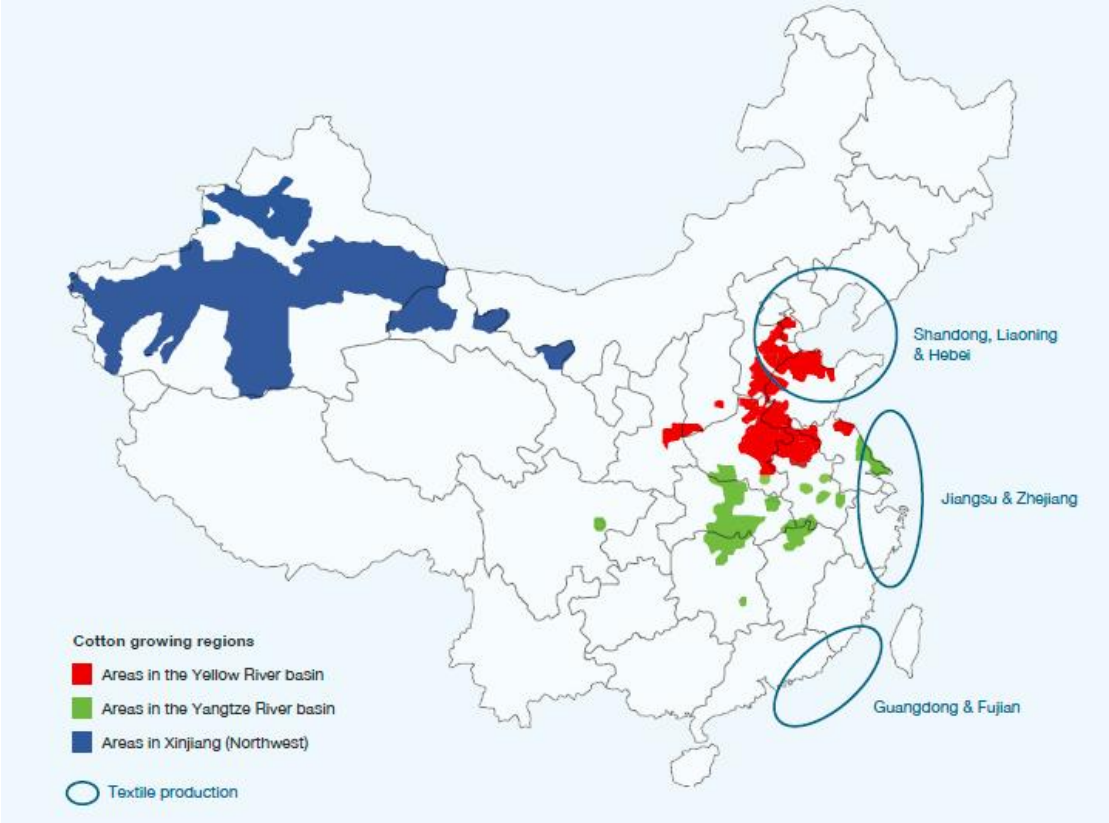


Figure 6-1 Distribution and cotton-growing and textile production in China

(Source: CottonConnect, 2015)

Dai and Dong (2014) claim that China accounts for about 30% of world's cotton

output with only 15% of the world's cotton land. The unit yield (output/planting area) was 85% higher than the global average due to the adoption of a series of intensive farming technologies such as seeding transplanting, plastic mulching, double cropping, and super-high plant density technique.

However, even with these techniques, cotton production is a very labour-intensive activity and involves large input of chemical products such as fertilizers, pesticides and plastic films in China. There are more than 40 procedures during cotton's whole growth period with the amount of labour input for cotton being 3.5 and 3 times that for wheat and corn (Mao, 2010). This demand for labour is especially high during the harvest stage. Xinjiang has the highest mechanization cotton production rate compared to other regions, with about 15% of the cotton area harvested with machinery, while harvesting is still completely done manually in the Yellow River and Yangtze River Valley (Dai and Dong, 2014). Together with China's rapid urbanization, the shortage of labour in cotton production has become even more serious.

China is the largest producer and consumer of fertilizer in the world. It is also the largest producer and exporter and the second largest consumer of pesticides in the world. Cotton is also the largest plastic film mulched crop in China, with about 70% of cotton field covered with plastic film which cannot be easily degraded. All these factors contribute to soil pollution which results in dysfunctional soil and quality degradation. Thus China is facing increasing challenges from soil pollution and labour shortages. Meanwhile, as cotton-growing regions in China are also the main food crop-growing regions, the competition for land between grain crops and cotton has become increasingly serious.

6.1.3 IKEA's sustainable cotton practice

Cotton is the second most important raw material at IKEA after timber. It is a renewable source and it has excellent comfort quality as it is soft and breathable. It is widely used in IKEA's home furnishing products, such as sofas, cushions, bed sheets and lampshades. Although IKEA does not directly purchase cotton, its upstream suppliers purchase large amounts. It is estimated that each year IKEA uses around 0.6% to 0.7% of the world's cotton supply.

Cotton-textile is a long and complex supply chain. Before cotton finished products reach the consumers it goes through several stages – Tier 6 farmer cultivation, Tier 5 ginner fibre extraction, Tier 4 spinner yarn production, Tier 3 textile producer weaving, Tier 2 dyeing, Tier 1 manufacturer cutting and sewing and finally focal company such as IKEA retailing. Multiple suppliers in different countries are involved in the long processes with some carrying out part of the functions and some covering multiple functions.

IKEA has been working on cotton sustainability issues for more than a decade. As early as 2002, the IKEA Material Risk Council carried out a study on the global cotton industry to strengthen its understanding of the industry and formulate policies for the company's cotton consumption (Rai, 2011). In 2005, IKEA and WWF extended their former global partnership in responsible forestry started in 2002, to sustainable cotton cultivation in India and Pakistan (the largest cotton sourcing zone for IKEA). It aims to enable farmers to reduce their environmental impact, improve efficiency, maintain cotton crop yields and increase their gross margins. Around 2,000 farmers in Pakistan and 500 farmers in Indian participated the project through Farmer Field Schools which provided hands-on training and support.

Also in the same year, IKEA, together with other world leading brands and

organizations launched a global platform, the Better Cotton Initiative (BCI), which aimed to make cotton production better for the people who produce it, better for the environment it grows in, and better for the sector's future. It aimed to develop a new commodity, 'Better Cotton', as a mainstream commodity in the market that would make up to 30% of global cotton production in 2020. Unlike organic cotton and Fairtrade, Better Cotton does not give a price premium to farmers. Instead, it reduces the costs of agricultural inputs to increase farmers' income and final consumers don't have to pay extra for this commodity. This philosophy is in line IKEA's belief in "making sustainability affordable for all".

BCI has also tried to develop globally accepted criteria for Better Cotton. In 2009, it launched a draft set of criteria, tested in some regional pilot projects. After several years of monitoring and evaluation now it has six major principles covering environmental and social aspects, outlined in Figure 6-2. Better Cotton (cotton produced under BCI standards) is traceable to bale level and farmers are selected at random to be audited by a third party.

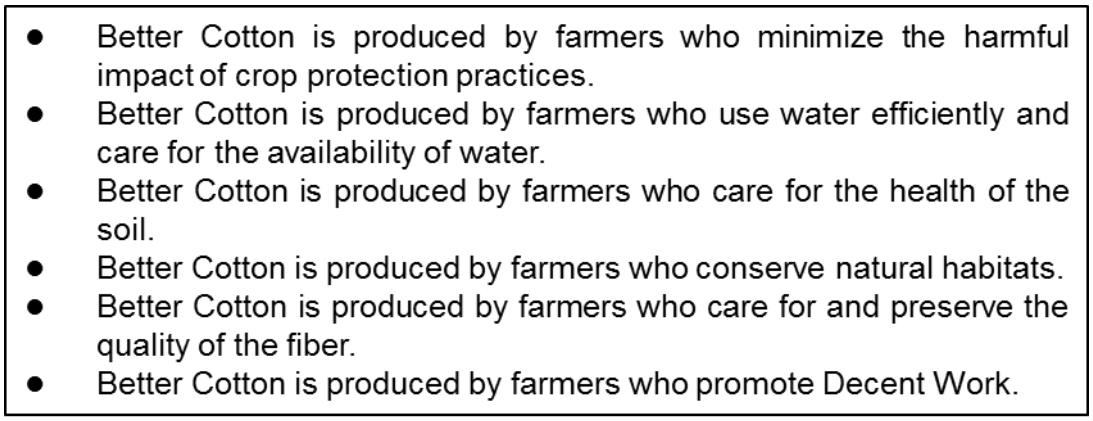


Figure 6-2 Better Cotton production principles

(Source: BCI website, http://bettercotton.org/about-better-cotton/better-cotton-standard-system/production-principles-and-criteria/)

In 2009, BCI, Dutch funding agencies (the Dutch Sustainable Trade Initiative (IDH), the Interchurch Organization for Development (ICCO), and Rabobank Foundation), implementing NGOs (WWF and Solidaridad), and global retailers (Adidas, H&M, IKEA, Levi Strauss & Co, Marks & Spencer) founded 'Better Cotton Fast Track Programme' (BCFTP). It established a fund to build up and accelerate farmers' capability to produce Better Cotton. IKEA and other retailers co-financed the project and are committed to buying Better Cotton from the participating famers.

The joint cotton projects in Pakistan and Indian achieved big success. With the cumulative capacity, IKEA also met its commitments to purchase these more sustainable sources. In order to avoid creating premium prices and to speed up the process of making the cotton a commodity available and affordable to all, IKEA only buys part of the volume it creates, with farmers free to sell the products to other brands or sale as conventional cotton. Currently, IKEA is the largest consumer of Better Cotton in the world (IKEA Group Sustainability Report FY12). In FY13 IKEA used 110,000 tonnes of cotton, 79,000 tonnes of cotton are from more sustainable sources, of which 47,000 tonnes are Better Cotton (IKEA Group Sustainability Report FY13).

The share of cotton from these sources in IKEA products was 34% in FY12 with this figure increasing sharply to 72% in FY13 and to 76% in FY14. In August 2015 IKEA achieved its goal of sourcing 100% of its cotton from more sustainable sources (see the amount and the ratio in Figure 6-3).

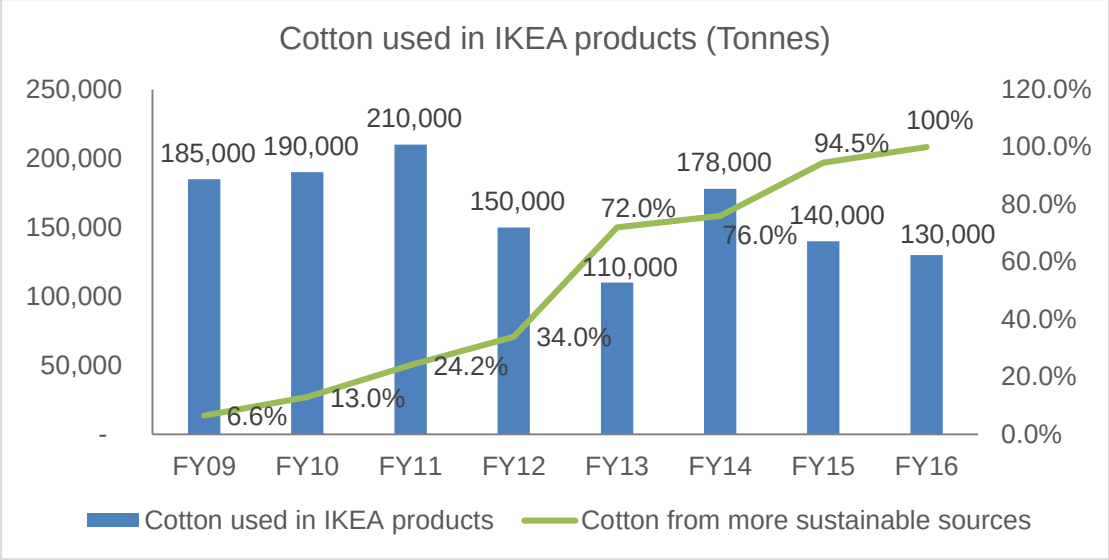


Figure 6-3 Cotton usage in IKEA products

(Source: IKEA Group Sustainability Report FY12, 13, 14, 15, 16)

Besides the sustainable cotton practices, IKEA is also finding ways to use cotton more efficiently. For example through standardizing the way fabric is constructed, reducing the amount of cotton by up to 15%, and reducing the use of cotton by blending it with other textiles and replacing it with alternative materials such as cellulose fibres.

6.2 Supply chain learning in IKEA's sustainable cotton project

IKEA purchases products through its 27 'trading service offices' which operate in 23 producer countries (IKEA Group Sustainability Report FY15). Its cotton products are manufactured primarily in South Asia (India 23.1%, Pakistan 19.5%), Turkey (15.0%), USA (8.8%) and China (7.0%) as of FY14.

IKEA sourced approximate 9,000 tonnes of cotton from China in FY12, 3,850 tonnes in FY13 and 12,460 tonnes in FY14 (IKEA Group Sustainability Report FY12, FY13, FY14). It is about 0.13% of China's cotton production on average

over the three years (author's calculation). Although this ratio is smaller than the global rate, inspired by the success practices of South Asia, IKEA would also like to have a positive influence on the cotton industry in China. In cooperation with BCFTP, three projects were initiated in China in FY11 based in Xinjiang province, where farms are often large and specialized cooperatives with big landholdings and many employees.

The trading service office in China applied various activities in implementing a sustainable cotton initiative in China. In three years, 100% of its cotton was sourced from more sustainable cotton sources, one year ahead of the IKEA Group target. The proactive initiative went through three learning stages: set up stage (2011), operating stage (2012 - August 2014), and sustaining stage (September 2014 onwards)

6.2.1 Set up stage

In China, a dedicated sustainable cotton team of two staff was set up in 2011 to look after the project, from 2012 Tony Dai was appointed as the dedicate project manager. They worked closely with different business development teams with cotton as raw materials. Kevin Liu, business development manager of IKEA home textile products explained the reasons to carry out this initiative,

> *"IKEA adopt a top-down and inspire approach. We know very clear why we are doing this… Because cotton is one of the largest raw materials for IKEA. Actually you could see this from our CEO, the senior executives, and the senior board of the purchasing team that it is our vision and we are clear the path for this blueprint. So this strategy, this vision, penetrates to the purchasing team and even to the front lines of the purchasing specialists of the business team…I could consider the earth, could consider the green issues of our company, and the long term development and competitive*

advantage… because IKEA is one of the founders of BCI, so IKEA is very clear about what needs to be done…At this stage, we then have many interactives with the sustainability team."

6.2.2.1 Supply chain mapping

To have a clear picture on the existing cotton-textile supply chain, IKEA China first conducted the supply chain mapping exercise. With long term relationships and frequent contacts with suppliers, IKEA China knows its fabric, even yarn suppliers. However, sustainable cotton initiatives required it to go even further and gain knowledge on its extreme upstream cotton suppliers. The sustainable cotton team then made it clear to the suppliers that the mapping was only to help analyse the whole supply chain rather than build direct business relations with their lower tier suppliers.

The pilot supply chain mapping exercise was first conducted with suppliers which have large shares in cotton consumption, then it rolled out to cover all the product categories with cotton as raw material. With the support of business development team, the sustainable cotton team traced the final products back to suppliers of fabric, yarns and cotton. The deputy sustainability manager of IKEA China and former sustainable cotton manager, Helen Fu, paid visits to all the major production sites. The mapping helped the sustainable cotton team to understand the original sources of cotton and identify some big cotton farming companies or ginners. The team also obtained the details of their cotton requirements in terms of both quality and quantity.

Their study found that in 2011, around half of the cotton sourced in China was mainly from traditional cotton production regions like Xinjiang, Shandong and Hubei provinces. Another half of the cotton was sourced from overseas markets such as the United States, Australia and Brazil. Along with the supply chain

mapping exercise, IKEA China also worked internally and externally to create awareness on the sustainable cotton initiative.

6.2.2.2 Awareness building

In IKEA, different business teams are looking for certain product categories. The sustainability team needs to collaborate with various business development teams. As Kevin Liu said previously, the business development team quickly achieved alignment with the sustainable cotton team, and made sure that they gave a consistent message to suppliers.

Awareness building has been carried out with Tier 1 supplier and extreme upstream suppliers (Tier 5 ginner and Tier 6 cotton farms). IKEA China organized various activities to help suppliers understand and be able to purchase sustainable cotton. Phil An, Purchasing manager of Nantai Textile, said,

> *"IKEA first introduced their target and told us about sustainable cotton, it should be that time they have set some key time node (milestone), to be what percentage at what time, when is the deadline for 100%. We feel difficult at that time, because no one in China have done this, at the same time we are not familiar with cotton…not enough resources in China. IKEA then organized several events, they invited the suppliers in Indian and Pakistan, and introduced some big international cotton traders…through IKEA we get in touch with these companies."*

Through its supply chain mapping exercise, IKEA China has been able to find out several big cotton farms and big ginners that have influence on the cotton farms. With its existing network and through the introduction of its suppliers, IKEA identified three cotton farms in 2011 to initiate the sustainable cotton

farming in Xinjiang province. Solidaridad, a NGO was funded by BCFTP and engaged to help implement the sustainable cotton practices with the BCI criteria.

In order to create more capacity, Tony Dai also tried to develop more resources. He intended to find cotton farms in other regions as an insurance against natural disasters. The potential cotton farms should be of a large scale and be efficient. After contacted several cotton farms, he found it was very difficult to persuade the cotton farm managers. One main reason was due to the Chinese government cotton reserve policy, through which the government purchased cotton at a high price so that cotton farmers don't need to worry about the turbulent market conditions. The other reason was that cotton produced under IKEA sustainable standards (adopted from BCI standards) could not be sold at a premium according to IKEA's strategy. Tony Dai said,

> *"With the serve policy it was very difficult for us to approach the farmers. They think our project is very good, but what benefits can they get? They cannot see it immediately. After they achieve the standards, buyers won't buy the cotton with a price higher than the government guidance price."*

6.2.2 Operating stage

After supply chain mapping and awareness building, IKEA China's sustainable development team mainly worked on 'create capacity'. This refers to working with the final end of the cotton-textile supply chain to create enough cotton sources for consumption. IKEA China itself developed several cotton farms, it then worked with BCI China, and at the same time IKEA China linked the sources with its Tier 1 suppliers.

6.2.2.1 Working directly with ginners and cotton farmers

By way of introduction through its suppliers, Tony Dai finally persuaded a cotton ginner named Yinzhou Cotton in Songzi Town, Hubei province in early 2012. Xiaolei, the general manager of the national owned farm also runs a ginner factory. Xiaolei is described by Tony Dai as an open minded person who cares about sustainability and has a long term view, while believing that the government policy was a temporary solution and would not last long.

Tony Dai talked about the project to Xiaolei and shared the standards and principles with him. Although both Helen Fu and Tony Dai are not agriculture experts, they believe that the principles are applicable and could make changes to cotton farming. Helen Fu said,

> *"We could only say we promote the better cotton principles as the farmers have grown cotton for decades, they have more knowledge than us. They may just need to change their mind-set on some principles like how to save water, use less fertilizer and pesticides, and how to apply more biological preventions."*

6.2.2.2 Working with BCI China

In May 2012, the BCI Representative Office was registered in Shanghai to promote better cotton practices in China. Tony Dai encouraged the IKEA sustainable cotton farms to apply for BCI's certification. With more than 40 world famous brands, BCI platform is more attractive for these cotton farms. BCI is also easier to develop BCI cotton farms in China than IKEA.

BCI China has helped IKEA sustainable cotton farms to set up the organization structure which is a better way to promote better cotton knowledge, Figure 6-4

provide an example. Normally BCI China works with an implementation partner, in this case, Huitong Textile, who look after a production units, the production unit is named Nongxi cooperative. A production unit could be further divided into smaller units with each having several study groups. BCI invites experts to provide training to production units' managers, and these managers then pass the training to smaller production units or agronomists, with smaller production unit managers or agriculture technicians providing training to study group members.

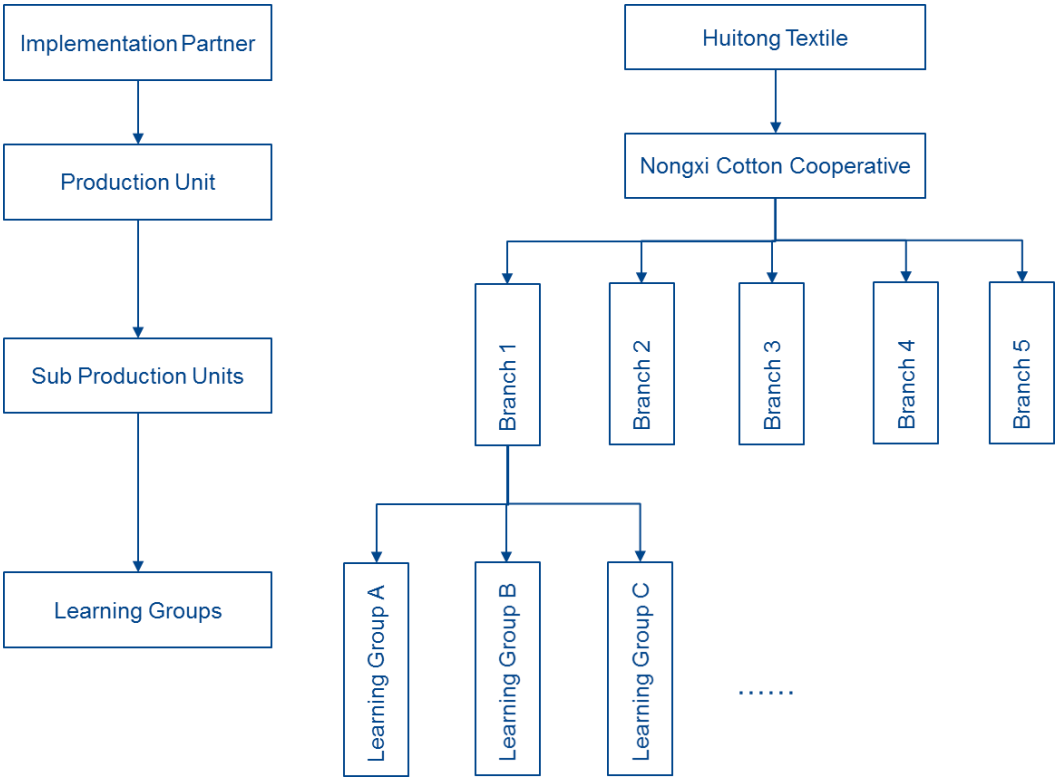


Figure 6-4 An example of the supply chain learning structure coordinated by BCI

(Source: Compiled based on interviews)

In 2014, in order to meet BCI China's farm land requirement, Xiaolei persuaded the local government and the region as a whole to apply better cotton certification standards. The training provided was in the structured manner as

outlined above and paper materials were also distributed to cotton farmers. Each of them received a field manual with the BCI information on it which could be used for recording their farming activities. A supervisory team was also set up to check whether farmers had implement the activities as required.

6.2.2.3 Linking the resource with the Tier 1 and Tier 2 suppliers

IKEA tried to link the raw material suppliers with its Tier 1 and Tier 2 suppliers. In the middle of 2013, Helen Fu led a team of people from Nantai and its suppliers to visit the sustainable cotton farms in Xinjiang province. The meaning of the field visit was twofold: to let the cotton farms meet with the final customers; and let suppliers gain an understanding of sustainable cotton farming and that Tier 1 suppliers' upstream suppliers may directly purchase from these farms.

Tier 1 suppliers met lots of difficulties in implementing the project at the beginning. One problem is the quality issue. A cotton purchasing manager at Yuyue, Tier 1 supplier with an integrated supply chain covering to ginning, said,

> *"It is definitely difficult at the beginning, because you have a small choice, the majority of sources are based in Africa and Indian. The better cotton quality have a serious problem in mixing fibres, but all the IKEA products have very strict requirements on mixed fibre…we have added lots of aiding machines to detect."*

Another problem is the related management issue. Sustainable cotton needs to be stocked separately with the traditional cotton and have a longer stock period than conventional cotton. For spinners, this adds more recording work than before in order to track any production problems. These management issues all add cost to the final end product, IKEA Tier 1 suppliers have to consider the sustainable issues, cost issues and quality issues simultaneously.

6.2.2.4 Linking the resource with middle tier suppliers

After Tier 1, 2 suppliers got the information, they passed on the requirements to upstream suppliers. Some of them even purchased the sustainable cotton on behalf of their suppliers. Take Nantai for example, Phil An purchased 100 tonnes of lint cotton from Indian for spinners to trial in early 2013, this was a way to show IKEA that it was working on the project and a chance to test the cotton quality from the new channel.

After the establishment of the BCI office in China, the BCI annual conference has also became a channel for suppliers to be familiar with Better Cotton. The middle tier suppliers are recommended to take part in the conference, some of them even joined the BCI membership with a membership fee according to their scale. This helped these companies be able to join a wider network and gain more business opportunities. The conference also worked as a bridge for middle tier suppliers to get the chance to meet with IKEA and other international brands directly.

6.2.3 Sustaining stage

After achieving 100% sourcing from more sustainable resources in September 2014, IKEA China started piloting the traceability projects with some suppliers. These require the suppliers not only to purchase more sustainable cotton but to truly apply the sources in the products. BCI monitors the input and output of the better cotton quantity, but do not require suppliers apply the real better cotton in their products. Debate still remains as to whether there is a need to track sustainable cotton has truly applied in the products. As a founding member of BCI, IKEA promised to continue developing new cotton farms according to BCI standards. BCI is responsible to provide trainings to these new

cotton farms. Tier 1 suppliers are also supposed to take the responsibility to verify their sourcing channels and need to make sure they fill the sustainability standards.

6.2.4 Summary of supply chain learning in sustainable cotton initiative

Table 6-1 makes a summary of the supply chain learning in the three stages.

Learning stages	Learning task	Learning activities	Learning outcome
Set up stage (2011)	Inspire Tier 1 suppliers; Looking for Tier 5, Tier 6 partners;	Visits Tier 1 supplier with large cotton assumption; Map the supply chain to the cotton field level; Provide training and workshop with Tier 1, even Tier 2 suppliers; Communicate with Tier 5, Tier 6 suppliers.	Suppliers well received the message and engage in the practice; Found several cotton suppliers which willing to participate the project.
Operating stage (2012 - August 2014)	Create the cotton capacity; Link the raw material with Tier 1 suppliers.	Collaborate with BCI and provide trainings to cotton suppliers; BCI work as a platform to hold annual conference for middle tier suppliers; Teach the suppliers to verify the sourcing channel;	Developed enough cotton capacity;
Sustaining stage (September 2014 - 2016)	Sustaining the efforts.	Continuous collaboration with BCI; Look for new cotton farms; Pilot projects on cotton tracking and traceability.	Gradually shift the workload to Tier 1 suppliers and BCI; Continuous development.

Table 6-1 IKEA's supply chain learning stages

6.3 Supply chain leadership in IKEA's sustainable cotton project

IKEA exhibit different leadership styles on different levels of suppliers in the

sustainable cotton project. This section presents the changing leadership styles in the three supply chain learning stages.

6.3.1 Supply chain leadership at the set up stage

IKEA mainly applied a transformational leadership style at this stage on both Tier 1 suppliers and extreme upstream suppliers. The sustainable team inspires ginners such as Xiaolei at Yinzhou cotton the sustainable practices to engage in the sustainable activities. This section mainly focuses on IKEA's leadership styles on Tier 1 suppliers.

Although the sustainable cotton manager has more knowledge on the cotton perspectives than the business development team, it is clear that business development teams have bigger impacts on IKEA's Tier 1 suppliers. IKEA China adopt a business leading approach to engage suppliers in the initiative. Kevin Liu commented,

> *"I think that IKEA is comparable to other brands, but one of the big differences is that our sustainable development is being led by the business development team. Some companies' business development teams only care about business and purchasing products and nothing about sustainable development. The sustainable initiatives are only driven by sustainable development department … I am quite surprised about this, then I ask their sustainable development team how can they drive the business with no voice on whether the suppliers are good or bad, no understanding of their situations and tell them how to do this, how to do that … they lack the motivation, lack of why and what, which is driven by the business."*

The business development team adopted a top down approach to promote the

initiative among suppliers through transformational leadership of inspiration. Kevin Liu said,

"We approached at least the suppliers' president or general manager level, and we could sit down and have a deep discussion on the topic, including what is the meaning of this strategy for IKEA and for the suppliers … suppliers soon realize it is a win-win situation, because if IKEA wants to be a global sustainable cotton retailer and a leading brand, then if the suppliers achieve the agreement and together we work on it, in fact the supplier become a leading company in China or even globally. It is not just about little economic profit, but it brings more value to the company brand and core competitiveness."

"IKEA's many principles, standards and methods are more advanced and ahead than many other brands, or more holistic and comprehensive, so once the suppliers achieved alignment in the ideas and strategies, IKEA will be guiding these suppliers heading towards industry leadership in terms of sustainable development and social responsibility. They will be leaders in their industry and gain first mover advantage."

"It may not be clear at the beginning, but more obvious afterwards. For example, we may share the supplier with other brands, and when they almost finish, other brands may come and ask whether they have the channels? They soon realize, that IKEA is really advanced, they have almost done or done by half, others just start to ask the possibility. Soon the suppliers could turn the advantage into two aspects – one is the long term competitive advantage as a green company in terms of survive and develop and the other one it has first mover advantages … So it may have difficulty at the beginning, but if we make a little effort, it would be more

smooth and smooth."

This communication has been well received by the suppliers. Beginning in 1997, Nantai Textile is one of the earliest of IKEA's suppliers in China, IKEA accounts approximately 90% of Nantai's sales revenue. Phil An said,

"We have cooperated with IKEA for a long time, so we actively respond to any calls or initiatives from IKEA. Because the better you do, the early you do, the fast you do, you could definitely gain more opportunities and grow. While we also know that IKEA is a world leading company in environment and social aspects, our CEO is also quite agree with the philosophies…So for us, we are definitely willing to take part no matter from a business development perspective or a social responsibility perspective."

Another supplier Dongrong Textile expressed similar points. The purchasing manager Mr. Yuan said,

"Firstly we have cooperated with IKEA for more than ten years, secondly we have employees between 8,000 to 9,000, we need such project to support our business, so when IKEA told us about this project we think it is feasible, and as a Top 500 Shanghai private company we need to take the corresponding responsibility, so we eagerly take part."

The sustainable cotton team also explained to the suppliers that the targets are achievable through continuous communication. Tony Dai said,

"We emphasis on communication at the first beginning and we did lots of detailed analysis with the suppliers with some trainings on what is the whole project, our target and the steps. We do it slowly as you can't explain clearly

by just once… We have also invited Tier 2 suppliers, because in the end its them to implement."

In the awareness building, the business development team also made sure that the strategy had a strong link with the suppliers' business, especially for the suppliers with cotton as the main raw material. The practice suggest that IKEA exhibits a transactional leadership style of contingent reward which is also applied in the operating stage. Kevin Liu said,

"From the business development perspective, we link all the aspects with what we call a supplier positioning, so we make sure that the sustainable development capacity it is not just a statement or it doesn't matter if you do not do it. We create a strong link with the suppliers' development and business, so the suppliers would realize better do it early than late unless they do not want the business, do not want to develop with IKEA."

"We highlight it at the very beginning, to suppliers which have the sustainable cotton platform and channel and are doing their best, such that we could give priority for product development. If you left behind, you won't have the chance to develop new cotton related products…we send a strong signal that sustainable development is our core focus."

6.3.2 Supply chain leadership at the operating stage

Supply chain leadership at the operating stage on Tier 1 suppliers

Besides IKEA's support of introducing international cotton traders and suppliers (Indian), IKEA's Tier 1 suppliers also made efforts responding to IKEA's transformational leadership of intellectual stimulation to be familiar with sustainable cotton themselves. Phil An said,

"In the end of 2013, together with our president, we went to Indian and wanted to have a look how IKEA worked in India. We visited some suppliers recommended by IKEA and also visited some suppliers through our own network."

Supply chain leadership at the operating stage on extreme upstream suppliers

Each of IKEA's sustainable cotton farm is also thinking about new ways to promote better cotton knowledge to the cotton farmers through intellectual stimulation. Xinjiang Luthai Fengshou Cotton Industry (Luthai) has its own TV station which broadcasts programs on Better Cotton to the farmers. Songzi Town has linked the Better Cotton training with a national training program, whenever the local agriculture department has training missions from the government they add Better Cotton in it. Better Cotton was also promoted in the local agriculture newspaper with a holistic introduction given at the beginning, followed by detailed requirements for the corresponding growing seasons. They have also spent lots of time on preparing for the training materials. Xiaolei said,

"To be honest, we think a lot on the training materials. With a few words we can quickly understand when we receive training. However we need to bear in mind when we provide training to the farmers, such as the videos and the cartoons we made, we need to make sure they are something that the farmers can easily understand just by seeing them."

IKEA also applied a transactional leadership style on extreme upstream suppliers in terms of both contingent reward and management-by-exception. Xiaolei recalls,

"In the second year IKEA compared our performance to the first year's… their method are once you made progress they recognize you, so we are more active with our work. At the same time they point out the problems, and you must make changes later… I quite admire IKEA's approach, it won't happen overnight to truly change an idea and carry it out… To change people's mind, I think it is a gradual process… firstly they recognize our progress and secondly point out the problems, so in the second year I am quite clear what should I do in order to achieve my target. If it is not good in the first year and not good again in the second year, then we can only give up. Without cooperating with IKEA we could still sell cotton. Cooperation with IKEA just means I have another sales platform."

IKEA China hired external partners such as SGS to verify the sustainable cotton farming activities. Yinzhou cotton, together with the farms in Xinjiang, were first recognized as IKEA's sustainable cotton producers (recognized as cotton working towards the BCI standards) with their names included in the preferred cotton sourcing list by IKEA. Later on, IKEA encourage the IKEA sustainable cotton farms to apply BCI standards. By the end of 2015, all the IKEA sustainable cotton farms had been awarded the Better Cotton certificate.

Supply chain leadership at the operating stage on middle tier suppliers

The development of the cotton farms in China, the oversea IKEA sustainable cotton sources and BCI cotton has made sure that suppliers have somewhere to purchase the raw materials. Along with the development of BCI China, IKEA's suppliers have more choices for ginner and spinner suppliers.

IKEA China signed contracts with the Tier 1 suppliers and required them to purchase the products made from sustainable cotton sources. It also signed agreements with the sustainable cotton farms to grow cotton according to

IKEA's requirements. Tier 1 suppliers then passed on the requirements to their sub suppliers also in the contracts which reflected the transactional leadership of management by exception. Mr. Yuan said,

> *"IKEA provides training to us every year. They let us know the requirements and we then pass these requirements to our suppliers…we first make constraints in the contract and make it clear that IKEA's fabric need to use IKEA recognized sustainable cotton."*

IKEA mainly applied a transactional leadership style of management by exception on these middle tier suppliers. Kevin Liu said,

> *"If the sub suppliers originally not work on sustainable cotton, they have no channels, even after our supplier have communicated with them, they showed no interest or can't understand, then these companies actually be eliminated. Because for the sub tier suppliers, we don't have much time to work with them one by one as Tier 1 suppliers. So basically it is very simple, you can't understand and do not want to do it then you out of game…we have many resources ourselves and even more with BCI…these resources may already BCI members or have worked on it for some years, they are mature enough. So if you are an upstream supplier and do not do it, then many others will fight to do it."*

Although IKEA China does not want to force Tier 1 suppliers to make changes to their existing cotton-textile supply chain, sustainable cotton initiatives do have an impact on the middle tier suppliers. Phil An said,

> *"This initiative actually is a shuffle to our supply chain, some suppliers cannot collaborate then they drop off. Some of them cannot meet the target*

in a short time under IKEA's time requirements and so we cannot purchase from them anymore."

"If the suppliers can recognize the strategic target the same as our business, if they could collaborate, no matter what are their current quantity, we place more orders on them. Suppliers previously working with us may place less orders or without any orders; while the ones with less order may get more orders…we have a new supplier coming in, it is not because of its price is cheaper or it is quality, quality is worse than our current suppliers, but we are willing to give time for it to develop, this is because the opportunity of sustainable cotton initiative."

The initiative also has an impact on the previous middle tier suppliers. Those suppliers left behind started to join BCI membership and learn Better Cotton practices in order to get back to the supply chain network again.

6.3.3 Supply chain leadership at the sustaining stage

At this stage, IKEA achieved 100% sourcing cotton from more sustainable resources. Thus it mainly rely on its partners to sustaining the initiatives through shared leadership. After IKEA China linked the cotton sources with its final end, IKEA China monitored the implementation process in two ways – by checking BCI ODF (Output Declaration Forms), and followed through the contracts and invoices. For Better Cotton and Better Cotton members, BCI can provide the ODF which proves its origin while suppliers could then pass on the ODF with each tier across the supply chain. Whilst for IKEA sustainable sources, or companies that are not BCI members, Tony Dai asked them to provide the related documents to check its reliability. Tier 1 suppliers gained this knowledge and could make the check themselves. For the extreme upstream suppliers, all

the IKEA recognized sustainable cotton farms were joined BCI, thus BCI would monitor and further develop these cotton farms on behalf of IKEA.

6.3.4 Summary of IKEA's supply chain leadership

Tables 6-2 and 6-3 summarises IKEA's leadership styles on Tier 1 suppliers and the extreme upstream suppliers. Bases on the discussion and the supporting statements in the tables, it can be found that for Tier 1 suppliers, IKEA applied both transformational leadership reflected by inspirational and transactional leadership of contingent reward and management by exception at the set up stage. It mainly applied transformational of intellectual stimulation at the operating stage to encourage Tier 1 suppliers quickly gain the sustainable cotton capacity. Finally, it delegate the supply chain leadership in the sustaining stage to let Tier 1 suppliers to responsible for their sustainable cotton sources.

For middle tier suppliers, the discussion in 6.3.2 suggest that IKEA mainly applied a transactional leadership of both contingent reward and management by exception on them through Tier 1 and 2 suppliers at the operating stage. These middle tier suppliers were at a fragile position, they have to compliance with IKEA's initiative, otherwise they may substitute by other middle tier suppliers.

For extreme upstream suppliers, IKEA mainly applied a transformational leadership of inspirational at the set up stage. IKEA then applied both transformational leadership of intellectual stimulation and transactional leadership of contingent reward and management by exception on them at the operating stage. Finally, IKEA applies transformational leadership of inspirational on new ginners and cotton farms suppliers.

6.4 Multi-tier supply chain management in IKEA's sustainable cotton project

The above discussions suggest that IKEA applied a direct approach governance mechanism on Tier 1, 2 and extreme upstream in the initiatives. At the set up stage, to disseminate the awareness, IKEA reached out to Tier 2 suppliers through Tier 1 suppliers' invitation. It also reached out to extreme upstream suppliers and trying to persuade them to join the initiative.

At the operating stage, IKEA continued to reach out to Tier 2 suppliers and built close collaboration with extreme upstream ginner and cotton farm suppliers. IKEA also engaged with BCI who serve as a knowledge provider to organize and provide trainings to cotton farmers, it also served as a platform to link all the suppliers in the long and complex cotton textile supply chain. At the sustaining stage, IKEA still apply a direct and work with BCI approach on the extreme and upstream suppliers. However, it could rely on Tier 1 suppliers to verify the sustainable cotton sources and don't need to work with Tier 2 suppliers. Figure 6-5 makes a summary of the multi-tier supply chain structure in the three learning stages.

Phil An, Purchasing manager of Nantai Textile, made a good summary on IKEA China's approach for driving a sustainable cotton-textile supply chain,

> *"I think IKEA actually managed the two ends, one is like me as IKEA's direct supplier, they need me to push the sub suppliers, but I am too far away to the final end…they also act as BCI to managed the cotton field…so they managed the two ends, when the two ends link together, then the project is smooth."*

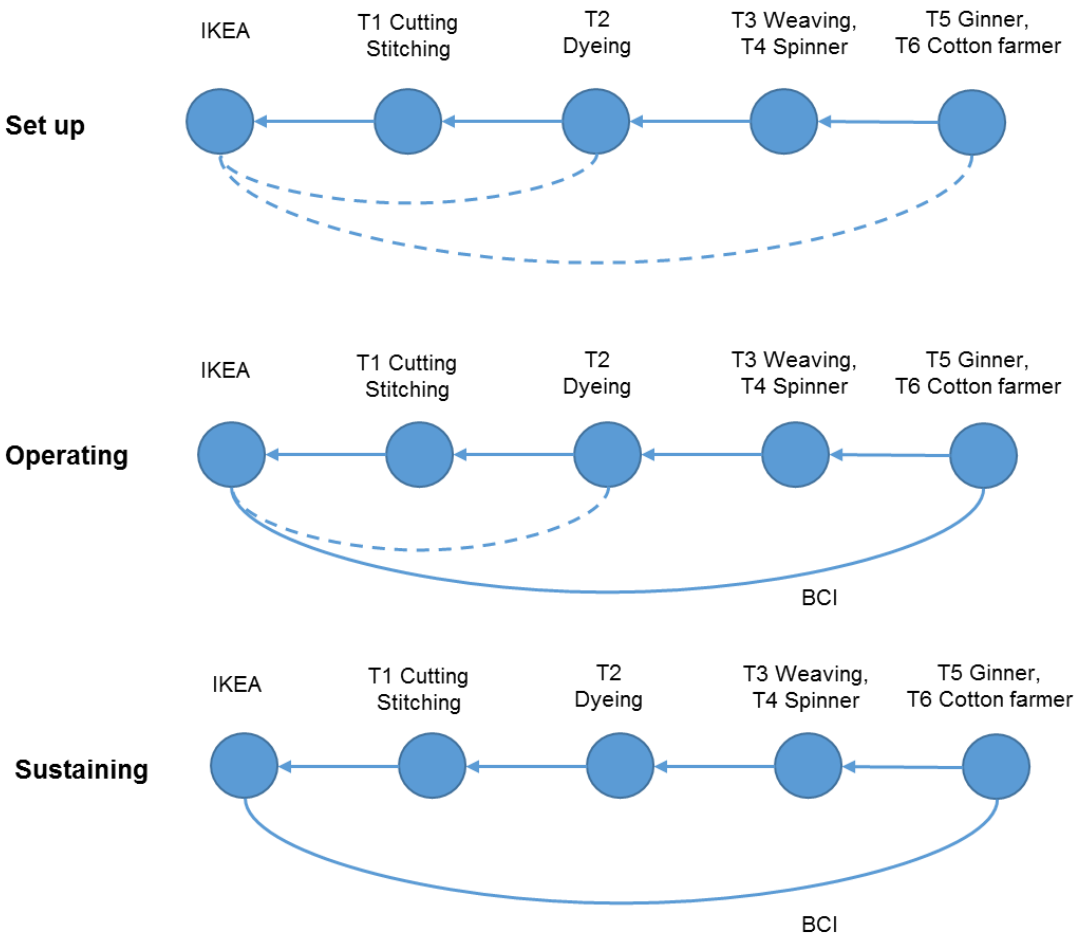


Figure 6-5 IKEA's multi-tier supply chain structures in implementing sustainable cotton initiative

6.5 Case summary

IKEA China played a supply chain leadership role in transforming its cotton-textile supply chain. It has worked closely with its Tier 1 suppliers and the cotton farms or ginners. Through both a transformational and transactional leadership style, in only three years it achieved purchasing 100% of its cotton from more sustainable sources.

		Supply chain learning stages		
		Set up	**Operating**	**Sustaining**
Transformational leadership	**Inspirational**	"Because business development team is leading the development and business of the suppliers ... so for us the biggest task is how to align IKEA's strategy and vision with the suppliers, that is what the most important." "We approached at least the suppliers' president or general manager level, and we could sit down and have a deep discussion on the topic, including what is the meaning of this strategy for IKEA and for the suppliers … suppliers soon realize it is a win-win situation, because if IKEA wants to be a global sustainable cotton retailer and a leading brand, then if the suppliers achieve the agreement and together we work on it, in fact the supplier become a leading company in China or even globally. It is not just about little economic profit, but it brings more value to the company brand and core competitiveness." --- Kevin Liu, Business Development Manager of IKEA Home Textile Products "Firstly we have cooperated with IKEA for more than		Tier 1 suppliers suppose to take the responsibility to sourcing from more sustainable cotton sources.

		ten years, secondly we have employees between 8,000 to 9,000, we need such project to support our business, so when IKEA told us about this project we think it is feasible, and as a Top 500 Shanghai private company we need to take the corresponding responsibility, so we eagerly take part." --- Mr. Yuan, Purchasing Manager of Dongrong Textile "IKEA first introduced their target and told us about sustainable cotton, it should be that time they have set some key time node (milestone), to be what percentage at what time, when is the deadline for 100%." --- Phil An, Purchasing Manager of Nantai Textile		
	Intellectual Stimulation		"In the end of 2013, together with our president, we went to Indian and wanted to have a look how IKEA worked in India. We have visited some suppliers recommended by IKEA and also visited some suppliers through our own network." --- Phil An, Purchasing Manager of Nantai Textile	

Transactional leadership	**Contingent Reward**	"From the business development perspective, we link all the aspects with what we call a supplier positioning, so we make sure that the sustainable development capacity it is not just a statement or it doesn't matter if you do not do it. We create a strong link with the suppliers' development and business, so the suppliers would realize better do it early than late unless they do not want the business, do not want to develop with IKEA." "We highlight it at the very beginning, to suppliers which have the sustainable cotton platform and channel and are doing their best, such that we could give priority for product development. If you left behind, you won't have the chance to develop new cotton related products … we send a strong signal that sustainable development is our core focus." --- Kevin Liu, Business Development Manager of IKEA Home Textile Products "We have cooperated with IKEA for a long time, so we actively respond to any calls or initiatives from IKEA. Because the better you do, the early you do, the fast you do, you could definitely gain more opportunities and grow. While we also know that IKEA is a world leading company in environment and social aspects, our CEO is also quite agree with the philosophies…So for us, we are definitely willing to take part no matter from a business development perspective or a social responsibility perspective." --- Phil An, Purchasing Manager of Nantai Textile	
	Management-by-Exception	"IKEA provides training to us every year. They let us know the requirements and we then pass these requirements to our suppliers…we first make constraints in the contract and make it clear that IKEA's fabric need to use IKEA recognized sustainable cotton." --- Mr. Yuan, Purchasing Manager of Dongrong Textile	

Table 6-2 IKEA's leadership on Tier 1 suppliers

		Supply chain learning stages		
		Set up	**Operating**	**Sustaining**
Transformational leadership	**Inspirational**	"We could only say we promote the better cotton principles as the farmers have grown cotton for decades, they have more knowledge than us. They may just need to change their mind-set on some principles like how to save water, use less fertilizer and pesticides, and how to apply more biological preventions." --- Helen Fu, Deputy sustainable manager of IKEA China		Inspire new ginner or cotton farms to join the sustainable cotton initiative.
	Intellectual Stimulation		"To be honest, we think a lot on the training materials. With a few words we can quickly understand when we receive training. However we need to bear in mind when we provide training to the farmers, such as the videos and the cartoons we made, we need to make sure they are something that the farmers can easily understand just by seeing them." --- Lei Xiao, General Manager of Yinzhou Cotton	

Transactional leadership	**Contingent Reward**		"Before it was normal farming, but after (Tony Dai) told us about the principles, we shared them with the farmers. In the second year IKEA compared our performance to the first year's… their method are once you made progress they recognize you, so we are more active with our work. At the same time they point out the problems, and you must make changes later… I quite admire IKEA's approach, it won't happen overnight to truly change an idea and carry it out… To change people's mind, I think it is a gradual process… firstly they recognize our progress and secondly point out the problems, so in the second year I am quite clear what should I do in order to achieve my target. If it is not good in the first year and not good again in the second year, then we can only give up. Without cooperating with IKEA we could still sell cotton. Cooperation with IKEA just means I have another sales platform." --- Lei Xiao, General Manager of Yinzhou Cotton	
	Management-by-exception			

Table 6-3 IKEA's leadership on extreme upstream suppliers

Chapter 7 Cross case analysis and discussion

This chapter presents the cross case analysis of the three cases and a discussion of the findings from both within and cross case analyses against existing literature. The similarities and differences of the three cases are discussed along the three themes: supply chain learning (Section 7.1), supply chain leadership (Section 7.2) and multi-tier SSCM (Section 7.3). Section 7.4 discusses the relationships between the constructs and applies resource orchestration theory (ROT) to tie the aforementioned constructs together. A number of propositions are developed along with these discussions. Finally, section 7.5 propose the revised theoretical framework to summarize this chapter.

7.1 Supply chain learning

The analysis of supply chain learning is discussed under two constructs of supply chain learning processes in Section 7.1.1 and supply chain learning content in Section 7.1.2.

7.1.1 Supply chain learning process

Bessant *et al.* (2003) propose that there are three distinct stages in supply chain learning: a set-up phase, an operating phase and a sustaining phase. In this research, similar to Bessant *et al*. (2003), the three case companies also generally followed the three stages.

It is found in this study that the ***set up*** stage mainly includes two activities of supply chain mapping and awareness building: supply chain mapping is to gain knowledge of the supply chain, scan the supply market and identify the potential partners, which may or may not be in the existing supply chain; awareness building aims to inspire suppliers and supply chain partners to 'buy-in', engage and make commitment to the sustainability initiative and also includes activities on supplier/partner selection. The ***operating*** stage focuses on supplier capacity building which refers to all kinds of support (financial, facility and expertise) provided by focal companies to multi-tier suppliers to create sustainability capacity. Finally the ***sustaining*** stage focuses on capacity sustaining and emphasizes the mechanisms to achieve long-term adoption of sustainable

initiatives. Table 7-1 makes a comparison of the three learning stages of the three focal companies.

Learning stages	Tetra Pak	Nestlé	IKEA
Set up stage	- Detail survey/study of the end of life of UBCs in China; - Identify potential recyclers. - Inspire potential recyclers to engage in the recycling business and select the suitable recyclers;	- Detail survey on dairy farmers' willingness, capacity and needs for upgrading; - Explain the dairy industry trends and government policy to dairy farmers on upgrading; - Identify and select potential DFI partners to collaborate.	- Pilot supply chain mapping with suppliers which consume large amount of cotton, map to cotton field level; - Roll out the supply chain mapping to other suppliers with cotton as raw material; - Identify big cotton farms or ginners which have influence on cotton farms. - Approach Tier 5 ginner or Tier 6 cotton farms to take part in sustainable cotton practices; - Business development team take the lead and inspire Tier 1 general managers or CEOs to participate in sustainable cotton initiative; - Training and workshops with Tier 1, 2 suppliers on the sustainable cotton practice; - Sustainable cotton team lead Tier 1, 2 suppliers to visit Tier 6 cotton farms.
Operating stage	- Facility support (recycle technology transfer), factory waste support to help recyclers start business; - Collaborate with external partners on recycling technology to enhance the recycle value; - Collaborate with collection company and provide trainings to collectors; - Marketing campaigns to raise consumer awareness.	- Provide all kinds of support to dairy farmers to facilitate upgrading, including price differentiation, financial loans, facility support, liaising with government on land and electricity; - Continue with traditional training modes on group learning, quarterly and annually conference and external government trainings; - Collaborate with partners to set up Dairy Farming Institute (DFI) both as demonstrating farms and an institute for modern dairy farming training.	- Before BCI entered China in 2012, collaborated with other third parties implement IKEA's standards on pilot cotton farms; - Collaborate with BCI after 2012 and gain sufficient Better Cotton supply; - Provide preferred sourcing list (the certified IKEA sustainable sources and BCI channel) to middle tier suppliers.

Sustaining stage	- Apply policy approach to facilitate government on recycle household waste - Plan to provide support base on recyclers' development plans. - Rely on recyclers to create stronger collection network.	- Continue with strict quality rules and checks; - Continuous training of previous various forms; - Rely on DFI partners to provide training on modern dairy farming.	- Achieved 100% sourcing from more sustainable cotton in August, 2014 in China; - Delegate the responsibility to Tier 1 suppliers; - Start pilot projects on sustainable cotton tracking project.

Table 7-1 Supply chain learning stages of the three case companies

7.1.2 Supply chain learning content

Bessant *et al.* (2003) suggest that the learning content in a supply chain can be simple or complex, whilst Tachizawa and Wong (2014) suggest that focal companies' knowledge resource is an important factor for implementing multi-tier SSCM.

Following this, Table 7-2 summarizes the learning content in terms of focal companies' knowledge resources and supplier learning complexity. The table suggests that the focal companies may have different levels of knowledge resources in promoting sustainability initiatives in the multi-tier supply chain. For instance, Tetra Pak and IKEA have certain levels of knowledge resources that both companies have implemented similar sustainability projects in other countries, while Nestlé have less knowledge resources in that it does not have the needed expertise to provide modern dairy farming training for medium and large farms.

Suppliers have different knowledge content to learn and the learning complexity differs for the first tier, middle tier and extreme upstream suppliers. For instance, in Tetra Pak's recycling chain, collection companies, collectors and consumers only need to learn waste classification knowledge which has a low complexity while recyclers need to learn and develop recycling technology which has a high complexity. Both constructs (focal company knowledge resources and supplier learning complexity) are measured by three levels of low, medium and high. The table also provide an exception that in Nestlé's dairy supply chain, Nestlé had

little knowledge on modern dairy farming and had to orchestrate on breadth to engage DFI partners in the dairy farming upgrading initiative. These DFI partners (Tier 2 suppliers and external academic partners) need to learn to collaborate with each other and localise their technology to suit for Chinese conditions, however they have also brought in modern dairy farming technologies and served as knowledge providers (Capó-Vicedo *et al.*, 2011; Tachizawa and Wong, 2014) (organizations which bring in the needed knowledge resource to the supply chain network).

Along with the learning process, the within case analysis suggests that the focal companies' knowledge resources tend to be accumulated over the learning process and peaked at the sustaining stage since they gained the knowledge over time. On the other hand, the learning complexity for suppliers tend to be reduced since they gradually acquired the needed knowledge resources. For instance, IKEA's Tier 1 suppliers found it difficult to implement the sustainable cotton project in the set up stage because they have never heard of the project and didn't have much knowledge on the raw material. These Tier 1 suppliers gradually gained the knowledge and experience at the operating stage and were expected to take responsibility for the purchase of sustainable raw materials by their suppliers at the sustaining stage. Base on the discussion, this research propose that:

> ***Proposition 1a****: Focal companies' knowledge resources tend to accumulate over time and peak at the sustaining stage while learning complexity of multi-tier suppliers reduces over time due to the learning efforts put in by the suppliers and support provided by focal companies.*

	Focal company knowledge resources	**Supplier learning complexity**			
Tetra Pak's recycling chain	**High:** Internal expertise, have the knowledge of recycling market; global recycle experience with headquarter	**T1 Recyclers** **High:** Learn or develop recycling technologies and supply chain management, work with new suppliers	**T2 Collection company** **Low:** Sorting and waste classification knowledge (UBCs can be collected and recycled by recyclers);	**T3 Collectors** **Low:** Sorting and waste classification knowledge (UBCs can be collected and sold to collection	**T4 Consumers** **Low:** Sorting and waste classification knowledge (UBCs can be recycled)

	support;	(collection companies) and new customers (plastic and aluminum customers)		company)	
Nestlé's dairy supply chain	**Low:** Not specialized in providing modern dairy farming trainings to medium and large farms;	**T1 Dairy farms** **High:** Learn and implement modern dairy farming ;	**T2 DFI partners** **High:** Learn to collaborate with other DFI partners; localize their global technology/knowledge to China; also serve as knowledge provide that they own modern dairy farming training knowledge.		
IKEA's cotton-textile supply chain	**Medium:** foundation members of BCI; not specialized in cotton farming; have general supply chain knowledge on its cotton-textile supply chain; other countries have existing practices.	**T1 Cutting and stitching** **Medium:** Learn the sustainable cotton project and the way of working with multi-tier suppliers to implementing the project.	**T2-T4 Middle tier suppliers** **Low:** Learned to comply with IKEA's requirements on sustainable cotton.	**T5 Ginners, T6 Cotton farmer** **High:** Cotton farmers learn to implement the sustainable cotton standards on the fields and ginners learn to apply the sorting and storage requirements.	

Table 7-2 Focal company knowledge resources and supplier learning complexity

This research also found that the three stages of supply chain learning process (set up, operating and sustaining) can be considered three stages of sustainable project lifecycle using resource orchestration theory term (e.g. project lifecycle).

> ***Proposition 1b****: The sustainable project lifecycle is aligned with the supply chain learning stages of set up, operating and sustaining.*

7.2 Supply chain leadership

Defee *et al.* (2009a) summarize that supply chain leaders can be distinguished based upon their behaviours engaging with suppliers into either transformational or transactional leadership. Transformational leaders exhibit three types of behaviours consistently: inspiration, intellectual stimulation and individualized consideration; while transactional leaders exhibit two behaviours – contingent rewards and management-by-exception.

Based on the operationalised constructs presented in Chapter 3, the leadership styles of three case companies are examined along the multi-tier supply chain. The findings suggest that all the three companies applied mainly a transformational leadership on Tier 1 and extreme upstream suppliers and generally applied a transactional leadership on middle tier suppliers.

7.2.1 Transformational and transactional leadership on Tier 1 suppliers

The within case chapters presented evidence on the leadership styles in which the three companies have applied on their Tier 1 suppliers with the supporting statements. Table 7-3 makes a comparison between the three companies according to the second order constructs (inspiration, intellectual stimulation, individualized consideration, contingent rewards and management-by-exception). It can be found that the three focal companies have primarily applied transformational leadership style but also applied transactional leadership style to a lesser extent on their Tier 1 suppliers. All three companies inspired their tier 1 suppliers to look further and transfer their sustainable goals to them. All three companies made an attempt to change their Tier 1 suppliers' mind-set, to challenge them with the existing conditions or seeking the contributions from their Tier 1 suppliers (intellectual stimulation). The three companies also provided financial/facility/expertise support to individual Tier 1 suppliers according to their individual needs.

Besides the transformational leadership style, all three companies also exhibited the transactional leadership styles. All three companies clarified the rewards to their Tier 1 suppliers in advance and provided assistance in exchange for their cooperation. They also recognize and reward the suppliers on their achievements. All three companies exhibited the 'management-by-exception' character, in that they tracked the suppliers' progress and pointed out the suppliers' mistakes.

Leadership styles		Tetra Pak - Recyclers	Nestlé - Dairy farmers	IKEA - Tier 1 suppliers
Transformational leadership	**Inspirational**	- Inspire recyclers to set up the recycling business; - Being an ethic/moral leader for recyclers; - Encourage recyclers to look further instead of focusing on short term goals; - Agree on collected recycle rate targets.	- Share with the dairy farmers the trend for upgrading; - Inspire dairy farmers to learn from exemplar dairy farmers to follow their success.	- Align sustainability mission with Tier 1 CEO or general managers; - Clear milestones and pathway to achieve sustainable cotton targets; - Being an ethic/moral leader for recyclers.
	Intellectual stimulation	- Take a holistic approach to create the recycle chain; - Enhance the value of the recycle chain by developing new technology; - Market approach together with policy approach for recycling; - Encourage recyclers think of new ways to collect and develop new technologies.	- Set up DFI to promote modern dairy farming knowledge; - Lead dairy farmers to pay visits to DFI during its construction and operation; - Lead dairy farmers to pay visits to other dairy farms; - Various modes to upgrade, for example 'cow hotels'.	- Introduce trading companies and foreign suppliers to Tier 1 suppliers; - Provide trainings and workshops to Tier 1 and Tier 2 suppliers; - Lead Tier 1 suppliers view the sustainable cotton farms/fields; - Tier 1 suppliers paid visits to foreign suppliers.
	Individualized consideration	- Provide tailored support to each recycler.	- Dedicated resource to follow the progress of each direct dairy farmers; - Make action plans together with the dairy farmers; - Various supports according to each dairy farmer's needs.	- Encourage vertical integrated Tier 1 suppliers move ahead of others.

Transactional leadership	**Contingent reward**	- Facility investment, discounted factory waste to seek recyclers' efforts; - Recognition of recyclers' achievement; - Lower factory waste price, more project support once recyclers meet recycle targets.	- Recognize the ones which move fast for upgrading; - Recognize the ones with good quality; - Support with capital, land, electricity, feedings; - Differentiate purchasing price to encourage upgrading.	- Align the sustainable cotton target with supplier positioning (prioritize cotton related product development; more orders if suppliers implement well and fast).
	Management-by-exception	- Third party audit the recycle amount	- Strict dairy purchasing requirements.	- Verify the sustainable cotton channels by ODF or contracts.

Table 7-3 A comparison between the three companies' leadership styles on their Tier 1 suppliers

7.2.2 Transformational and transactional leadership on extreme upstream suppliers

Table 7-4 makes a comparison on the three focal companies' leadership styles on their extreme upstream suppliers. Similar to what the three companies did to their Tier 1 suppliers, they mainly applied a transformational leadership style toward their extreme upstream suppliers but also applied transactional leadership in a lesser extent. Tetra Pak launched series of campaigns targeting the public (considered as extreme upstream supplier) in order to inspire consumers for environmental protection that UBCs can be recycled and transformed to useful materials for other products. Nestlé collaborated with DFI partners that share the same vision for sustaining China's dairy industry, it relies on the partners' strength and seek their contribution in helping the sustainable development of the industry. IKEA approached the Tier 5 ginners or Tier 6 cotton farmers either directly and/or through BCI. IKEA exhibited a transformational leadership on the Tier 5 ginners by inspiring them to think long term development and sustainability and relied on these organizations to influence the cotton farmers' activities.

Both Nestlé and IKEA also showed evidence of applying transactional leadership style on the extreme upstream suppliers. DFI partners got potential business opportunities by approaching Nestlé's dairy suppliers and it is beneficial for their reputation. IKEA recognized the cotton farmers' achievements and listed the sustainable cotton suppliers into its preferred sourcing list (contingent reward). Later, IKEA encouraged them to join BCI thus providing them a bigger platform to approach more brands. IKEA also pointed out the problems for these suppliers so as to encourage continuous improvement (management by exception). Overall, the three case companies mainly applied a transformation leadership style toward their extreme upstream suppliers.

Leadership styles		Tetra Pak - Consumers	Nestlé - DFI partners	IKEA- Tiers 5 & 6 Suppliers
Transformational leadership	**Inspirational**	- Tetra Pak inspire consumers that the UBCs are not waste but can be recycled and processed into marketable raw materials or products.	- Vision alignment for China's dairy industry's sustainable development; - Joint decision making for future collaborations.	- The vision of sustainable cotton farming; - Analysis the future cotton policy with the general managers.
	Intellectual stimulation	NA	- Lead DFI partners to visit Nestlé's milk districts to generate new ideas; - Think of new ways for future collaboration.	- Collaborate with third parties to implement the sustainable cotton practices; - The Tier 5 ginners design various promotional materials to educate cotton farmers; - The Tier 5 ginners think of ways of promoting sustainable cotton knowledge to cotton farmers, for example in local newspapers, TV stations, and align with government trainings.
	Individualized consideration	NA	- Design of training material and courses according to each partners' strengths.	NA
Transactional leadership	**Contingent reward**	NA	- Potential to approach Nestlé's dairy suppliers; - Collaborate with a world leading brand to quickly gain reputation.	- Recognize the cotton farmers' achievement. - List the suppliers in IKEA's preferred sourcing list; - Opportunity to join BCI platform to approach other big international buyers.
	Management-by-exception	NA	NA	- Point out the problems for continuous improvement.

Table 7-4 A comparison on the three companies' leadership styles on their extreme upstream suppliers

7.2.3 Transactional leadership on middle tier suppliers

Table 7-5 presents the focal companies' leadership styles on middle tier suppliers. As Nestlé don't have a middle tier suppliers, the table makes a comparison between Tetra Pak and IKEA.

Tetra Pak collaborated with certain collection companies, and mainly applied a contingent reward approach on the collection companies and collectors. It provided facility support to the collection companies in exchange for their efforts and provided training to collectors through the organization of the collection companies and rewarded the collectors for their achievements.

IKEA also applied a transactional leadership style toward middle tier suppliers. Some middle tier suppliers gained business opportunities because of having purchased from sustainable cotton sources, and others lost business because of the lack of sustainability capacity or lack of interest in participating sustainable cotton initiative. IKEA also pointed out the middle tier suppliers' mistakes by checking their sustainable cotton channels and whether they fulfilled IKEA's standards.

Interestingly, at the sustaining stages, both Tetra Pak and IKEA tend to rely on Tier 1 suppliers to influence and manage these middle tier suppliers. The two companies influenced the middle tier suppliers through Tier 1 suppliers' transactional leadership styles. Tetra Pak relied on recyclers to develop their own UBC collection network and IKEA delegated the responsibility of sustainable sourcing of cotton to Tier 1 suppliers. On the other hand, Nestle share the responsibility of providing modern dairy farming training with its DFI partners.

Leadership styles		Tetra Pak - middle tier suppliers	IKEA - middle tier suppliers
Transactional leadership	**Contingent reward**	- Facility support to collection companies; - Provide training to collectors at operating stage; - Recognize the achievement of collectors.	- Gain business opportunity with sustainable cotton channels; - Lose business if suppliers cannot source sustainable cotton within a given time/ no interest to participate the sustainable cotton initiative; - Provide training to some Tier 2 suppliers in exchange of their efforts.
	Management by exception	NA	- Verify the sustainable cotton channels by ODF or contracts.

Table 7-5 Transactional leadership on middle tier suppliers for Tetra Pak and IKEA

7.3.4 Summary of supply chain leadership

By adopting Defee *et al.'s* (2009a) conceptual framework building on traditional individual leadership theories (Burns, 1978; Bass, 1985, 1990, 1999; Avolio *et al.*, 1999), this research applies the concepts of transformational leadership and transactional leadership styles to examine focal companies' influence on suppliers in implementing the multi-tier sustainable initiatives.

The three cases suggest that proactive focal companies played a leadership role in implementing sustainability initiatives covering multiple tiers of the whole chain. Overall they applied a transformational leadership style to the whole chain, however different leadership styles are applied to different tiers of

suppliers. Furthermore, the within case chapters also suggest that focal companies applied different elements (secondary constructs) of transformational leadership on lower-tier suppliers, such as they mainly applied inspiration in the set up stage, combined of inspiration, intellectual stimulation and individual consideration at the operating and sustaining stage, and delegating the leadership to suppliers or third parties in the sustaining stage. Based on the within and cross case analyses, this research proposed that:

> ***Proposition 2a****: Focal companies tend to apply different leadership styles on different tiers of suppliers in multi-tier SSCM, with a mainly transformational leadership style on Tier 1 and extreme upstream suppliers and a transactional leadership style on middle tier suppliers.*
>
> ***Proposition 2b:*** *Focal companies' detailed leadership styles are shifting along the learning stages and focal companies apply different elements or secondary constructs of leadership styles on Tier 1 and extreme upstream suppliers.*

7.3 Multi-tier SSCM governance and structure

The analysis of multi-tier SSCM is discussed under two constructs of supply chain governance mechanism in Section 7.3.1 and supply chain structure in Section 7.3.2.

7.3.1 Multi-tier supply chain governance mechanisms

The discussion on supply chain governance mechanisms mainly focuses on the focal companies and their lower tier suppliers because focal companies collaborated closely with Tier 1 suppliers to implement sustainable initiatives in multi-tier supply chains. Tetra Pak rely on Tier 1 recyclers to create the collection network and recycle the UBCs; Nestlé's dairy upgrading initiative is targeting Tier 1 dairy farms; and IKEA's sustainable cotton initiative is rely on

Tier 1 suppliers to implement the project and pass on the requirements to middle tier suppliers. Tachizawa and Wong (2014) propose conceptually that in a multi-tier supply chain, focal companies can apply all the four approaches on their lower tier suppliers: “Direct”, “Indirect” (i.e. via Tier 1 suppliers), “Work with third parties” and “Don’t bother”. This research identifies that the case companies apply all the approaches and in a combined and dynamic manner.

Tetra Pak directly approached collection companies (a way to help recyclers quickly build up recycling capacity) and indirectly with individual collectors through collection companies at the operating stage. At the sustaining stage, Tetra Pak mainly approached the collection companies both directly and indirectly through recyclers and a ‘don’t bother’ approach with individual collectors. However, Tetra Pak have always approached consumers through a direct approach given that Tetra Pak have more expertise in public relations and have more resources to promote the environmental protection philosophy to the public.

Nestlé approached the DFI partners through a direct approach. It relies on DFI partners’ knowledge resources to provide training to dairy farmers either within its existing supply chain network of its milk districts or externally to the wider dairy industry.

IKEA approached the middle tier suppliers (Tier 2-4) through both direct and indirect approaches at the set up and operating stages. It provided training directly to some Tier 2 suppliers along with Tier 1 suppliers while also indirectly approaching some Tier 2 suppliers via Tier 1 suppliers who passed on information and requirements. For Tier 3 and 4 suppliers, IKEA mainly adopted an indirect approach and influenced them through the Tier 1 or 2 suppliers at the operating stage. At the sustaining stage, IKEA mainly applied an indirect and work with third party (BCI) method on these middle tier suppliers. For Tier

5 and 6 suppliers, IKEA adopted both direct and work with third party approaches simultaneously. As a commitment to BCI, IKEA continued to develop new cotton farms which are willing to participate in sustainable cotton initiatives. Hence, it will still continue to collaborate with BCI and will also apply a direct approach on Tier 5 or Tier 6 suppliers in the future.

Table 7-6 summarizes the case companies' governance mechanisms on their lower tier suppliers (except for tier 1) from set up/operating stage (some lower tiers only emerged in the operating stage.) to sustaining stage.

Focal companies	**Governance mechanisms on Lower tier suppliers**				
Tetra Pak	**Collection company (Tier 2)**	**Collectors (Tier 3)**	**Consumers (Tier 4)**		
Approaches on lower tier suppliers	Direct ---> Direct/Indirect	Indirect ---> Don't bother	Direct		
Nestlé	**DFI partners (Tier 2)**				
Approaches on lower tier suppliers	Direct				
IKEA	**Dyeing (Tier 2)**	**Weaving (Tier 3)**	**Spinner (Tier 4)**	**Ginner (Tier 5)**	**Cotton farming (Tier 6)**
Approaches on lower tier suppliers	Direct/Indirect ---> Indirect/Work with third party/don't bother			Direct and Work with third party	

Table 7-6 Governance mechanisms on lower tier suppliers

(Suppliers beyond Tier 1 in the upstream; Tier 1 not included; ---> represent the changing status from set up/operating stage to sustaining stage)

It is found that there is a necessity to further classify sub-tier suppliers. This research further classifies the lower tier suppliers into middle tier suppliers and

extreme upstream suppliers. The middle tier suppliers are in the middle between Tier 1 and extreme upstream of a long multi-tier supply chain. For instance, Tetra Pak's recycling supply chains have four tiers of suppliers, Tier 2 (collection company) and Tier 3 (individual collectors) are the middle tiers and Tier 4 consumers are the extreme upstream suppliers; Nestlé only have two tiers of supplier (Tier 1 dairy farmers; Tier 2 DFI partners), thus there is no middle tier suppliers; finally, IKEA have six tiers of suppliers, Tiers 2 (dyeing), 3 (weaving) and 4 (spinner) are the middle tier suppliers and Tier 5 (ginner) and 6 (cotton farmers) are the extreme upstream suppliers because ginning and cotton farming have a close relationship which are sometimes carried out by the same company.

Base on Table 7-6 and the above classification this research suggests that it is common for focal companies to apply more than one governance mechanism and in a dynamic manner especially on middle tier suppliers. Focal companies also tend to reach out to extreme upstream suppliers in the set up or operating stage and remain applying a direct (with/without third party) governance mechanism on extreme upstream suppliers at operating and sustaining stage. Thus this research proposes that:

Proposition 3: *Focal companies tend to apply different governance mechanisms on different lower tiers of suppliers in a multi-tier SSCM.*

Proposition 3a: *Focal companies tend to apply various or mixed forms of governance mechanisms on middle tiers by using one or more of the four governance mechanisms: "direct", "indirect", "work with third-party" or "don't bother".*

Proposition 3b: *Focal companies tend to apply one or more governance mechanisms of direct/indirect/work with third party in the operating stage and one or more governance mechanisms of indirect/work with third party/don't bother at sustaining stage on middle tier suppliers.*

Proposition 3c: *Focal companies tend to apply either direct only or direct and work with third party together on extreme upstream suppliers, which tend to remain the same in the operating and sustaining stages.*

7.3.2 Multi-tier supply chain structure

Adopting Mena *et al*.'s (2013) framework, there are three types of triadic supply chain structure: open triad, transitional triad and closed triad. Figures 7-1 to 7-3 present the evolving statuses along the **learning process** of the three supply chain structures inspired by Mena *et al.* (2013) but with more tiers than Mena's (3-tier). This research highlights the overall structures and the triad structures of focal company, Tier 1 supplier and Tier 2 supplier, and labelled the types in the figures. The dotted lines represent an effort by two parties to make a direct connection while the solid lines represent an established direct relationship.

At operating stage, a new type of triad supply chain structure emerged from the data that is in addition to the three types proposed by Mena *et al.* (2013) and is labelled as **closed plus triadic supply chain** structure. Both Tetra Pak and Nestlé directly identified new suppliers as Tier 2 suppliers and introduced them to Tier 1 suppliers. This new type of triadic supply chain structure is outlined in Figure 7-4. By assuming that Tier 2 suppliers have an established relationship with Tier 1 suppliers, this new type of triadic supply chain is not found by Mena *et al.* (2013).

This fourth one (closed plus triad) is described as where a focal company initiated the relationship with new lower tier suppliers who is not in the supply chains of the focal company before and introduced them to Tier 1 suppliers in order to close the loop. It is labelled as such because there was no existing relationship between Tier 1 and the new lower tier suppliers previously and the

focal companies need to make extra efforts to identify and develop the new lower tier suppliers before introducing them to its existing tier 1 suppliers.

Mena *et al.* (2013) propose that an open triad needs fewer management resources than a closed triad, while what the transition triad requires is in between. The closed plus triad is identified and enriches Mena *et al.* (2013) and is evident in the case of Tetra Pak and Nestlé. This research suggests that this format needs more management resources than the closed triad. For instance, Tetra Pak looked for collection companies in the market (which did not collaborate with recyclers previously) and provided facility support to them in order to introduce them to recyclers and help recyclers gain recycling capacity. Nestlé provided another example. In order to upgrade the dairy farms, it collaborated with DFI partners directly. The dairy farms supplying Nestlé were not DFI partners' market targets previously, due to their small scale. In both cases the focal companies invested management resources and brought in the lower tier suppliers to the supply chain, who have the potential and willingness to implement sustainable initiatives and introduced them to Tier 1 suppliers. Based on the findings and Mena *et al.* (2013), this research proposes the following:

> ***Proposition 4a:*** *The different triad supply chain structures in the multi-tier supply chain including open triad, transitional triad, closed triad and closed plus triad require different levels of management resources (ranked from fewer to more management resources needed).*

From set up stage to operating stage, Figures 7-1 to 7-3 suggest that Tetra Pak moved from nothing but a single firm to a linked closed recycling chain. The relationship between Tetra Pak, recyclers and collection companies is a closed plus triad, in which Tetra Pak identified the collection companies (new Tier 2 supplier), developed and introduced them to recyclers (Tier 1). Nestlé also

identified DFI partners (Tier 2) and introduced them to dairy farms (Tier 1) to create a closed plus triad. IKEA moved from a transitional supply chain to an overall closed supply chain and the structure with Tier 1 and 2 suppliers remain as a transitional triad.

From operating stage to sustaining stage, Figures 7-1 to 7-3 suggest that Tetra Pak's recycling chain is still a closed recycle chain, however the closed plus triadic relationship with recyclers and collection companies changed to a transitional triad. Nestlé's closed plus triad changed to a closed triad. IKEA's supply chain is still an overall closed supply chain while the transitional triad with Tier 1, 2 suppliers shifted from a transitional triad to an open triad.

It can be found that these focal companies tend to create an overall closed supply chain structure covering at least three tiers. Various sub triad existed in a SSCM when the supply chain has more than three tiers. These sub triad tend to shift from a format requiring more management resources at operating stage to a format requiring fewer management resources at sustaining stage.

> ***Proposition 4b:*** *Focal companies' multi-tier supply chain structure tend to shift along with the learning stages in a way that they tend to devote more management resources in the operating stage and less resources in the sustaining stage.*

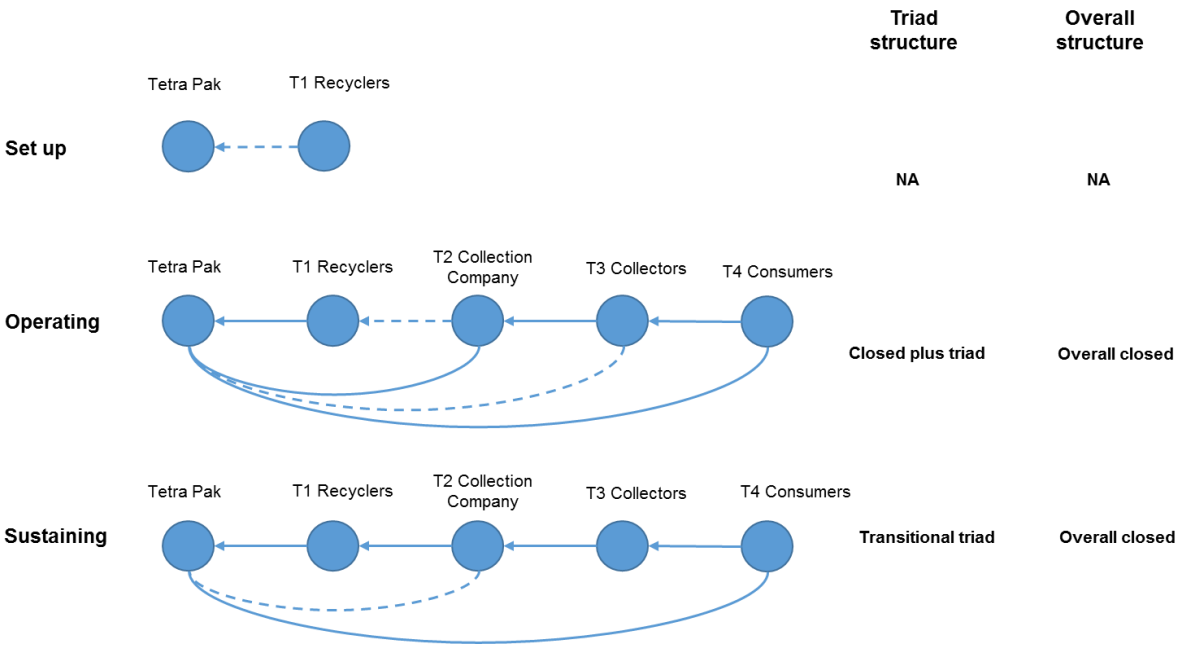


Figure 7-1Tetra Pak's multi-tier supply chain structures in creating a recycling chain

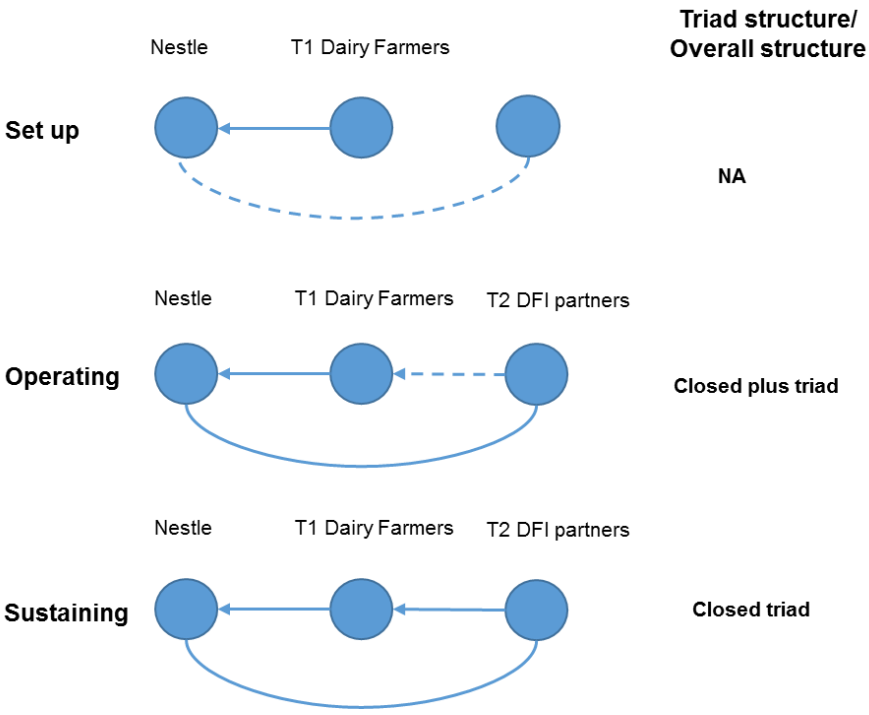


Figure 7-2 Nestlé's multi-tier supply chain structures in implementing dairy farmer upgrading initiative

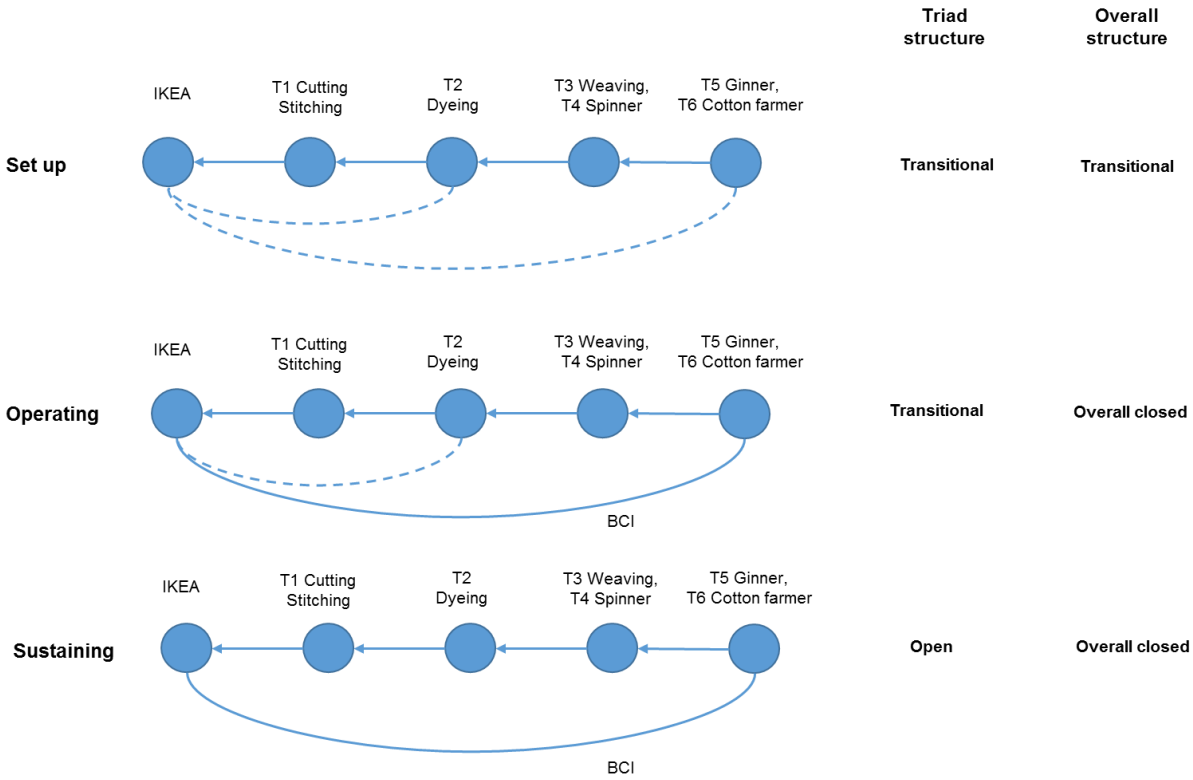


Figure 7-3 IKEA's multi-tier supply chain structures in implementing sustainable cotton initiative

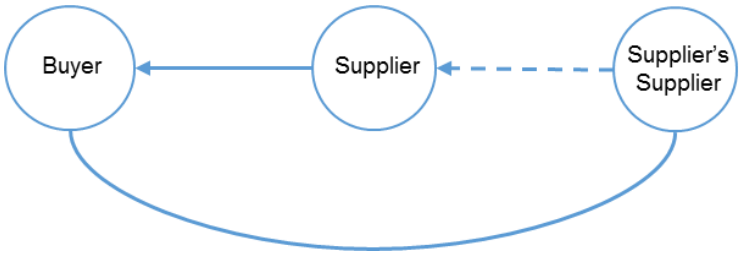


Figure 7-4 Closed plus triad supply chain structure

7.4 Discussion on the relationships of the constructs

This section discusses and codes the relationships of the constructs discussed in the within case analysis i.e. supply chain learning (process and content), supply chain leadership (transformational and transactional), multi-tier SSCM (multi-tier supply chain governance mechanisms and multi-tier supply chain structure) based on Resource Orchestration Theory (ROT) i.e. breadth, depth and project lifecycle. It is considered that project lifecycle and supply chain

learning stages are aligned i.e. project lifecycle follows the three learning stages if we consider sustainability initiatives are learning projects. Supply chain leadership and governance mechanisms are coded as resource orchestration depth as they are applied in the multi-tier supply chain vertically. Resource orchestration breadth is divided into two aspects of internal and external breadth: working with other functional departments (e.g. manufacturing and purchasing) is considered as resource orchestration of internal breadth and working with third party (one of the governance mechanisms) is considered as resource orchestration of external breadth. Both depth and breadth of resource orchestration form the mechanism of implementing sustainability initiatives. Supply chain learning content is an antecedent and supply chain structure a consequence to the mechanism. All these constructs mentioned change along the resource orchestration project lifecycle i.e. supply chain learning stages.

This section include four parts: Section 7.4.1 discusses the relationship between supply chain learning content and governance mechanisms; section 7.4.2 discusses the relationship between supply chain governance mechanisms and supply chain structure; the last three sections discuss (7.4.3, 7.4.4, 7.4.5) how supply chain leaders orchestrate the breadth, depth and project lifecycle on supply chain learning to implement multi-tier proactive SSCM initiatives.

7.4.1 Relationship between supply chain learning content and supply chain governance mechanisms

Focal companies tend to apply different supplier governance mechanisms on their suppliers. Tachizawa and Wong (2014) propose that the contingency factors including knowledge resources determine the approach chosen by the focal companies to implement sustainable initiative. This research empirically supports the salience of knowledge resources, an important factor of supply chain learning. According to their conceptually developed propositions 3-6

(Tachizawa and Wong, 2014, p. 658-659), the probability of a focal company adopting the “Direct” approach is positively affected by knowledge resources; the probability of adopting the “work with third party”, “Indirect” and “Don’t bother” approaches are negatively affected by knowledge resources.

The findings of this research reject their propositions 3-6. Their proposition 3 suggest that a “direct” approach is positively affected by focal companies’ knowledge resources. This research suggest that focal companies could apply a direct approach on lower-tier suppliers (especially with high learning complexity) even without sufficient knowledge resources. This is evidenced by the fact that IKEA do not have sufficient knowledge resources to provide trainings on sustainable cotton farming to cotton farmers, however it adopted a direct approach and make a direct engagement with them in participating the better cotton initiative. Nestlé have low knowledge resources on modern dairy farming, however it directly work with Tier 2 suppliers which could provide the much needed knowledge resources.

Their propositional 4 (Tachizawa and Wong, 2014) suggests that “work with third party” is negatively affected by focal companies’ knowledge resource. This research suggest that focal companies tend to work with various types of third parties regardless of their level of knowledge resources. The three focal companies have different levels of knowledge resources, however all of them worked with third parties (media, external technology company, NGOs, government etc.). Focal companies tend to work with third parties (e.g. IKEA works with BCI) as knowledge providers to bring in knowledge for suppliers facing high learning complexity or as knowledge brokers (Hult *et al.*, 2000b; Knoppen *et al.*, 2015) (organizations which disseminate the knowledge to wider supply chain network, such as Tetra Pak work with media to create consumers’ awareness) to disseminate the knowledge to suppliers with low learning complexity.

The findings also reject their propositions 5 and 6, which propose the negative relationships between knowledge resources and “Indirect” and “Don’t bother” approaches. This research suggest that focal companies could also apply the approaches when they have high knowledge resources. For instance, Tetra Pak have more knowledge resources in terms of recycling network than a collection company and collectors, they still applied the “Indirect” and “Don’t bother” mechanisms because recyclers gained the capability and could work well with collection companies and collectors, the learning content of these middle suppliers is low. Based on the discussion, this research proposes that:

Proposition 5: *Focal companies with different levels of knowledge resources tend to use different governance mechanisms on lower tier suppliers with different levels of learning complexity to implement multi-tier SSCM;*

Proposition 5a: *Focal companies with insufficient knowledge resources tend to apply a “direct” approach on lower tier suppliers especially when the complexity of learning content for suppliers is high;*

Proposition 5b: *Focal companies with sufficient knowledge resources tend to apply an “indirect” or “Don’t bother” approach on lower tier suppliers especially when complexity of learning content for suppliers is low.*

7.4.2 Relationship between supply chain governance and supply chain structure

The discussions in section 7.2 suggest that supply chain governance and supply chain structure are interrelated constructs and can be discussed together in a way that different types of supply chain governance corresponds to different types of supply chain structure, which in turn requires different levels of management resources accordingly. Table 7-7 shows the different governance mechanisms and their corresponding four types of triad supply

chain structure (buyer, supplier and supplier's supplier respectively in the triad structures, similar to Mena *et al.*, 2013) and management resources required. When coding the data, it is found that work with third party is indeed resource orchestration in breadth and recoded as such and not included in the table as the table shows governance mechanisms in multi-tier supply chain (depth).

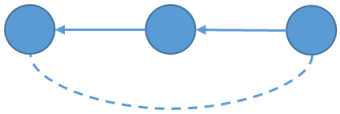
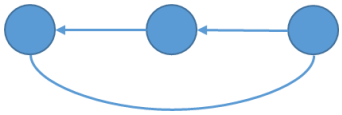
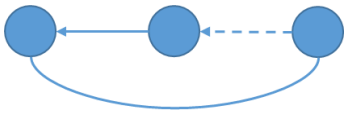
Supply chain governance on tier 2 suppliers	**Triad structures**	**Supply chain Structure**	**Management resources required**
Indirect or Don't bother		Open triad	Least management resources
Direct and Indirect		Transitional triad	Some management resources
Direct and Tier 2 suppliers in the existing supply chain		Closed triad	Consistent and considerate amount of management resources
Direct and Tier 2 suppliers not in the existing supply chain		**Closed plus triad**	Significant management resources

Table 7-7 Triadic supply chain structure and supply chain governance mechanisms

The first three supply chain structures in Table 7-7 were identified by Mena *et al.* (2013), the only difference being that Mena *et al.* (2013) propose the transitional triad is a status changing from open triad to closed triad. In this research it is found that the transitional triad is a middle stage between open triad and closed triad, it can shift toward both sides: from open triad to closed triad and from closed triad to open triad. Assuming that Tier 2 suppliers exist in the supply chain structure, the fourth type of supply chain structure (closed plus

triad) in Table 7-7 is a structure identified by this research but not mentioned by Mena *et al.* (2013).

Focal companies' governance mechanisms have an impact on the triad supply chain structure, however, whether Tier 2 suppliers already exist in the supply chain will decide the types of the triad supply chain structure. If the focal company applies a "don't bother" mechanism, then the structure is an open triad. If focal companies apply a "direct" approach but don't have a close collaboration with Tier 2 suppliers, then the structure tends to be transitional triad. If focal companies apply a "direct" approach and have a close collaboration with Tier 2 suppliers are present in the supply chain before implementing a sustainable initiative, the structure is a closed triad. If Tier 2 supplier previously did not have a relationship with Tier 1 suppliers before implementing a sustainable initiative, then the structure is a closed plus triad because selecting and developing news suppliers require more significant resources.

Besides the identification of the new triad structure, this research also extend Mena *et al.* (2013) triad structure into more tiers and labels it as overall supply chain structure in Figures 7-1 to 7-3. Similar as Mena *et al.* (2013) that the overall multi-tier supply chain structure could be divided into three types: open, transitional and closed depending on focal companies' governance mechanism on extreme upstream suppliers. Based on the discussion this research proposes that:

> ***Proposition 6a:*** *Focal companies' governance mechanisms used on extreme upstream suppliers define the overall supply chain structure into three types of open, transitional and closed multi-tier supply chain structure;*

Proposition 6b: *Focal companies' governance mechanisms used on Tier 2 suppliers define the triadic structure (focal firm, tier 1 and tier 2) types of open, transitional, closed and closed plus;*

Proposition 6c: *The more the focal companies tend to adopt more involved (or direct) governance mechanisms with Tier 2 suppliers, the more closed/closed plus their triadic structure tend to be;*

Proposition 6d: *The more the focal companies rely on Tier 1 suppliers or third party to govern Tier 2 suppliers, the more open their triadic structure tends to be.*

7.4.3 Resource orchestration in breadth in the supply chain

It is found that all the three focal companies proactively orchestrated both internal and external resources demonstrating the ***breadth*** of orchestration in the supply chain to implement the sustainable initiatives. Before orchestrating the knowledge resources of external non-supply chain members, all the three focal companies tend to orchestrate their internal resources to enhance its knowledge base first by setting up new boundary spanning departments to work with suppliers and potential external partners: Tetra Pak set up environment department and collaborated closely with purchasing department on providing advice to recyclers and worked with marketing and corporate comminutions to launch consumer awareness campaigns to educate consumers; Nestlé set up DFI department and worked closely with internal agricultural service teams and external DFI partners to provide modern dairy farming training to trainees. It also worked with media to promote DFI and recruit trainees. Finally IKEA set up the sustainable cotton team to work with various business development teams, worked with Tier 5 ginners and Tier 6 cotton farm suppliers and work with a NGO of BCI. These new departments coordinate each focal company's sustainable initiatives respectively.

Externally the focal companies actively orchestrated and worked with the third parties (non-supply chain members) to implement sustainability initiatives in their suppliers. Here, this study shows that the work with third party governance mechanism could not only apply on lower-tier suppliers as Tachizawa and Wong (2014) suggested but also could be applied on Tier 1 suppliers. These third parties contain two types: knowledge providers and knowledge brokers: the former could bring in knowledge resources while the latter help disseminate the knowledge to knowledge user. The focal companies searched for and then collaborated with various knowledge providers to implement the sustainability initiatives: Tetra Pak supported the knowledge provider of a recycling technology company and a University to develop the recycling separation technology, enhance the value of the recycled products and further motivate recyclers to participate in the recycling business; Nestlé collaborated and relied on the knowledge provider of DFI partners which include Tier 2 suppliers and academic institutes to design and provide modern dairy farming training to the dairy farmers (Tier 1); and finally IKEA relied on knowledge provider of BCI to provide and organize trainings to cotton farmers. These external partners acted as knowledge provider and supported the suppliers facing high learning complexly.

The within cases also suggest that the focal companies tend to orchestrate breadth with external knowledge brokers to disseminate the knowledge to suppliers facing low learning complexity: Tetra Pak collaborated with NGOs, and media to educate consumers for environmental protection and raise their awareness that UBCs can be recycled; Nestlé collaborated with media to recruit potential trainees for DFI; and finally IKEA collaborated with BCI to disseminate the sustainable cotton knowledge to the supply chains and the industry trends to middle tier suppliers. Table 7-8 summarizes on the breadth and the suppliers' learning complexity.

Focal company	Third parties	Type	Target group and learning complexity
Tetra Pak	Recycle technology company, University	Knowledge provider	Tier 1 recyclers (high learning complexity), to enhance the recycle value
	Media, NGO, government	Knowledge broker	Tier 4 consumers (low learning complexity), UBCs could be recycled
Nestlé	DFI partners, universities	Knowledge provider	Tier 1 dairy farms (high learning complexity), provide modern dairy farming trainings
	Media	Knowledge broker	Trainees (low learning complexity), the information that dairy farmers could receive trainings at DFI
IKEA	BCI	Knowledge provider	T5 ginners, T6 cotton farmers (medium learning complexity), how to implement sustainable cotton practices
		Knowledge broker	Middle tier suppliers (low learning complexity), sustainable cotton concept

Table 7-8 Focal companies' resource orchestration on external breadth

Based on the discussion, this research propose that:

Proposition 7: *Focal companies' knowledge resources and supplier learning complexity jointly decide the resource orchestration in breadth;*

Proposition 7a: *Focal companies tend to prioritise orchestrating internal resources before orchestrating external resources to implement the proactive multi-tier sustainable initiatives.*

Proposition 7b*: To reach a breadth of resource orchestration in the supply chain, focal companies tend to identify and collaborate with external knowledge providers (e.g., NGO, universities, knowledge suppliers) to obtain needed knowledge resource to support suppliers with high learning complexity.*

Proposition 7c*: To reach a breadth of resource orchestration in the supply chain, focal companies tend to collaborate with external knowledge brokers (e.g. media, NGO and government agency) to reach a wider coverage on suppliers with low learning complexity.*

7.4.4 Resource orchestration in depth in the supply chain

The three companies also orchestrated resources in ***depth*** in their supply chains: Tetra Pak created a recycling chain of four tiers including recyclers, collection company, collectors and consumers; Nestlé directly worked with Tier 2 suppliers (e.g. nutrition, facility suppliers) which were not involved in the supply chain before the initiative; and IKEA directly worked with Tier 5 ginners and Tier 6 cotton farmers which it does not have a direct contact before. The focal companies applied different leadership styles and governance mechanisms on different tiers of the suppliers detailed in propositions of P2a, P2b, and P3, P3a, P3b and P3c. Focal companies' impact on the depth of the supply chain is also shifting along the learning stages as shown in Figures 7-1 to 7-3. Thus this research suggests that:

Proposition 8a: *Focal companies' knowledge resources and supplier learning complexity jointly decide the resource orchestration in depth;*

Proposition 8b: *To reach a certain* ***depth*** *of resource orchestration in the supply chain, focal companies tend to apply different* ***supply chain leadership styles*** *to sub-tier suppliers (detailed in P2a and P2b) and a combination of* ***governance mechanisms*** *towards sub-tier suppliers (detailed* in P3, P3a, P3b and P3c);

Proposition 8c: *Resource orchestration in depth could lead to the change of multi-tier supply chain structure along the learning stages so that the depth of the supply chain resource orchestration tend to become deeper and overall supply chain structure tends to change towards an overall closed structure in the operating and sustaining stage (detailed in P4b).*

Interestingly to notice that proactive focal companies could also engage with external parties in the existing supply chain and turn the previous weak ties (loose connections commonly external to the main network) to strong ties (more intense interactions in the relationships) to foster more collaborations (Hitt, 2011). Mena *et al.*'s (2013, p.70) propose that "*A buyer who wants to influence key product characteristics need to connect directly with its suppliers' supplier who works with undifferentiated resources.*" IKEA adopted this approach and provided an example to directly work with raw material cotton farmers in the extreme upstream. Nestlé has been proactive to work directly with the raw material suppliers (dairy farmers) from the beginning. In the modernizing initiative it further worked directly with raw material suppliers' supplier (Tier 2 DFI partners, resource orchestration in breadth) which previously only have a weak link or no relationship with Nestlé to integrated in the dairy supply chain (resource orchestration in depth), suggesting that focal companies could be more proactive by making one more step ahead, enriching Mena *et al.*'s (2013) argument:

> ***Proposition 8d:*** *Resource orchestration breadth enhances depth i.e. the external knowledge suppliers could even join focal companies' supply chain network and become a supply chain member, changing the relationship with focal companies from a weak to a strong tie and adding the depth of resource orchestration.*

7.4.5 Resource orchestration along project lifecycle in the supply chain

Base on the propositions, it can be found that focal companies tend to orchestrate along the project lifecycle and all the other constructs tend to shift along the learning stages. Table 7-9 summarizes the propositions related to the supply chain orchestration along the sustainable initiative project lifecycle.

Other constructs		Supply chain learning stages			Supporting propositions
		Set up stage	**Operating stage**	**Sustaining stage**	
Learning content	Focal company knowledge resource	accumulate along the stages and peak at the sustaining stage			P1a
	Supplier learning complexity	the learning complexity reduce over time			P1a
Resource orchestration in breadth		Priorities the orchestration of internal resource over external resources			P7a
Resource orchestration in depth		collaborate with extreme upstream suppliers		remain the same	P8c
Mechanism	Multi-tier supply chain governance mechanism (middle tier suppliers)	direct/indirect/work with third party		indirect/work with third party/don't bother	P3b
	Supply chain leadership (transformational leadership on Tier 1 and extreme upstream suppliers)	Inspirational	Inspirational, intellectual stimulation and individual consideration. Delegate leadership to suppliers or third parties.		P2b
Multi-tier supply chain structure		NA	A structure associated with more management resources	A structure associated with less management resources	P4b

Table 7-9 Focal companies' resource orchestration along the sustainable initiative project lifecycle

7.5 Summary

This chapter presents the cross-case analysis based on the within case chapters and discussion of the findings against existing literature. In order to answer the research question, a revised theoretical framework from Figure 2-3 (initial conceptual framework) is proposed in Figure 7-5. The chapter is divided into four parts: the first three sections focus on the three themes of supply chain learning, supply chain leadership and multi-tier SSCM; the fourth section focus

on the relationships of the constructs under the themes and applied resource orchestration theory. Table 7-10 makes a summary of the propositions.

Through the discussion and the propositions it can be found that supply chain learning content which contains focal company knowledge resources and supplier learning complexity jointly decide focal companies' resource orchestration in breadth and depth (supported by P7 and P8a). The knowledge resource in breadth include internal breadth by working with different internal functions and external breadth include working with third parties (non-supply chain members). The knowledge resource orchestration in depth reflected by governance mechanisms on the vertical supply chain of direct, indirect, don't bother, and by applying different supply chain leadership of transformational and transactional leadership style. Resource orchestration in breadth could lead to the resource orchestration in depth (supported by P8d) and both resource orchestration in breadth and depth could lead to the change of multi-tier supply chain structure (supported by P8c and P7c). Finally, focal companies also orchestrate resource along the project lifecycle reflected by supply chain learning stages of set up, operating and sustaining stages. All the constructs of supply chain learning content, resource orchestration in breadth and depth and multi-tier supply chain structure tend to shift along with the supply chain learning stages (supported by P1a, P7a, P8c, P3b, P2b and P4b and the summary in Table 7-10).

The differences between the initial framework and the revised framework are that: ROT has been later identified and adopted in the revised framework. This is a major iteration between literature and data. Resource orchestration along the project lifecycle is aligned with supply chain learning stages while resource orchestration in breadth and depth are the mechanisms between supply chain learning and multi-tier supply chain structure. Multi-tier supply chain governance mechanisms of direct, indirect and don't bother and supply chain

leadership are under resource orchestration in depth while in the initial conceptual framework, supply chain leadership is considered the only mediator between supply chain learning and multi-tier supply chain management. Multi-tier supply chain governance mechanisms of work with third party and internal breadth are under resource orchestration in breadth. The initial conceptual model (Figure 2-3) has been much enriched and expanded.

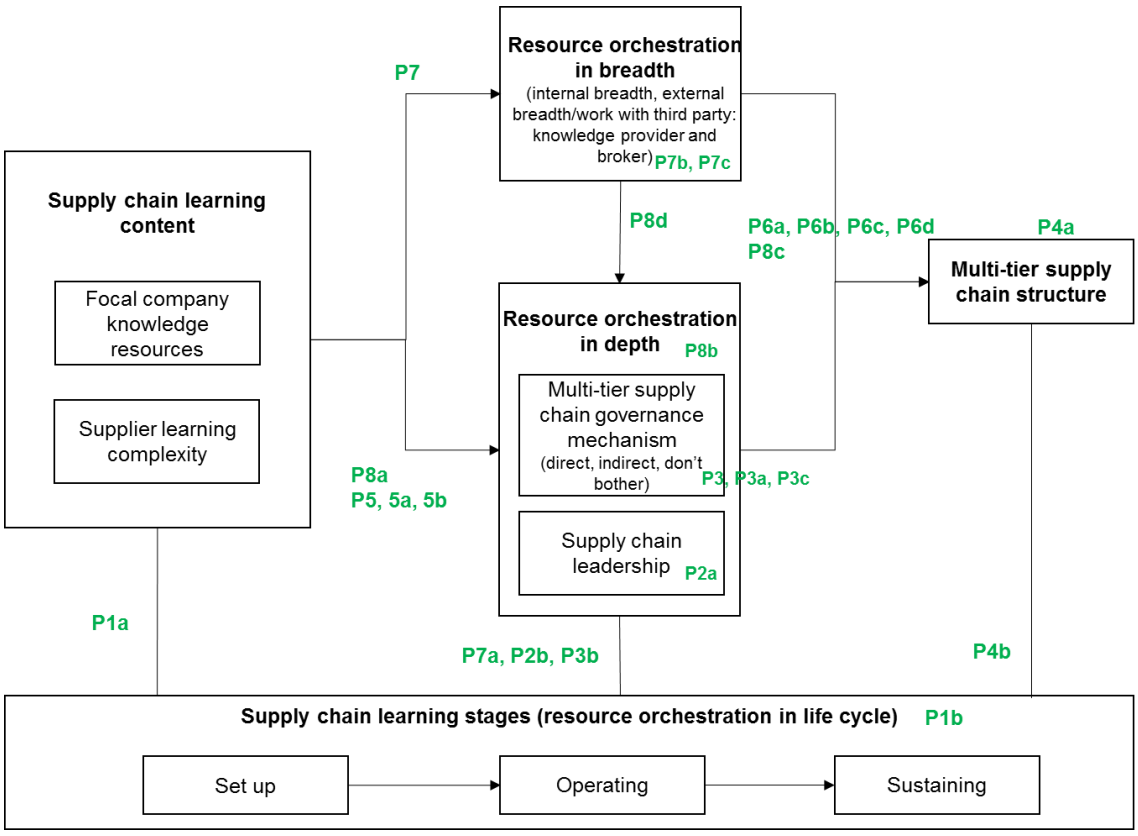


Figure 7-5 Proposed framework of supply chain learning in multi-tier supply chains

Propositions
Supply chain learning: content and process **Proposition 1a:** Focal companies' knowledge resources tend to accumulate over time and peak at the sustaining stage while learning complexity of multi-tier suppliers reduces over time due to the learning efforts put in by the suppliers and support provided by focal companies. **Proposition 1b:** The sustainable project lifecycle is aligned with the supply chain learning stages of set up, operating and sustaining.
Supply chain leadership on multi-tier supply chains **Proposition 2a:** Focal companies tend to apply different leadership styles on different tiers of suppliers in multi-tier SSCM, with a mainly transformational leadership style on Tier 1 and extreme upstream suppliers and a transactional leadership style on middle tier suppliers. **Proposition 2b:** Focal companies' detailed leadership styles are shifting along the learning stages and focal companies apply different elements or secondary constructs of leadership styles on Tier 1 and extreme upstream suppliers.
Multi-tier supply chains governance mechanisms **Proposition 3:** Focal companies tend to apply different governance mechanisms on different lower tiers of suppliers in a multi-tier SSCM. **Proposition 3a:** Focal companies tend to apply various or mixed forms of governance mechanisms on middle tiers by using one or more of the four governance mechanisms: "direct", "indirect", "work with third-party" or "don't bother". **Proposition 3b:** Focal companies tend to apply one or more governance mechanisms of direct/indirect/work with third party in the operating stage and one or more governance mechanisms of indirect/work with third party/don't bother at sustaining stage on middle tier suppliers. **Proposition 3c**: Focal companies tend to apply either direct only or direct and work with third party together on extreme upstream suppliers, which tend to remain the same in the operating and sustaining stages.
Multi-tier supply chain structure **Proposition 4a:** The different triad supply chain structures in the multi-tier supply chain including open triad, transitional triad, closed triad and closed plus triad require different levels of management resources (ranked from fewer to more management resources needed). **Proposition 4b:** Focal companies' multi-tier supply chain structure tend to shift along with the learning stages in a way that they tend to devote more management resources in the operating stage and less resources in the sustaining stage.

Relationship: supply chain learning and governance mechanisms

Proposition 5: Focal companies with different levels of knowledge resources tend to use different governance mechanisms on lower tier suppliers with different levels of learning complexity to implement multi-tier SSCM;

Proposition 5a: Focal companies with insufficient knowledge resources tend to apply a "direct" approach on lower tier suppliers especially when the complexity of learning content for suppliers is high;

Proposition 5b: Focal companies with sufficient knowledge resources tend to apply an "indirect" or "Don't bother" approach on lower tier suppliers especially when complexity of learning content for suppliers is low.

Relationship: governance mechanisms and supply chain structure

Proposition 6a: Focal companies' governance mechanisms used on extreme upstream suppliers define the overall supply chain structure into three types of open, transitional and closed multi-tier supply chain structure;

Proposition 6b: Focal companies' governance mechanisms used on Tier 2 suppliers define the triadic structure (focal firm, tier 1 and tier 2) types of open, transitional, closed and closed plus;

Proposition 6c: The more the focal companies tend to adopt more involved (or direct) governance mechanisms with Tier 2 suppliers, the more closed/closed plus their triadic structure tend to be;

Proposition 6d: The more the focal companies rely on Tier 1 suppliers or third party to govern Tier 2 suppliers, the more open their triadic structure tends to be.

Resource orchestration in breadth

Proposition 7: Focal companies' knowledge resources and supplier learning complexity jointly decide the resource orchestration in breadth;

Proposition 7a: Focal companies tend to prioritise orchestrating internal resources before orchestrating external resources to implement the proactive multi-tier sustainable initiatives.

Proposition 7b: To reach a breadth of resource orchestration in the supply chain, focal companies tend to identify and collaborate with external knowledge providers (e.g., NGO, universities, knowledge suppliers) to obtain needed knowledge resource to support suppliers with high learning complexity.

Proposition 7c: To reach a breadth of resource orchestration in the supply chain, focal companies tend to collaborate with external knowledge brokers (e.g. media, NGO and government agency) to reach a wider coverage on suppliers with low learning complexity.

Resource orchestration in depth

Proposition 8a: Focal companies' knowledge resources and supplier learning complexity jointly decide the resource orchestration in depth;

Proposition 8b: To reach a certain depth of resource orchestration in the supply chain, focal companies tend to apply different supply chain leadership styles to sub-

tier suppliers (detailed in P2a and P2b) and a combination of governance mechanisms towards sub-tier suppliers (detailed in P3, P3a, P3b and P3c);

Proposition 8c: Resource orchestration in depth could lead to the change of multi-tier supply chain structure along the learning stages so that the depth of the supply chain resource orchestration tend to become deeper and overall supply chain structure tends to change towards an overall closed structure in the operating and sustaining stage (detailed in P4b).

Proposition 8d: Resource orchestration breadth enhances depth i.e. the external knowledge suppliers could even join focal companies' supply chain network and become a supply chain member, changing the relationship with focal companies from a weak to a strong tie and adding the depth of resource orchestration.

Table 7-10 A summary of the propositions

Chapter 8 Conclusion

This chapter provides a conclusion to the whole research, by first providing the answers to the research question raised in chapter one and then theoretical and practical contributions, research limitations and future research directions are discussed.

Overall, this study is divided into eight chapters: the first chapter provides an overview of the research background focusing on the role of multinational corporations (MNCs) in sustainable supply chain management (SSCM) in emerging economy countries with a specific focus on China; the second chapter conducts a content based analysis on the literatures of multi-tier SSCM, supply chain learning and supply chain leadership respectively. Resource Orchestration Theory (ROT) has been selected and reviewed as the theoretical lens; the third chapter presents and justifies qualitative research method with a detailed three case study design; chapters four, five and six presents the within case discussions of the focal companies' proactive multi-tier sustainable initiatives following the same structure containing constructs of supply chain learning, supply chain leadership and multi-tier SSCM; chapter seven makes a cross case analysis on similarity and differences of the three cases' and discuss the findings against existing literature by applying ROT. Eight sets of research propositions are advanced based on the case study findings and literature. Finally, this chapter draws a conclusion of this whole research project.

8.1 Answer to the research question

In chapter one, a research question was laid out: ***how do MNCs assume a supply chain leadership role in facilitating supply chain learning in multi-tier SSCM?***

Adopting a ROT perspective, this research finds that focal companies tend not to have sufficient knowledge resources and need to orchestrate in breadth, depth and throughout project lifecycle to enable the supply chain learning of sustainability along the multi-tier supply chains. Focal companies need to orchestrate both internal and external resources including knowledge resources to implement the proactive sustainable initiatives. Focal companies tend to prioritise orchestrating internal resources before orchestrating external resources by setting up new internal functions (e.g. environmental or sustainability teams) to acquire/cumulate the knowledge and liaise with other functional departments within the company and external stakeholders. The external knowledge suppliers or stakeholders could include universities, entrepreneurs with technology capability, NGOs and media etc. External knowledge providers may even join focal companies' supply chain network and become a supplier in the supply chain. The need to orchestrate external parties could be explained by the factor that sustainable initiatives tend to have a spill over effect on the environment and social aspects, which means it was normally not the focal companies' sole responsibility to conduct the sustainable initiatives.

Focal companies also need to orchestrate in depth in multi-tier supply chains. This research extends the dimension of depth of ROT from within an organization to a supply chain level. Supply chain leadership and governance mechanisms are recognized as two mechanisms of resource orchestration in depth as they could be applied in the multi-tier supply chain vertically. This research suggests that focal companies need to exhibit both transformational leadership and transactional leadership styles on multi-tier suppliers and tend to apply more of transformational leadership style on the first tier and extreme upstream suppliers, and more of transactional leadership style on middle tier suppliers. A mixed governance mechanism of direct, indirect and don't bother

have been applied on the middle tier suppliers and a direct only or direct and third party mechanism applied on extreme upstream suppliers. Finally, the focal companies' resource orchestration is not a static but a dynamic process shifting along project lifecycle, which is aligned with the three supply chain learning stages of set up, operating and sustaining.

8.2 Theoretical contributions

This section summarizes the theoretical contributions of the PhD project to supply chain management literature in particular supply chain learning, supply chain leadership, multi-tier SSCM and ROT respectively.

8.2.1 The contribution to supply chain learning

Supply chain learning is a slowly developing research topic in supply chain management literature. Not much research has been done after Bessant *et al.* (2003), however, researchers do emphasise the learning activities in SSCM are important (Silvestre, 2015), for example that learning activities may be embedded in 'collaboration' approaches (Vachon and Klassen, 2006, 2008; Gimenez and Tachizawa, 2012) and in supplier development programmes (Plambeck *et al*., 2012; Grimm *et al.*, 2016).

Building on Bessant *et al.* (2003) and Jia and Lamming (2013), this is one of the first studies that propose a systematic and comprehensive framework on supply chain learning i.e., making a distinction between learning stages and learning content at a supply chain level. It answers the call for supply chain learning research by Flint *et al.* (2008), Biotto *et al.* (2012) and Silvestre (2015). Supply chain learning research has been sparse in recent years, but this study lays a solid foundation for future research to build on and to open new avenues of research. This study has gone beyond dyadic or triadic level investigating the

whole multi-tier supply chain for the first time, proposing a new classification of supply chain structure of Tier 1, middle tier and extreme upstream suppliers.

This research is the first to explicitly propose the two constructs of supply chain learning i.e. learning stages and learning content in terms of focal company knowledge resources and supplier learning content complexity. Inspired by Bessant *et al.* (2003), ROT (Sirmon *et al*., 2007; 2011) and based on the findings of the three cases, the three-stage supply chain learning process was identified, and include set up, operating and sustaining stages. The three-stage process framework could be merged under resource orchestration along supply chain project lifecycle. Finally the research found that the focal companies' knowledge resource and supplier learning complexity jointly affects the resource orchestration in breadth and depth. Section 8.2.4 provides more details on this.

8.2.2 The contribution to supply chain leadership

Supply chain leadership is a relatively new concept in supply chain management research. Traditionally leadership theories are studied with a focus on individual leaders (Burns, 1978; Bass, 1985, 1990, 1999; Yukl, 1998; Avolio *et al.*, 1999). Defee *et al.* (2009a, b; 2010) are the first to apply the concept to supply chain management studies and build a conceptual framework for supply chain leadership following a simulation method.

Through the three case studies, this research explores the 'supply chain leadership' concept, identifies the leadership styles of the focal companies through their management behaviours towards their multi-tier suppliers. Similar to Defee *et al.* (2009a, b; 2010), the research suggests that supply chain leadership exist at a supply chain level and the focal companies' leadership

styles could be identified through its exhibited behaviours on followers. Going beyond Defee *et al.*'s (2009a, b; 2010) study, this study is the first to support the existence of supply chain leadership in multi-tier supply chains and finds that focal companies tend to apply a transformational leadership style associated with transactional leadership style on different tiers of the whole sustainable supply chain and to different degrees. They tend to be more transformational on Tier 1 and extreme upstream suppliers and more transactional towards middle tier suppliers.

8.2.3 The contribution to multi-tier SSCM research

Given the fact that many of the supply chain sustainability issues are located at upstream supply chains, companies nowadays emphasize the management of the sustainability of its multiple tiers of suppliers. This research makes a contribution to the emerging studies on Multi-tier SSCM research (Mena *et al.*, 2013; Grimm *et al.*, 2014, 2016; Tachizawa and Wong, 2014). This research significantly enriches the research stream of multi-tier SSCM, and examines the phenomenon through three cases: Tetra Pak creating a recycling chain in China (five tiers), Nestlé modernizing China's dairy industry (three tiers) and IKEA's sustainable cotton initiative (seven tiers) providing rich description. Going beyond the traditional focus on implementing supplier's code of conduct, this research explored the proactive multi-tier SSCM practices. Two important concepts of supply chain governance mechanisms and supply chain structure are applied to analyse the phenomena.

The contribution to supply chain governance mechanisms

This research contributes to the debates on supply chain governance mechanisms. Tachizawa and Wong (2014) undertook a literature review on supply chain governance mechanisms and propose that there are four approaches: direct, indirect, work with third party and don't bother, to describe focal companies' work with lower tier suppliers. This research provides

empirical evidence to support these four types of governance mechanisms and suggest that they tend to be applied in a mixed format especially on middle tier suppliers. However this research rejects Tachizawa and Wong's (2014) propositions on the contingency factor of knowledge resource on multi-tier supply chain governance mechanisms.

What Tachizawa and Wong (2014) suggest is that the probability of the lead firm adopting the "direct" approach is positively affected by its knowledge resources (proposition 3 on p. 658), and the probability of the lead firm adopting the "work with third party", "indirect" and "don't bother" are negatively affected by its knowledge resources (propositions 4, 5, & 6 in p. 658-659). This research suggests that focal companies tend to work with third parties both as knowledge providers and knowledge brokers no matter whether the focal companies have knowledge resource or not. Insufficient knowledge resources do not hinder focal companies applying a "direct" approach on lower tier suppliers especially when the complexity of learning content is high; and sufficient knowledge resources do not hinder focal companies applying an "indirect" or "Don't bother" approaches on lower tier suppliers especially when the complexity of learning content is low.

The contribution on supply chain structure

Based on Mena *et al.* (2013), this research further developed their study from three tiers to the whole chain including more tiers. This study finds that focal companies tend to work directly with extreme upstream suppliers to create an overall closed supply chain structure in implementing SSCM initiatives.

The research on the triad structure of focal companies, Tier 1 suppliers and Tier 2 suppliers suggests that there is another type of triad structure that has not been discussed by Mena *et al.* (2013), which is labelled as 'closed plus triad'. In order to implement a proactive sustainability initiative in a multi-tier SSCM, focal companies may bring in Tier 2 suppliers and introduce them to Tier 1 suppliers, where new Tier 2 suppliers did not have an established relationship with Tier 1 suppliers previously. This research also suggests that the triad supply chain structure requires various management resources, ranked from less to more management resources including open triad, transitional triad, closed triad and closed plus triad. The closed plus triad type is identified by this study as an important enrichment of three types suggested by Mena *et al.* (2013) and shows the need for proactivity by a focal company while implementing SSCM initiatives. Furthermore, the transitional triad could shift between open triad and closed triad rather than only from open triad to closed triad suggested by Mena *et al.* (2013).

The research also finds that overall the whole supply chain structure remain closed, while the triad structure tends to associate with a pattern that requires more management resources at the operating stage and then needs less management resources at the sustaining stage. It would not be sustainable for focal companies continuously devote resources to governance the whole chain, suppliers (such as recyclers in Tetra Pak's recycling chain, Tier 2 suppliers in Nestlé's supply chain and Tier 1 cutting and stitching suppliers of IKEA's supply chain) and external partners (such as BCI in IKEA's supply chain) could and need to take the ownership and responsibility to together driven for a multi-tier SSCM.

8.2.4 The contribution to Resource Orchestration Theory (ROT)

This research may be the first to extend the ROT theory (Sirmon *et al.*, 2007; 2011) to a supply chain level. A few studies (e.g. Liu *et al.*, 2016) applied ROT in SCM research in a superficial way. This is the first to propose that focal companies could orchestrate the resources to achieve sustainability in their supply chains based on three aspects: breadth (resource orchestration across the scope of the supply chain including both internal and external breadth); depth (resource orchestration across multi-tiers of the supply chain); and project lifecycle (resource orchestration at various stages of supply chain learning stages).

Figure 7-5 presents the revised framework after the data analysis which highlights the theoretical contributions to ROT. Supply chain learning is measured by focal company knowledge resources and supplier learning complexity, which jointly decide focal companies' resource orchestration in breadth and depth. The knowledge resource in breadth include internal breadth by working with different internal functions and external breadth include working with third parties (non-supply chain members). The knowledge resource orchestration in depth is reflected by governance mechanisms on the vertical supply chain of direct, indirect, don't bother, and by applying different supply chain leadership of transformational and transactional leadership styles. Resource orchestration in breadth could lead to the resource orchestration in depth and both could lead to the change of multi-tier supply chain structure. Finally, focal companies also orchestrate resource along project lifecycle reflected by supply chain learning stages of set up, operating and sustaining stages. All the constructs of supply chain learning content, resource orchestration in breadth and depth and multi-tier supply chain structure tend to change along with the supply chain learning stages.

In a sense, this research tells a complete story or give a full explanation of how MNCs assuming leadership in multi-tier supply chain learn sustainable knowledge/initiatives. ROT proves to be valuable to tie all the constructs together (supply chain learning, supply chain leadership, multi-tier SSCM in terms of governance mechanisms and structure) to answer the research question. Through the ROT lense, the study contributes to aforementioned debates in particular multi-tier supply chain in a sustainability context. A theory of supply chain learning in multi-tier supply chain adopting a ROT perspective has been built. This research also contributes to ROT theory by extending from an internal organizational focus to a supply chain one, significantly enriching the theory. Based on above discussions, Table 8-1 makes a summary on the theoretical contributions of this study.

Themes	Contributions
Supply chain learning	Conduct an empirical research on supply chain learning, answer the call for research on supply chain learning by Flint *et al.* (2008), Biotto *et al.* (2012) and Silvestre (2015);
	Supply chain learning content include focal company knowledge resource and supplier learning complexity which jointly decide ROT in breadth and depth.
Supply chain leadership	Conduct an empirical research on supply chain leadership, answer the call for research on supply chain leadership by Harland *et al.* (2007), Defee *et al.* (2009a, b; 2010);
	Focal companies tend to apply transformational leadership on Tier 1 and extreme upstream suppliers and a transactional leadership on middle tier suppliers;
Multi-tier SSCM	Conduct the research on proactive multi-tier SSCM, extend the multi-tier to more than three tiers (Mena *et al.*, 2013);
	Identify a new type of triad supply chain structure of closed plus, the triad supply chain structures are associate with different levels of management resources; the transitional triad structure could shift

	between open triad and closed triad rather than only from open triad to closed triad suggested by Mena *et al.* (2013);
	Provide empirical evidence to support Tachizawa and Wong's (2014) four types of lower-tier governance mechanisms;
	Reject the Tachizawa and Wong's (2014) propositions on the relationships of focal companies' knowledge resources and lower tier governance mechanisms;
	Explore the multi-tier SSCM governance mechanisms and structures based on a process view rather than a static or snapshot view;
Resource orchestration theory (ROT)	Extend ROT from within an organization to a supply chain level;
	Resource orchestration in breadth include internal functions and external stakeholders (work with third party governance mechanism), external stakeholders could be knowledge provider or knowledge broker;
	Resource orchestration in depth include the vertical governance mechanisms of direct, indirect and don't bother and supply chain leadership on multi-tiers' suppliers;
	Resource orchestration along the project lifecycle include three learning stages of set up, operating and sustaining;
	Both resource orchestration in breadth and depth leads to change in supply chain structure.

Table 8-1 A summary of the theoretical contributions

8.3 Practical contributions

Besides the theoretical contributions, this research had also provided significant practical contributions to MNCs and their suppliers. This section summarizes the practical contributions for focal companies, suppliers and third parties (i.e. NGOs, media) respectively.

8.3.1 Practical contributions for focal companies

For focal companies intending to implement proactive sustainable initiatives at multi-tier supply chain levels, they may wish to learn from the case companies' best practices. This study provides focal companies with detailed mechanisms and a roadmap of how to implement sustainable initiatives from a resource orchestration perspective presented in Figure 7-5. This was a black box and there was fragmented information with regards to how focal companies did this. This research is the first to disclose the black box and provide managers with a detailed explanation and points of reference (constructs and their relationships). These are detailed in below.

First, focal companies could follow the three-stage supply chain learning framework. At the set up stage, focal companies would conduct 'supply chain mapping' at the beginning to generate a thorough understanding of the supply chain network, identify potential partners and generate the criteria for selecting suppliers. Through 'awareness building', focal companies need to persuade qualified suppliers to 'buy-in' the sustainable supply chain vision, and align themselves with focal companies to pursue long term sustainability goals. It is also important to let internal functions of focal companies be aware and take part in the initiative. Next, operating stage, focal companies should work on 'capacity building' to develop multi-tier suppliers to gain sustainability capacity. Finally, sustaining stages, focal companies could gradually delegate their responsibilities to suppliers and/or external third party partners, and let suppliers/partners take on the ownership of SSCM initiatives.

Second, focal companies should play a leading role in the implementation of sustainability initiatives. The whole implementation process needs focal companies' design and careful selection of the leadership styles used towards

different tiers of suppliers (tier 1, middle tier and extreme upstream), supply chain governance mechanisms, and management resources devoted. Focal companies need to exhibit transformational leadership as well as transactional leadership. In one hand, focal companies need to be transformational to inspire suppliers to look further for the benefits of the whole supply chain, encourage suppliers to think about new sustainability solutions and provide tailored support to meet suppliers' needs; on the other hand focal companies need to exhibit transactional behaviours to recognize suppliers' achievements and point out their mistakes.

Finally, focal companies could learn from a number of the three case companies' best practices, which include:

1) Integrating sustainability strategy with business strategy;

2) Designing sustainable initiatives along with business direction either helping the organization achieve competitive advantages or minimising future potential risk;

3) Embedding sustainability into corporate culture;

4) Seeking to be innovative and design sustainable initiatives which could follow the product lifecycle analysis and think about the whole supply chain system;

5) Altering organization structure by setting new boundary-spanning departments to better manage the sustainable projects;

6) Relying on traditional purchasing and sourcing teams to have an influence on suppliers;

7) Adopting a 'platform strategy' by collaborating with peers, competitors, NGOs, or suppliers to leverage the influence on the supply chain network.

8.3.2 Practical contributions for suppliers and third parties

The research also provides suggestions to focal companies' suppliers. Given the fact that focal companies consider more about SSCM, suppliers' sustainability capability will become an increasingly important and be reflected in supplier selection criteria. To survive in the fierce competition, suppliers should create and enhance their sustainability capacity so as to make them outstanding from their peers. Suppliers should examine their operation environment, foster internal talents and increase their knowledge on sustainability. The three case studies suggest that focal companies tend to maintain long term relationship with suppliers with sustainability capability, thus suppliers should pay more attention to sustainability in the future in order to gain sustainable competitive advantages.

This research also presents implications for third parties (i.e. NGOs, media). From a knowledge resource perspective, this research classified the third parties into two types of knowledge provider and knowledge broker which highlight two critical capacities for third parties. For third parties wishing to collaborate with MNCs they would prefer to enhance two capabilities: enhance its expertise in sustainability or enlarge its network coverage to make a wider impact on targeting groups.

8.4 Limitations

This research doesn't exempt from limitations: First, power is a factor not discussed in this research. Power is an important factor for focal companies to have an influence over suppliers and is an important source of supply chain leadership. With a focus on supply chain leadership, this research did not discuss the relationship between power and transformational and transactional

leadership styles which leaves space for future research. No doubt that the three case companies have power over their suppliers such as buying power, expertise/knowledge power and reputation power. The extent to which their power influences lower tier suppliers requires further investigation.

Second, only one sustainability initiative of each of the focal companies has been studied in this project. Under budget and time constraints, this research only looks into the proactive sustainability initiatives of the case companies. One should note that SSCM includes a whole set of practices, and a single proactive sustainable initiative does not indicate that a focal company can be considered truly sustainable, or that their supply chains are truly sustainable. However, the three proactive sustainable initiatives provide valuable lessons to other organizations seeking to implement proactive sustainability practices in multi-tier supply chains.

Third, methodologically this project employs a case study approach containing three cases. It is not the intention of the study to be exhaustive of all the types of sustainable initiatives to make the study more representative and generalizable; however future research could take an alternative method such as large sample survey method to test the propositions developed in this study.

8.5 Future research directions

This research makes a major contribution to supply chain leadership and supply chain learning in multi-tier SSCM and ROT and has opened up new avenues for future research.

First, what role does power play in multi-tier SSCM, and what is the relationship between power and supply chain leadership? As pointed out in the limitation paragraph, power is an important factor in supply chain relationships, and the extent to which focal companies' power has influence on lower tier suppliers merit further study. Touboulic *et al.* (2014) could serve as a good starting point to explore the relationship between power and leadership in SSCM.

Second, future research could examine trust in SSCM. Trust is identified as a pre-condition of inter organizational learning and a corner stone for any type of collaborations (Spekman *et al.*, 2002). It is believed that "one's partner will act in a predictable manner, will keep his/her word, and will behave in a way that will not negatively affect the other" (Spekman *et al.*, 2002, p.44). According to Sako (1992), trust could be distinguished as contractual, competence and goodwill trust. Contractual trust indicates that partners adhere to a specific agreement; competence trust entails the belief that partner has the capabilities to fulfil a given set of tasks and finally goodwill trust exists when partners are willing to act in ways exceeding stipulated contractual agreements. Recently, Ojha *et al*. (2016) empirically find that trust is significantly related to supply chain learning. Meqdadi *et al.* (2017) propose that both power and trust significantly impact the supply network actors' engagement in sustainability initiatives and its wider spread in supply networks.

Third, future research could look into organizational culture. Culture is the central norms of an organization which shape its behaviours and attitudes (Schwartz and Davis, 1981). Culture also influence organizations' ability to learn and absorb knowledge (Spekman *et al*., 2002) and the shared culture among supply chain could sustain the learning efforts (Biotto *et al.*, 2012). The three case studies reflect on this point that all the MNCs have a traditional

culture of focusing on sustainability, whilst suppliers which have a supportive culture of openness, experimentation and entrepreneurship tend to be ahead of their peers to embrace SSCM in their practices.

Fourth, another area worth researching is institutional environment. Developing countries' institutional environment is featured as turbulent, high degree of uncertainty and complexity (Golgeci and Arslan, 2014; Silvestre, 2015). Future research may explore how the changing institution environment influence supply chain learning. This research touched the surface of the topic however didn't go into details. For example, one motive for Tetra Pak to proactively create a recycling chain is being ahead of China's government legislation and show its goodwill to the government; the Shuangcheng local government are quite supportive to Nestlé's DFI initiative; and finally the implementation of IKEA's sustainable cotton initiative first met obstacles because of the national cotton reserve policy, then it gained support after cancelling of this policy.

Fifth, the survey method can be applied in supply chain leadership research. The second order constructs of transformational and transactional leadership are generated from individual leadership theories, and no doubt that leadership at the organizational level is different from leadership at individual level. Researchers in the future could apply a survey method to study the second order constructs of leadership theory at a supply chain level. This research summarizes the focal companies' leadership behaviours, which could serve as the starting point.

Sixth, followership theories could be applied to study multi-tier SSCM implementation from the suppliers' perspectives. There are no leaders without

the followers. Defee *et al.* (2009b; 2010) point out that supply chain followers may have a bigger impact on supply chain performance than supply chain leaders. Thus, what role do suppliers play in SSCM? What followership behaviours do they exhibit in the implementation process? Researchers could first study the followership styles of Tier 1 suppliers and then move on to lower tiers. Furthermore, it could be interesting to study Tier 1 suppliers, applying both supply chain leadership and supply chain followership theories. One could compare the study with Wilhelm *et al.* (2016b) on the double-agency role of the first tier supplier in implementing SSCM practices.

Seventh, future research could focus on small and medium enterprises' (SMEs) supply chain leadership. How do SMEs successfully implement sustainable initiatives in their multi-tier supply chains? What supply chain leadership behaviours do they exhibit in the process? Whether their leadership styles are different from large MNCs? Researchers could apply multiple case studies to explore answers to these research questions.

Finally, future research could explore the research topic of supply chain finance in multi-tier supply chains (Wuttke *et al.*, 2013; Gelsomino *et al.*, 2016). The three case studies provide examples of how MNCs provide financial support to its suppliers: Nestlé provide financial guarantee and financial subsidiary to dairy farms and Tetra Pak provide equipment support to recyclers and liaise with financial institutes to provide financial advice for recyclers. The traditional supply chain research focuses on the logistics and information flows but lacks the study of finance flows. How MNCs facilitate the multi-tier SSCM through supply chain finance need more studies.

8.6 Final words

During the three year PhD program, I have fortunately had the chance to study MNCs' proactive multi-tier SSCM in China extensively. I have had one paper been published by the *Journal of Cleaner Production*, and several papers in the development process – a summary of these works can be found in Appendix E. By observing the MNCs' practices, I hope my research could open new avenues of research in SSCM and multi-tier supply chains and provide the best practices of the MNC cases for other companies to learn.

Together, we can make a better world!

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Appendix

Appendix A A summary of previous SSCM literature review papers

No	Author	Title	Journal	No. of papers	Coverage	Main topic
1	Srivastava (2007)	Green supply-chain management: A state-of-the-art literature review	International Journal of Management Reviews	227	>1990	A review on GSCM studies of the importance of GSCM, green design and green operations;
2	Carter and Rogers (2008)	A framework of sustainable supply chain management: moving toward new theory	International Journal of Physical Distribution & Logistics Management	NA	NA	From literature review to a conceptual model of SSCM;
3	Seuring and Muller (2008)	From a literature review to a conceptual framework for sustainable supply chain management	Journal of Cleaner Production	191	1994-2007	From literature review to a conceptual model SSCM;
4	Gold *et al.* (2010)	Sustainable Supply Chain Management and Inter-Organizational Resources: A Literature Review	Corporate Social Responsibility and Environmental Management	70	1994-2007	Link SSCM with inter-organizational resources;

5	Carter and Easton (2011)	Sustainable supply chain management: evolution and future directions	International Journal of Physical Distribution & Logistics Management	80	1991-2010	The evolution and future research directions for SSCM;
6	Sarkis *et al.* (2011)	An organizational theoretic review of green supply chain management literature	International Journal of Production Economics	NA	NA	The application of organizational theories in GSCM literatures;
7	Abbasi and Nilsson (2012)	Themes and challenges in making supply chains environmentally sustainable	Supply Chain Management: An International Journal	190	-2009	Major themes and challenges in environmental SSCM;
8	Ashby *et al.* (2012)	Making connections: a review of supply chain management and sustainability literature	Supply Chain Management: An International Journal	134	1983-2011	Link SCM with social and environmental dimensions of sustainability;
9	Gimenez and Tachizawa (2012)	Extending sustainability to suppliers: a systematic literature review	Supply Chain Management: An International Journal	41	1996-2011	Supplier assessment and collaboration are effective mechanism in improving supply chain sustainability;
10	Hassini *et al.* (2012)	A literature review and a case study of sustainable supply chains with a focus on metrics	International Journal of Production Economics	87	2000–2010	Literature review on SSCM with performance measures and propose a conceptual model for SSCM metrics;
11	Hoejmose and Adrien-Kirby (2012)	Socially and environmentally responsible procurement: A literature review and future research agenda of a	Journal of Purchasing & Supply Management	188	2000–2010	Literature review on socially and environmentally responsible procurement;

		managerial issue in the 21st century				
12	Miemczyk *et al.* (2012)	Sustainable purchasing and supply management: a structured literature review of definitions and measures at the dyad, chain and network levels	Supply Chain Management: An International Journal	73	NA	Three levels of analysis in sustainable purchasing and supply management studies;
13	Ahi and Searcy (2013)	A comparative literature analysis of definitions for green and sustainable supply chain management	Journal of Cleaner Production	180	<2012	Focus on GSCM and SSCM definitions;
14	Herva and Roca (2013)	Review of combined approaches and multi-criteria analysis for corporate environmental evaluation	Journal of Cleaner Production	NA	>2000	Review three types of environmental evaluation methodologies;
15	Igarashi *et al.* (2013)	What is required for greener supplier selection? A literature review and conceptual model development	Journal of Purchasing & Supply Management	60	1991-2011	Examine the existing literature on green supplier selection;
16	Seuring (2013)	A review of modeling approaches for sustainable supply chain management	Decision Support Systems	36	1997-2010	Quantitative models for forward sustainable supply chains;

17	Taticchi *et al.* (2013)	Performance measurement of sustainable supply chains A literature review and a research agenda	International Journal of Productivity and Performance Management	205	2002-2012	literature review of sustainable supply chain performance measurement;
18	Winter and Knemeyer (2013)	Exploring the integration of sustainability and supply chain management Current state and opportunities for future inquiry	International Journal of Physical Distribution & Logistics Management	456	1995-2010	Review the intersection of “sustainability” and “supply chain management”;
19	Beske *et al.* (2014)	Sustainable supply chain management practices and dynamic capabilities in the food industry: A critical analysis of the literature	International Journal of Production Economics	52	2002-2011	Examine SSCM and Dynamic Capabilities(DCs) in the food industry;
20	Brandenburg *et al.* (2014)	Quantitative models for sustainable supply chain management: Developments and directions	European Journal of Operational Research	134	1994-2012	Review the mathematical models that focus on environmental or social factors in forward supply chains;
21	Schaltegger and Burritt (2014)	Measuring and managing sustainability performance of supply chains Review and sustainability supply chain management framework	Supply Chain Management: An International Journal	NA	NA	Literature review and analytical framework for the measurement and management of sustainability performance of supply chains;
22	Tachizawa and Wong (2014)	Towards a theory of multi-tier sustainable supply chains: a systematic literature review	Supply Chain Management: An International Journal	39	2000-2014	Build a conceptual framework to manage the sustainability of multi-tier supply chains;

23	Ahi and Searcy (2015a)	An analysis of metrics used to measure performance in green and sustainable supply chains	Journal of Cleaner Production	445	1989-2012	Review the metrics that have been published in GSCM and SSCM literatures;
24	Ahi and Searcy (2015b)	Measuring social issues in sustainable supply chains	Measuring Business Excellence	39	2001-2012	Review the social metrics in SSCM;
25	Bai *et al.* (2015)	Corporate sustainability development in China: review and analysis	Industrial Management & Data Systems	189	1997-2013	Review corporate sustainability development (CSD) research in China;
26	Beske-Janssen *et al.* (2015)	20 years of performance measurement in sustainable supply chain management – what has been achieved?	Supply Chain Management: An International Journal	149	1998-2014	Review SSCM performance measurement;
27	Eskandarpour *et al.* (2015)	Sustainable supply chain network design: An optimization-oriented review	Omega	87	1990-2014	Review supply chain network design which consider economic factors as well as environmental and/or social dimensions;
28	Fahimnia *et al.* (2015)	Green supply-chain management: A review and bibliometric analysis	International Journal of Production Economics	884	1992-2013	A bibliometric analysis on green supply chain management literatures;
29	Khalid *et al.* (2015)	Putting sustainable supply chain management into base of the pyramid research	Supply Chain Management: An International Journal	77	2000-2014	Link SSCM with the base of the pyramid related research;
30	Meixell and Luoma (2015)	Stakeholder pressure in sustainable supply chain	International Journal of Physical Distribution & Logistics Management	250	>1994	Review how stakeholder pressure influence SSCM;

		management A systematic review				
31	Tajbakhsh and Hassini (2015)	Performance measurement of sustainable supply chains: a review and research questions	International Journal of Productivity and Performance Management	140	1994-2013	Review journal articles, cases and reports to develop a performance measurement framework.
32	Taticchi *et al.* (2015)	A review of decision-support tools and performance measurement and sustainable supply chain management	International Journal of Production Research	384	2000-2013	Review decision-support tools and performance measurement for SSCM;
33	Touboulic and Walker (2015b)	Theories in sustainable supply chain management: a structured literature review	International Journal of Physical Distribution & Logistics Management	308	1995-2013	Review the theories applied in SSCM;
34	Wong *et al.* (2015)	Integrating environmental management into supply chains A systematic literature review and theoretical framework	International Journal of Physical Distribution & Logistics Management	142	1994-2012	Apply stakeholder and resource orchestration theories on emerging environmental practices;
35	Gosling *et al.* (2016)	The role of supply chain leadership in the learning of sustainable practice: toward an integrated framework	Journal of Cleaner Production	44	NA	Embrace supply chain leadership and supply chain learning in a SSCM conceptual framework;
36	Kremer *et al.* (2016)	Directions for instilling economic and environmental	Journal of Cleaner Production	NA	NA	Combine SSCM and product development;

		sustainability across product supply chains				
37	Quarshie *et al.* (2016)	Sustainability and corporate social responsibility in supply chains: The state of research in supply chain management and business ethics journals	Journal of Purchasing & Supply Management	195	2007-2013	Examine sustainability and corporate social responsibility (CSR) issues in supply chains management and business ethics fields, call for research on transformational leadership;
38	Schoggl *et al.* (2016)	Toward supply chain-wide sustainability assessment: a conceptual framework and an aggregation method to assess supply chain performance	Journal of Cleaner Production	61	1998-2014	Review and conceptual framework of sustainability assessment in supply chains;
39	Zimmer et al. (2016)	Sustainable supplier management – a review of models supporting sustainable supplier selection, monitoring and development	International Journal of Production Research	143	1997-2014	Analyse and review literatures on formal models supporting decision-making in sustainable supplier selection, monitoring and development.

Appendix B Cover letter for selected companies

Supply chain learning of sustainability in China:

What role does MNCs' leadership play?

Research background

Sustainable supply chain management has been a hot topic in recent years. With globalization and more outsourcing activities, companies have been facing a more complex task of managing their supply chains and associated risks imposed by their supply chains members. Companies cannot label themselves sustainable unless the whole supply chain been sustainable.

In practice, major Western-based MNCs respond proactively to the constraints of scarce resources and environmental degradation. However adequate their actions, they usually claim to integrate sustainability as part of their strategy and tend to assume a leadership role in their supply chains in emerging economies with an aim to implementing various practices aiming at improved sustainability along with quality, price and reliability. In this research, I aim to explore the leadership role assumed by MNCs to facilitate the learning of sustainable practice in their supply chains and answer following research question:

> *"How do MNCs assume a supply chain leadership role in facilitating supply chain learning in multi-tier SSCM?"*

Format/time scale

Face to face/telephone one to one interview lasting about 1 hour with key individuals involved in sustainability at XXXX (company name).

Project contact and interviewer

Mr Yu Gong, MSc (Cranfield, UK), BSc (WHUT; HUST; Dual degrees)
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Mr Yu Gong (Jack) is a PhD researcher specializing in sustainable supply chain management (SSCM) at the University of Exeter Business School, UK. In his industry experience, he has worked and consulted extensively with multiple industries and large scale clients such as 3M, BAT, Nestlé Malaysia, TCL, PCCC and BMW China on both supply chain management and related IT consulting projects. Before doing his PhD, he worked as a project manager at Capgemini. His technical expertise includes supply chain and logistics network optimization, demand forecast and fulfilment using JDA software.

Jack has been trained as a supply chain management professional throughout. He obtained his Master in Logistics and Supply Chain Management from Cranfield in 2010 and holds dual bachelor degree in Logistics Engineering from Wuhan University of Technology and Public Administration from Huazhong University of Science and Technology. Jack has published one conference paper in the 21st EuroMA conference, worked on a teaching case in the review process and working in progress for a conceptual paper for *Journal of Cleaner Production*.

Deliverable

I would like to produce and share with you a case report devoted to XXXX (company name).

Sample interview questions:

- What is your understanding of sustainable supply chain management?

- How does your company link sustainability with supply chain management? Please specify by examples.

- Which department leads SSCM projects internally? What other departments/functions have been involved and what role do they assume?

- How do Chinese customers and/or suppliers (Tier 1 & Tier 2 or even the whole upstream) learn in SSCM projects? How does your company help them in the learning process?

- Do you consider your company the leader in SSCM projects or creating SSCM in general in an emerging economy e.g., China? If yes, how (in what ways) your leadership affect SSCM? Or how does leadership affect the creation of sustainable supply chain?

Appendix C Interview protocol

Interview protocol for focal company

SSCM related questions

1. 贵公司如何理解可持续发展供应链？可持续发展供应链的战略是怎样的？与其他公司相比该战略是消极，相当或是更积极？

How does your company understand SSCM? What is your company SSCM strategy? How do you position your company's SSCM strategy when compared with others?

2. 该可持续发展供应链战略的制定更多的倾向于防范供应链风险或是赢得市场先机？请列举项目说明。

What motivated you to adopt the SSCM strategy, risk mitigation-orientation or opportunity-orientation? Could you specify with examples?

3. 可持续发展供应链项目有哪些？主要由什么部门主导？还有那些部门参与，分别扮演什么角色？请按具体项目举例说明。

Which SSCM projects do you implement? Which department leads SSCM projects internally? What other departments/functions have been involved and what role do they assume? Please specify with real sustainable SCM project examples.

4. 可持续发展供应链项目在实施过程中的障碍因素有哪些？怎么解决的？

What are the barriers when your company implements SSCM projects? How do you solve them?

请举例说明：

Please specify by examples:

Supply chain learning related questions

1. 可持续发展供应链项目在实施的过程中，中国客户和供应商（tier1; tier2 整个上游供应链）是如何学习的？贵公司如何帮助客户或供应商学习？贵公司在项目过程中有没有从客户和供应商学到什么？

How do Chinese customers and/or suppliers (Tier 1 & Tier 2 or even the whole upstream) learn in SSCM projects? How does your company help them in the learning process? Does your company also learn from your customers and suppliers?

2. 可持续发展供应链项目中贵公司、供应商和客户学习了哪些知识？采用怎样的形式？运用了哪些工具？

What specific knowledge do your suppliers, customers and your company learn? In which formats? And what tools have you used?

Supply chain leadership:

1. 贵公司在可持续发展供应链项目中是否扮演了领导角色？如果是，你们是如何理解供应链领导力；供应链领导力对可持续发展供应链有何影响，或者说它怎样影响建立了可持续发展供应链？

Do you consider your company the leader in SSCM projects or creating SSCM in general in China? If yes, how do you understand SC leadership; how (in what ways) does leadership affect SSCM? Or how does leadership affect the creation of sustainable supply chain?

2. 供应商对贵公司可持续发展供应链认同度如何; 参与度如何？供应商在参与过程中大致有哪些不同的类别？

To which extend do your customers and suppliers take part in SSCM (proactive or reactive engagement; critical thinking)? How do you classify the suppliers while implementing SSCM projects? Please specify with project examples (SC followership, supplier portfolio).

3. 贵公司如何区别对待这些不同类别的供应商？

How does your company deal with these different types of suppliers?

4. 供应链领导力在可持续发展供应链实践的学习的过程中发挥了怎样的作用？

What role does supply chain leadership play in the learning process of SSCM practice?

5. 还有什么其它因素决定供应商学习的结果？

Are there any other factors affect the results of supply chain learning?

在访谈结束后询问：

At the end of the interview, ask:

在后续的访谈中能否采访贵公司供应商和客户，如果项目覆盖了二级供应商，能否也帮忙采访到他们？

Shall I interview these suppliers and customers? If your project covers Tier 2 suppliers, would you also help us to interview with them?

Interview protocol for 1st tier suppliers

让供应商谈 focal company 一起做的 SSCM 项目 （他们应该谈的是同一个项目）。

The same SSCM project as the focal company mentioned

SSCM related questions:

1. 为什么贵公司参与 XX 公司的可持续发展供应链项目？

Why does your company take part in XX company's SSCM project? (motivations)

2. 贵公司最初如何理解可持续发展供应链，现在又是怎样理解的？这种思想/观点/行为是如何发生转变的？

What's your view on SSCM at the beginning and now? How has fact that you have worked on this SSCM project changed your mind-set/thinking/behaviours?

3. 在可持续发展供应链项目中贵公司遇到了哪些困难？如何解决的？

What difficulties have you company met in SSCM project? How do you deal with them?

4. 在项目执行过程中 XX 公司为贵公司提供了怎样的帮助？

How does XX company help your company in implementing SSCM project?

5. 可持续发展供应链项目是否为贵公司带来了积极的效益？对与 XX 公司的关系有何影响？

Does SSCM project have a positive effect on your company? What is the effect for the relationship between your company and XX company?

Supply chain learning related questions:

1. 在可持续发展供应链项目中贵公司学习了什么，在您看来 XX 从贵公司学到了什么？

What have you learnt from the SSCM project and what has xx company learnt in your view?

2. 学习的过程中采用怎样的形式？运用了哪些工具？哪种形式和工具在您看来是最有效的？

Which formats has been used during the learning process? And what tools have you used? Which format and tool is most effective?

Supply Chain leadership related questions:

1. 您认为 XX 公司在可持续发展供应链项目中，亦或供应链中是否扮演了领导者的角色？为什么？能否举例说明？如果没有，有没有其他公司扮演领导者角色？

Do you consider xx company a leader in this SSCM project and even the supply chain? Why? Could you provide some examples? If not, are there any other companies play the leadership role?

2. XX 公司的 SC leadership 是怎么影响你们学习 SSCM practice？

How do XX company's leadership affect your learning of SSCM practices?

3. 除了 SC leadership，还有什么其它因素影响你们学习 SSCM practice？

Except SC leadership, are there any other factors affect your learning of SSCM practices?

Interview protocol for 2nd tier suppliers

The same SSCM project as the focal company mentioned.

SSCM related questions:

1. 为什么贵公司参与 XX 公司的可持续发展供应链项目？

Why does your company take part in XX company's SSCM project? (motivations)

2. 贵公司最初如何理解可持续发展供应链，现在又是怎样理解的？这种思想/观点/行为是如何发生转变的？

What's your view on SSCM at the beginning and now? How has fact that you have worked on this SSCM project changed your mind-set/thinking/behaviors?

3. 在可持续发展供应链项目中贵公司遇到了哪些困难？如何解决的？

What difficulties have you company met in SSCM project? How do you deal with them?

4. 在项目执行过程中 XX 公司为贵公司提供了怎样的帮助？一级供应商为贵公司提供了怎样的帮助？

How does XX company help your company in implementing SSCM project? How does 1st tier suppliers help your company in implementing SSCM project?

5. 可持续发展供应链项目是否为贵公司带来了积极的效益？对与 XX 公司的关系有何影响？

Does SSCM project have a positive effect on your company? What is the effect for the relationship between your company and XX company?

Supply chain learning related questions:

1. 在可持续发展供应链项目中贵公司学习了什么，对贵公司与一级供应商的关系有何影响？对与 XX 公司的关系有何影响？

Does SSCM project have a positive effect on your company? What is the effect for the relationship of your company and 1st tier company? What is the effect for the relationship of your company and XX company?

2. 学习的过程中采用怎样的形式？运用了哪些工具？哪种形式和工具在您看来是最有效的？

Which formats has been used during the learning process? And what tools have you used? Which format and tool is most effective?

Supply Chain leadership related questions:

1. 您认为 XX 公司在可持续发展供应链项目中，亦或供应链中是否扮演了领导者的角色？为什么？能否举例说明？如果没有，有没有其他公司扮演领导者角色？

Do you consider xx company a leader in this SSCM project and even the supply chain? Why? Could you provide some examples? If not, are there any other companies play the leadership role?

2. 一级供应商在可持续发展供应链项目中是否扮演了领导者的角色？为什么？能否举例说明？

Do your 1st tier a leader in this SSCM project and even the supply chain? Why? Could you provide some examples?

3. XX 公司和一级供应商的 SC leadership 是怎么影响你们学习 SSCM practice？

How do XX company's, and 1st tier supplier's leadership affect your learning of SSCM practices?

4. 除了 SC leadership，还有什么其它因素影响你们学习 SSCM practice？

Except SC leadership, are there any other factors affect your learning of SSCM practices?

Appendix D Interview photos

Tetra Pak's recycling chain

Figure 1 Tetra Pak's Shanghai plant

Figure 2 Product made from UBCs by Tetra Pak recycling partner

Figure 3 Tetra Pak recycling partner – Fulun

Figure 4 Fulun's production site

Figure 5 Fulun's paper production line

Figure 6 Polyethylene grain made from UBCs

Figure 7 Nestlé's DFI partners at a glance

Figure 8 The participated training event by author in DFI

Figure 9 A type ‘B’ dairy farm

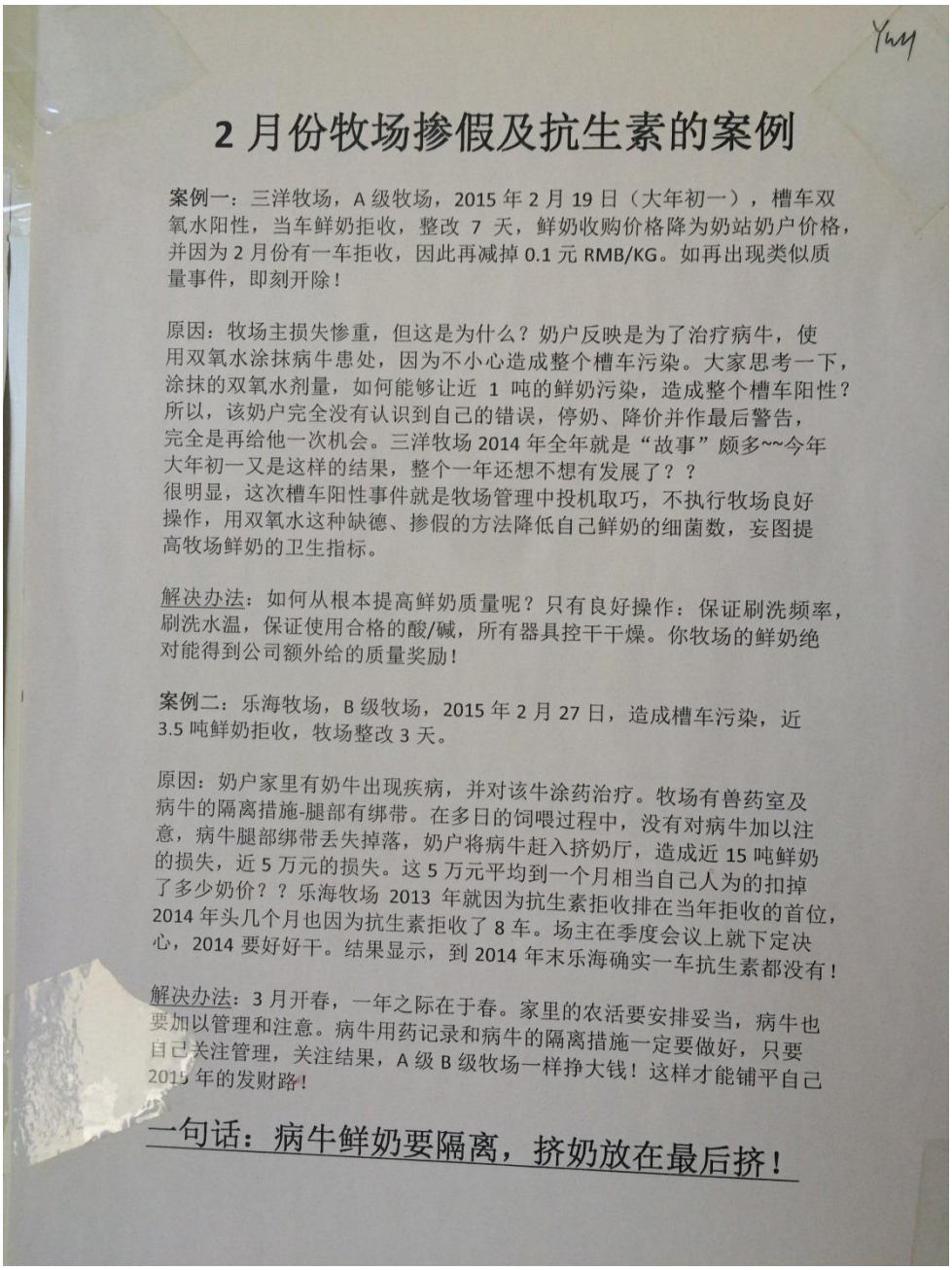
Figure 10 “Cow hotel”

Figure 11 Milk collection centre

Figure 12 Posters outside the milk collection centre

Figure 13 Management reviews and action plans
(Nestlé Technical Assistant made for a “cow hotel”)

Figure 14 Nestlé Internal documents



2 月份牧场掺假及抗生素的案例

案例一：三洋牧场，A 级牧场，2015 年 2 月 19 日（大年初一），槽车双氧水阳性，当车鲜奶拒收，整改 7 天，鲜奶收购价格降为奶站奶户价格，并因为 2 月份有一车拒收，因此再减掉 0.1 元 RMB/KG。如再出现类似质量事件，即刻开除！

原因：牧场主损失惨重，但这是为什么？奶户反映是为了治疗病牛，使用双氧水涂抹病牛患处，因为不小心造成整个槽车污染。大家思考一下，涂抹的双氧水剂量，如何能够让近 1 吨的鲜奶污染，造成整个槽车阳性？所以，该奶户完全没有认识到自己的错误，停奶、降价并作最后警告，完全是再给他一次机会。三洋牧场 2014 年全年就是“故事”颇多~~今年大年初一又是这样的结果，整个一年还想不想有发展了？？
很明显，这次槽车阳性事件就是牧场管理中投机取巧，不执行牧场良好操作，用双氧水这种缺德、掺假的方法降低自己鲜奶的细菌数，妄图提高牧场鲜奶的卫生指标。

解决办法：如何从根本提高鲜奶质量呢？只有良好操作：保证刷洗频率，刷洗水温，保证使用合格的酸/碱，所有器具控干干燥。你牧场的鲜奶绝对能得到公司额外给的质量奖励！

案例二：乐海牧场，B 级牧场，2015 年 2 月 27 日，造成槽车污染，近 3.5 吨鲜奶拒收，牧场整改 3 天。

原因：奶户家里有奶牛出现疾病，并对该牛涂药治疗。牧场有兽药室及病牛的隔离措施-腿部有绑带。在多日的饲喂过程中，没有对病牛加以注意，病牛腿部绑带丢失掉落，奶户将病牛赶入挤奶厅，造成近 15 吨鲜奶的损失，近 5 万元的损失。这 5 万元平均到一个月相当自己人为的扣掉了多少奶价？？乐海牧场 2013 年就因为抗生素拒收排在当年拒收的首位，2014 年头几个月也因为抗生素拒收了 8 车。场主在季度会议上就下定决心，2014 要好好干。结果显示，到 2014 年末乐海确实一车抗生素都没有！

解决办法：3 月开春，一年之际在于春。家里的农活要安排妥当，病牛也要加以管理和注意。病牛用药记录和病牛的隔离措施一定要做好，只要自己关注管理，关注结果，A 级 B 级牧场一样挣大钱！这样才能铺平自己 2015 年的发财路！

一句话：病牛鲜奶要隔离，挤奶放在最后挤！

Figure 15 Poster to dairy farms on misconduct behaviour

Figure 16 Nongxi cotton co-operative

Figure 17 Better cotton stocked in a textile supplier

Figure 18 An IKEA Tier 1 supplier

Figure 19 Plant tour in the Tier 1 supplier

Figure 20 Production with BCI cotton

Appendix E Publications and publications in preparation

Peer reviewed papers based on my PhD

Gosling, J., Jia, F., Gong, Y. and Brown, S. (2016). “The role of supply chain leadership in the learning of sustainable practice: toward an integrated framework”. *Journal of Cleaner Production*, 137, 1458-1469.

Gong, Y., Jia, F. and Brown, S., “Nestlé: Modernizing China’s Dairy Industry”, a teaching case under review by *Emerging Markets Case Studies* in May, 2017.

Gong, Y., Jia, F. and Brown, S., “Tetra Pak: Creating a Recycling Chain in China”, a teaching case under review by *Ivey Case Publisher* in May, 2017.

Papers in the preparation based on my PhD

Gong, Y., Jia, F., Brown, S. and Koh, S.C.L., “Supply chain learning of sustainability in multi-tier supply chains: a resource orchestration perspective”, to be submitted to *International Journal of Production and Operations Management* (IJPOM) in June 2017.

Gong, Y., Jia, F. and Brown, S., “Multiple multi-tier supply chain management: a single-case study on IKEA’s sustainable cotton initiative in China”, to be submitted to *International Journal of Production Economics (IJPE)* in September 2017.

Gong, Y., Jia, F. and Brown, S., “Supply chain leadership in multi-tier sustainable supply chains”, to be submitted to *Journal of Business Ethics (JBE)* in December 2017.