Lean Supply Chain Management in SMEs:
A Case Study of a New Zealand Company

Gao Chen

A thesis submitted for
the degree of Master of Commerce
at the University of Otago, Dunedin New Zealand
February 2017
Abstract

In the modern business world, the competition among companies has been generally becoming the competition among supply chains (SCs). Supply chain management (SCM) is playing an increasingly significant role in running a business regardless of its size. Lean Thinking, as a useful tool to enhance the efficiency of the production process, it can also be used in the other processes and fields in a general business including SCM.

This thesis focuses on the Lean supply chain management (LSCM) in a company of the small and medium-sized enterprises (SME) and uses literature analysis and case study as the research strategy. In the literature review, key concepts such as SC, SCM, Lean Thinking, and LSCM will be introduced and reviewed; the model of SCM and the principles of Lean Thinking will be discussed. All of these are the theory preparation for LSCM implementation.

By single case study, this research aims at finding out how the case company did the Lean implementation in the company and throughout its SC and what effects were achieved, exploring the reason why some Lean practices are suitable for an SME to improve its SCM and some others are not, and developing a theoretical explanation of what LSCM is for an SME and how to achieve it. This research tries to cast light on filling the gap in the existing theoretical research on LSCM in SMEs.

As an employee in the case company, I adopted an empathetic stance, entered the company, and observed the research phenomenon from the inside of the company. This provided me a major advantage in collecting valuable data (both of primary data and secondary data), understanding the real situation, and conducting deep analysis.

As a single case study on a New Zealand SME, this thesis has some inherent difficulties with generalizing its research findings. But some general problems that the case company encounters are similar with the ones other companies have, especially for the companies in the promotional product industry and some SMEs with similar SC structure. So, some conclusions of the case study, for example the characteristics of LSCM, the method of applying lean principles and arranging lean implementation process, can be generalized to a wider scope.
Acknowledgements

I feel honored for being able to have this precious opportunity to study in this prestigious university. And I am very grateful for having so many outstanding people who have offered generous help in the process of completing this research.

Firstly, I would like to express my deep gratitude to my supervisor, Professor André Everett. Thank you for the guidance on my study, research, and living abroad. It was a great experience working with you which was significantly beneficial to increasing my knowledge and broadening my horizon.

Secondly, I want to give my sincere thanks to the support staff in management department: Sue McSkimming, Leanne Skryba, Lu Cox, and Nancy Benington. They did great supporting and problem-solving job which helped me a lot when I was studying in the department.

Finally, the case study was strongly supported by the case company, Tuapeka Gold Print, from the managers to the employees. It was a unique opportunity for me to deeply understand the promotional product industry, the wisdom of running an SME and managing its SC with Lean Thinking. All interviewees in the case study shared their experience, knowledge, and opinions without holding back, which contributed a lot to the completion of this thesis.
# Contents

ABSTRACT ............................................................................................................... I

ACKNOWLEDGEMENTS ...................................................................................... II

CONTENTS ........................................................................................................... III

LIST OF TABLES ................................................................................................... VI

LIST OF FIGURES ............................................................................................... VII

LIST OFABBREVIATIONS .................................................................................... VIII

1. INTRODUCTION ............................................................................................. 1

1.1. RESEARCH BACKGROUND ............................................................................ 1

1.1.1. The Importance of Supply Chain Management ............................................. 1

1.1.2. Lean Production and Lean Supply Chain Management ............................... 2

1.1.3. Current Denominators of L SCM Research ............................................... 3

1.2. OVERVIEW OF THIS RESEARCH ................................................................... 4

1.2.1. Research Questions ................................................................................... 4

1.2.2. Research Purpose ..................................................................................... 5

1.2.3. Thesis Organization .................................................................................. 5

2. LITERATURE REVIEW .................................................................................... 7

2.1. SUPPLY CHAIN ........................................................................................... 7

2.1.1. The Definition of Supply Chain ................................................................. 7

2.1.2. The Structure of Supply Chain .................................................................. 9

2.2. SUPPLY CHAIN MANAGEMENT .................................................................... 13

2.2.1. The Definition of Supply Chain Management ............................................ 14

2.2.2. The Key Elements in Supply Chain Management ..................................... 16

2.2.3. The Model of Supply Chain Management ............................................... 19

2.3. LEAN ........................................................................................................... 20

2.3.1. Toyota Production System ....................................................................... 20

2.3.2. Lean Production and Lean Thinking ......................................................... 23

2.4. LEAN SUPPLY CHAIN MANAGEMENT ...................................................... 25

2.4.1. Principles of Lean Supply Chain Management ......................................... 25

2.4.2. Identifying the Wastes in a Supply Chain ................................................ 27

2.4.3. Implementing L SCM .............................................................................. 28

3. RESEARCH METHODOLOGY ......................................................................... 34

3.1. RESEARCH PHILOSOPHY ............................................................................ 34

3.1.1. Positivism ............................................................................................... 35

3.1.2. Interpretivism ........................................................................................... 36

3.1.3. Realism .................................................................................................... 36

3.2. RESEARCH APPROACH .............................................................................. 37

3.2.1. Deduction ............................................................................................... 38
6.3. LIMITATIONS OF THIS RESEARCH ................................................................. 94
6.4. FUTURE RESEARCH OPPORTUNITIES ....................................................... 95
7. REFERENCES ........................................................................................................ 97
8. APPENDICES ....................................................................................................... 102
8.1. PARTICIPANT INFORMATION AND CONSENTS ........................................ 102
8.2. THE OUTLINE OF THE INTERVIEW QUESTIONS ..................................... 106
List of Tables

TABLE 1 DEFINITIONS OF SCM ............................................................................................................. 15
TABLE 2 DIFFERENT MEANING OF THE FIVE PRINCIPLES OF PRODUCTION AND SCM .................. 26
TABLE 3 SEVEN WASTES IN SC ........................................................................................................... 29
TABLE 4 FEATURES OF THE TRADITIONAL LEAN TOOLS ................................................................... 32
TABLE 5 MAJOR DIFFERENCES BETWEEN DEDUCTION AND INDUCTION ........................................ 39
TABLE 6 RELEVANT SITUATIONS FOR DIFFERENT RESEARCH STRATEGIES ....................................... 40
TABLE 7 CASE STUDY PROTOCOL ....................................................................................................... 42
TABLE 8 FUNDAMENTAL DIFFERENCES BETWEEN QUANTITATIVE AND QUALITATIVE RESEARCH ........... 45
TABLE 9 CLASSIFICATION OF ENTERPRISE SIZE IN NEW ZEALAND .................................................. 49
TABLE 10 PRODUCT LINE STRUCTURE ............................................................................................... 50
TABLE 11 “TIM WOODS” WASTES IDENTIFIED ................................................................................... 79
List of Figures

FIGURE 1 V Model ................................................................. 6
FIGURE 2 Three Degrees of SC Structure ............................................. 10
FIGURE 3 Structure with Two Flows .................................................. 11
FIGURE 4 Multi-tier SC Structure .................................................... 12
FIGURE 5 Multi-tier SC Structure and Business Process Links ................. 13
FIGURE 6 Two Perspectives of SCM ................................................ 16
FIGURE 7 Nine Key Elements in SCM ............................................. 18
FIGURE 8 The Model of SCM ...................................................... 19
FIGURE 9 Four Categories of TPS Principles ..................................... 21
FIGURE 10 TPS House .................................................................. 23
FIGURE 11 Lean Tools ................................................................... 30
FIGURE 12 The Leader Framework .................................................. 33
FIGURE 13 The Research Process ‘Onion’ .......................................... 34
FIGURE 14 Types of Secondary Data ................................................ 43
FIGURE 15 Forms of Interview ....................................................... 44
FIGURE 16 Printing and Manufacturing Processes .............................. 50
FIGURE 18 VSM – Future Status ..................................................... 59
FIGURE 19 VSM – Current Status .................................................... 59
FIGURE 20 Lean Implementation Process in the Case Company ............. 62
FIGURE 21 The Result of the Lean Assessment .................................... 64
FIGURE 22 SWOT Analysis on the Lean Assessment Result .................. 64
FIGURE 23 Pyramid of the Lean Implementation Plan ............................ 66
FIGURE 24 Comparison of the Transit Times ...................................... 72
FIGURE 25 Bidirectional Value in SC ............................................... 75
FIGURE 26 The Characteristics of SCM Match-up with Lean ................ 83
FIGURE 27 The Characteristics of LSCM .......................................... 84
FIGURE 28 The Case Company’s SC Structure ................................... 85
FIGURE 29 Supplier Quantities by Country ........................................ 86
FIGURE 30 Relations Among Different Flows ..................................... 88
FIGURE 31 Three Steps to LSCM .................................................... 89
## List of Abbreviations

| Abbreviation | Description
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>APPA</td>
<td>Australasian Promotional Product Association</td>
</tr>
<tr>
<td>BPR</td>
<td>Business Process Reengineering</td>
</tr>
<tr>
<td>CBM</td>
<td>Cubic Meter</td>
</tr>
<tr>
<td>FBIC</td>
<td>Fung Business Intelligence</td>
</tr>
<tr>
<td>FCL</td>
<td>Full Container Load</td>
</tr>
<tr>
<td>FG</td>
<td>Finished Goods</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>IMVP</td>
<td>International Motor Vehicle Program</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>JIT</td>
<td>Just-In-Time</td>
</tr>
<tr>
<td>KISS</td>
<td>Keep It Simple, Stupid</td>
</tr>
<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
</tr>
<tr>
<td>LCL</td>
<td>Less Than Container Load</td>
</tr>
<tr>
<td>LP</td>
<td>Lean Production</td>
</tr>
<tr>
<td>LSC</td>
<td>Lean Supply Chain</td>
</tr>
<tr>
<td>LSCM</td>
<td>Lean Supply Chain Management</td>
</tr>
<tr>
<td>MOQ</td>
<td>Minimum Order Quantity</td>
</tr>
<tr>
<td>NVA</td>
<td>Non-Value-Adding Actions</td>
</tr>
<tr>
<td>PDCA</td>
<td>Plan-Do-Check-Act</td>
</tr>
<tr>
<td>PPAI</td>
<td>Promotional Products Association International</td>
</tr>
<tr>
<td>RM</td>
<td>Raw Materials</td>
</tr>
<tr>
<td>RNVA</td>
<td>Required Non-Value-Adding Actions</td>
</tr>
<tr>
<td>SBA</td>
<td>U.S. Small Business Administration</td>
</tr>
<tr>
<td>SC</td>
<td>Supply Chain</td>
</tr>
<tr>
<td>SCM</td>
<td>Supply Chain Management</td>
</tr>
<tr>
<td>SME</td>
<td>Small And Medium-Sized Enterprise</td>
</tr>
<tr>
<td>SMED</td>
<td>Single-Minute Exchange Of Die</td>
</tr>
<tr>
<td>SQDCM</td>
<td>Safety, Quality, Delivery, Cost and Morale</td>
</tr>
<tr>
<td>TPM</td>
<td>Total Productive Maintenance</td>
</tr>
<tr>
<td>TPS</td>
<td>Toyota Production System</td>
</tr>
<tr>
<td>VAA</td>
<td>Value-Adding Actions</td>
</tr>
<tr>
<td>VSM</td>
<td>Value Stream Map</td>
</tr>
<tr>
<td>WIP</td>
<td>Work In Progress</td>
</tr>
</tbody>
</table>
1. Introduction

1.1. Research Background

To find out how a small and medium-sized enterprise (SME) can improve its supply chain management (SCM) by implementing Lean Thinking is the main research objective of this thesis. In the first section of Chapter 1, some basic research background information will be introduced.

1.1.1. The Importance of Supply Chain Management

The concept of SCM was coined in the 1980s. It has been recognized as an integrated management theory and approach, and one of the best ways to optimize the organizational performance (Kaihara, 2001). SCM integrates the supply chain (SC) members and the business processes across the SC trying to add value for both customers and shareholders by providing information, products and services (Croxton et al., 2001). After so many years’ development, it is playing an increasingly significant role in the modern business world.

The modern marketplace has been rapidly changing for many years driven by the combined impact of the changing macro-forces. Enterprises in many sectors today are facing a highly variable market environment that immersed in hyper-competition (D’Aveni, 1994). Constantly improving SCM is an inevitable choice for them.

Among these macro-forces, the technological advancement and economic globalization development should be two major forces. They significantly influenced the nature of both supply and demand.

The advancement of information technology (IT), especially the applying and spreading of internet and mobile internet, has transformed consumers and their consuming behaviors in a very profound way. Through these technologies, consumers can have a better and easier access to product information, more convenient and fast purchasing and paying channels. Information technology decreases transaction cost significantly, makes the market transactions more active, changes consumers’ consumption ideas, and gradually enhances social welfare. With the consumers’ advancing cognition degree of products, they are also demanding for lower prices, higher quality, more variety, and more functions. The diversified and personalized consumer demand brings enterprises in this buyer’s market more challenges. However, in the meanwhile, there are also new opportunities created. For example, using IT to manage the
SC process has become a general practice in the corporate world. IT is providing enterprises huge benefits by reducing labor cost and lead time, and improving SC efficiency and agility (Radjou, 2003).

In the background of economic globalization, capital, resources, and talents intend to exchange in worldwide scope. On one hand, enterprises can purchase raw materials (or other products and services) from anywhere in the world, so that they are able to select the best suppliers from a wide range of options, which will benefit them to lower the cost, higher the quality, and better meet customers’ demands. On the other hand, enterprises can expand their target market from partial to global, which will bring almost infinite market opportunities and global competitors. For enterprises, they can obtain opportunities of survival and development only by responding to and satisfying the customers’ demands rapidly. In the presence of diversified demands from a broad array of consumers, suppliers, manufacturers, distributors, or retailers, we should not ignore the importance of integrating both of upstream and downstream players in the whole SC. Each enterprise is a link in the SC, and it can enhance its competitiveness only by mutual collaboration in product designing, manufacturing, delivering, marketing and selling, etc.

1.1.2. Lean Production and Lean Supply Chain Management

SCM is aimed to manage the efficiency of both upstream and downstream business processes in a SC, and improve competitive advantages by achieving faster operation, better flexibility, and lower cost (Al-Mudimigh et al., 2004). These features of SCM coincide with some basic ideas of Lean Production (LP).

LP mainly originated from the Toyota Production System (TPS). After the World War 2, Japan’s economy took off and gained significant achievement in a consecutive 30 years. Japan’s industrial system which had been destroyed by the war was quickly rebuilt. Toyota was one of the start-ups during that period when the U.S. car companies were dominating the world automotive industry. In 1980s, Japanese automotive industry gradually caught up with and to some extent surpassed their competitors in the United States. This phenomenon caused tremendous attention from business community and academia.

Then the International Motor Vehicle Program (IMVP), which has become one of the oldest and largest international research consortiums in the world today, conducted thorough investigation and research on Japanese automobile manufacturers represented by Toyota. Researchers investigated many Japanese-owned automobile plants in different countries and did comparative research with U.S. automobile manufacturers such as Ford, GM, and Chrysler. Finally, they believed that the reason why Toyota succeeded was mainly
because of Toyota’s new production management method. In addition, this method is committed to eliminating all of the non-value-added activities, and enabling the manufacturer to keep a good balance between the economic efficiency of mass production and the flexibility of multi-product production.

The term of LP was first proposed by John Krafcik in 1988. And IMVP accepted it and continued to use it in their research. In 1990, Womack et al. published their famous book, The Machine That Changed the World, which was an important research achievement of IMVP. It was this book which made the term of LP known worldwide.

Afterward, many researchers started to investigate how to implement LP from automobile industry to other manufacturing industries, even to non-manufacturing industries; how to implement LP principles from production activities to other enterprise behaviors. So LP principles can be beneficial to a wider arrange of enterprises in many different aspects.

Because Lean set up a methodology that aims at adding value for the ultimate customer and focuses on constantly eliminating wastes throughout the SC (Bhamu et al., 2014), the combination of LP and SCM seems just happened naturally. Lean supply chain management (LSCM) extended the Lean principles from production process to the whole SC system. A Lean supply chain (LSC) integrates product designing, raw materials purchasing, inventory management, production, delivery, sales and customer service. Its core idea is to eliminate wastes in the SC and create the maximum value for customers using minimum resources (Bian, 2006).

1.1.3. Current Denominators of LSCM Research

There are two common denominators in current LSCM research.

The first one is that most previous research examined large enterprises, e.g. multinationals such as Toyota and Ford. Therefore, the research outcomes applied to large enterprises but not necessarily to small and SMEs.

Although the definition of SME varies in different countries or regions, it’s a common view that SMEs are an important driving force no matter in developed countries or developing countries. They are playing a significant role in developing national economy, increasing employment, enlarging export, promoting innovation, and providing personalized service, etc.

According to 2016 Small Business Profiles for the States and Territories, which was produced by the U.S. Small Business Administration’s Office of Advocacy, there are 28.8 million small businesses in U.S. They take up 99.7% of the total U.S. businesses, and nearly
half of the overall private workforce is working in small businesses. In Europe, SMEs are also ubiquitous, they took up 99.8% of all the non-financial business enterprises in the EU28 in 2014. And 67% of the total employment was employed by SMEs, which means about 90 million employees were involved (Muller et al., 2015). Stated in Statistics New Zealand Business Demography (Feb 2014), the total number of enterprises in New Zealand in February 2014 was 487,875 of which 97% are SMEs. More than 970,000 employment positions were created by SMEs. And they also contributed nearly 30% of New Zealand’s GDP.

Compared with large enterprises, SMEs have some congenital disadvantages in enterprise scale, market share, financing ability, talents reserve, and R&D ability, etc. So, the proven success of LSCM in large enterprises is attractive to many SMEs around the world. However, LSCM in SMEs has a relatively short history both in practical and academic perspective. There are a lot of untouched important issues and areas need to be explored (Zhou, 2012).

The second common denominator is that most previous LSCM research focused on a specific aspect of the SC, such as procurement, logistics, or distribution.

A typical SC should be considered as a whole system of organizations with processes that link them both upstream and downstream. The main aim of SCM is to integrate all of the business processes in the SC to "lower the total amount of resources required to provide the necessary level of customer service to a specific segment" (Jones et al., 1985, p18). In the modern marketplace, the success of an enterprise is no longer determined by the single enterprise itself but the integrated performance of all the SC participants. Managing the whole SC properly always has greater significance than the sum of its parts (Christopher, 1998). This thesis will discuss the Lean concept from the perspective of the whole SC as an integrated system.

1.2. Overview of This Research

In this section, an overview of the whole research will be presented including research questions, research purpose, and thesis organization.

1.2.1. Research Questions

In this thesis, there are two main research questions.

Question 1: What is Lean supply chain management for a small and medium-sized enterprise?
Question 2: How can Lean be implemented practically into a small and medium-sized enterprise’s non-Lean supply chain?

The second research question can be divided into two sub-questions:

Sub-question 1: How should a small and medium-sized enterprise apply Lean principles in supply chain management?

Sub-question 2: How should a small and medium-sized enterprise arrange the Lean implementation process?

1.2.2. Research Purpose

This research tries to use literature analysis and case study to explore the case company’s experiences of implementing Lean thinking in SCM. Aiming at finding out how the case company did the Lean implementation in the company and throughout its SC and what effects were achieved, this research tries to cast light on filling the gap in the existing theoretical research on LSCM in SMEs.

So, this research consists of two main interconnected parts: literature review and case study. In the literature review, key concepts such as SC, SCM, Lean Thinking, and LSCM will be introduced and reviewed; the model of SCM and the principles of Lean Thinking will be discussed. All of these are the theory preparation for LSCM implementation.

Single case study is an appropriate study strategy to find out the unique features of an SME’s SC and the specific problems it has in its SCM, and understand the practices conducted by the case company.

By referring to the existing theoretical research achievements, it is possible to explore the reason why some Lean practices are suitable for an SME to improve its SCM and some are not, and develop a theoretical explanation of what LSCM is for an SME and how to achieve it, which can be a beneficial complement to the current theoretical research on LSCM.

1.2.3. Thesis Organization

This thesis will be organized under the guidance of the V-model (see Figure 1) which can assist the author to keep the components and the system of the thesis closely connected (Sheffield, 2005). It will start with an introduction of the research background and purpose. The second chapter will be literature review, and reviewing the existing SCM, Lean Thinking and LSCM will be the main content. The next chapter will introduce the methodology by explaining what the primary research method is and how to conduct the
case study and data collection. In chapter 4, some background information about the case company including its business, industry environment, and the SC characteristics will be introduced. The followed chapter will be the case study and discussion, and all the research questions will be discussed in this part. The single case study approach is often criticized to be feeble to construct a sound foundation for generalizability, so, generalization will not take up a large amount of space in this thesis. But for some SMEs, especially those SMEs in promotional product industry, some comparatively generalizable findings can be expected. So, the generalizability of the case study, limitations of this research, and future research opportunities will compose the last chapter.
2. Literature Review

This chapter will provide an overview of the extant literature on SCM, Lean Thinking, and LSCM. There are two main purposes of this chapter: first, by an overall review of related concepts, theories, and necessary knowledge of this field, this chapter can show the direction and boundary of the whole research; second, through comparison and discussion, this chapter will constitute a solid theoretical foundation for the further research and then provide support for determining an appropriate research approach in the next chapter.

2.1. Supply Chain

As mentioned in the previous chapter, in modern business market, enterprises are no longer competing as independent entities, instead, their competitiveness is increasingly dependent on the performance of their SCs (Lambert et al., 2000). We can see an increasing interest on SC among researchers and practitioners. The features and functions of SCs are constantly changing along with the advancement of technology and the development of competitive market. So, people’s perception of SC is also updating with the times. As one of the most important basic concept in this thesis, SC will be introduced in the first section of this chapter from two aspects: definition and structure.

2.1.1. The Definition of Supply Chain

Due to the differences in academic background and research angle of the researchers, it’s a normal phenomenon that different people propose different definitions of SC. In order to get a deep understanding of the definition which can support the further research, we will discuss it from the participants in SC, the processes in a SC, and the nature of the SC, and then give out the formal definition suits for this research.

About the participants in the SC, some early views just limited their range of vision within the core enterprise and the suppliers, and considered that SC was an internal process of resource utilization for the core enterprise (Shihua et al., 2010). Developing along with the time, researchers were gradually aware of the great importance of the linkage with other enterprises in the SC. The participants include “not only the manufacturer and suppliers, but also transporters, warehouses, retailers, and even customers themselves” (Chopra et al., 2007, p3). In this thesis, a certain entity will be considered as a SC participant only if it is involved in satisfying the customer demand either directly or indirectly.
It’s a common view that the SC is an important series of business processes “from a source to a customer” (Mentzer et al., 2001, p4). The material flow is the most obvious process and feature which has been noticed and concerned by most of the researchers. The SC is a material flow process in which a set of companies participate (La Londe et al., 1994). Beamon thought that SC is “an integrated manufacturing process wherein raw materials are converted into final products, then delivered to customers” (Beamon, 1998, p281).

Actually, back to the year of 1989, Stevens had pointed out that the SC is “the connected series of activities which is concerned with planning, coordinating and controlling material, parts and finished goods from suppliers to the customer” (Stevens, 1989, p3). We can identify two different flows running through the company: material and information (Stevens, 1989). Chow et al. (1999) supported the view that information flow should be an important aspect of SC, because transportation, information and other logistics management service providers are also engaged in SC together with a group of manufacturers, suppliers, distributors, retailers (Chow et al., 1999). Mentzer et al. (2001) extended the definition of SC by introducing finance flow into the research objects. From their point of view, SC is defined as “a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer” (Mentzer et al., 2001, p4). The operating processes include four parts: work flow, physical flow, information flow, and funds flow (FBIC, 2009).

The objective of the SC with materials (products), information, and funds flowing through should be generating the maximum overall value. SC is a value-adding chain which is comprised of raw material suppliers, component suppliers, manufacturers, distributors, retailers, transporters and so on (Lan et al., 2000). However, the value created by a SC is not exactly same with the worth of the final product (or service) for the customers and the cost that happens across the SC. Chopra et al. used the concept of supply chain profitability which “is the total profit to be shared across all supply chain stages and intermediaries” to represent this value (Chopra et al., 2007, p6). Christopher even thought that the SC had become the value chain. This viewpoint was inspired by the works of a Harvard Business School professor, Michael Porter. According to Porter, each firm can be considered as “a collection of activities that are performed to design, produce, market, deliver, and support its product” (Porter, 1985, p36). All these
activities constitute a value chain. To have a different value chain with its competitors is a key source of competitive advantage for a company (Porter, 1985).

Referring to the abovementioned definitions and views, for the purposes of this thesis, a SC is defined as a set of value-adding activities to fulfil the end customers’ demands through the upstream and downstream flows of materials, information and funds among suppliers’ suppliers, suppliers, manufacturer, distributors, retailers, logistics companies, customers, and customers’ customers, etc.

2.1.2. The Structure of Supply Chain

From the structure of SC, we can see the internal relationships among different participants and how the whole SC works. What’s more important is that the SC structure also provides a fundamental framework for SCM and Lean Thinking.

Mentzer et al. (2001) classified the SC structure according to the degree of SC complexity (see Figure 2). The “direct supply chain” illustrates the immediate relationship among the focal company, suppliers, and customers, which is the simplest and most basic relationship in any SC. The immediate supplier’s suppliers and the immediate customer’s customers are involved in the “extended supply chain”. An “ultimate supply chain” shows the greater complexity that a SC can have. All the participants in upstream and downstream relative to the focal company are included into the structure. Moreover, a third party logistics provider who provides logistics services, a market research firm who provides integrated information about target markets and customers, and a financial provider who provides financial support are also under consideration in this SC structure.
Ross (2008) drew a similar SC structure with the “ultimate supply chain” which was described as the shape of a pipeline (see Figure 3). In this pipeline, there are two flows which are mutually supportive but with different directions: demand flow and product flow. The term of demand flow in Ross’s theory can also be seen as information flow. In the form of intelligence about market demand, real orders of products and services, etc., information starts from consumer, goes through a variety of intermediaries, and ends with the materials supplier. Contrary to the demand flow, the product flow represents the downstream flow of products and services from producer to customers (Ross, 2008).

It is important to realize that the SC structure can be described in a variety of alternative ways, and each company can be a part of different SCs (Mentzer et al., 2001). Meanwhile, for each company, the SC can have a complicated network nature as what is shown in multi-tier SC structure (Figure 4).
From Figure 4 we can see that the SC has a much more complicated structure than a linear pipeline. The tree structure represents the multitude of relationships in a SC. A SC member might have multiple inputs and outputs on each side of the SC, and there are several tiers in a whole SC. In a normal multi-tier SC structure, the size of the supplier companies decreases from the upper tiers to the under tiers. For example, we consider the end buyer as major company, each of its first tier suppliers may have 500 employees on average, the second tier supplier may only employ 100 people, and the third tier suppliers will have lesser workload. The other feature of multi-tier SC structure is that the number of suppliers for each SC member on the “tree” drops from top to bottom. E.g. the major company on the top tier may deal with 100 first tier suppliers, each first tier supplier company may deal with only 50 second-tier suppliers, and this figure for the next tier suppliers will be fewer (Cooper et al., 1999).
Lambert and Cooper (2000) used another form of layout to show this networking relationship among different tiers of suppliers (see Figure 5). The horizontal structure of SC consists of the number of tiers which may be more or less. The vertical structure of SC describes the number of companies within each tier (Lambert et al., 2000). Among the roles in this SC structure, Lambert and Cooper (2000) found four types of business process link. They are:

A. Managed business process links: the process link between the focal company and the first tier supplier, and the focal company and the first tier customer. This type of process link is considered as the most important link for the focal company to integrate and manage.

B. Monitored business process links: the process links between other member companies, for example the process link between the tier 1 supplier and the tier 2 suppliers, the tier 2 supplier and the tier 3 suppliers, the tier 1 customer and the tier 2 customers, and the tier 2 customer and the tier 3 customers, etc. The focal company is not directly involved in this type of process link, but monitoring this type of links is important to the focal company.

C. Not-managed business process links: the focal company is not actively involved in this type of link, and there is no significance to monitor the links.

D. Non-member business process links: the process links between a member of one SC and the members of another SC. For example, if one of the focal company’s suppliers is also a supplier of the focal company’s major competitor,
the link between this supplier and competitor is not the real link on the focal company's SC, but it can affect the performance of the focal company and even its SC (Lambert et al., 1998).

To understand the whole SC structure and the relations between various participants in different tiers is an important precondition to enhance a company's performance in the SC (Snehota et al., 1995). Using the four business process links, Lambert et al. (1998) indicate that different companies in the same SC have different activity structures, and in many cases, it is important to manage beyond the first tier of suppliers.

2.2. Supply Chain Management

It is important for us to realize that no matter how we define the SC, it is just something exists in the business world. While, in the perspective of management, the SC requires great many management efforts by the companies in it to keep it being operated in a proper way and create maximum value to customers, which is just about
SCM (Mentzer et al., 2001). In this section, we’ll review the literature of SCM in three steps. First, we’ll get a comprehensive understanding of SCM from its definition. Then, we must clearly recognize what are the key elements in SCM. At last, a model of SCM will be introduced, which will be used in the case study.

2.2.1. The Definition of Supply Chain Management

From the above discussion, we can see that regarding to the definition of SC there are many common viewpoints perceived across different authors. By contrast, the situation of SCM’s definition is more complicated. Despite the growing popularity and importance of SCM as a research area, many publications have noted the lack of existing research (Chen et al., 2004; Meredith, 1998), and there is a considerable confusion with regard to the existing terminologies.

From the definitions in Table 1, it can be seen that there are two different perspectives on the evolution of SCM concept: purchasing & supply perspective and transportation & logistics perspective (Tan, 2001). The purchasing & supply perspective emphasizes that the fundamental strategic business process is about the material management triggered by supply-demand relationship. From this perspective, the SCM concept extends an enterprise’s traditional internal activities by involving the upstream and downstream partners into the general goals of the focal company which is to pursue optimization and efficiency (Harwick, 1997). The transportation & logistics perspective considers logistics as a key factor in the strategic decisions in a company (Hale, 1999). According to this perspective, SCM is a concept grounded in the field of logistics (Lamming et al., 1996), because only after the SC is linked and smoothed by logistics, the value can be transferred from the supplier to the customer (Shapiro et al., 1993).

Afterward, researchers realized the importance of implementing SCM in the whole business process (Harland et al., 1999), so these two perspectives gradually presented a new trend of mutual learning and assimilation in order to support the implementation in real business. Figure 6 demonstrates the differences and connections between the two perspectives of SCM and the trend of integration.
<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones et al.</td>
<td>1985</td>
<td>“Supply chain management deals with the total flow of materials from suppliers through end users...”</td>
</tr>
<tr>
<td>Stevens</td>
<td>1989</td>
<td>“The objective of managing the supply chain is to synchronize the requirements of the customer with the flow of materials from suppliers in order to affect a balance between what are often seen as conflicting goals of high customer service, low inventory management, and low unit cost.”</td>
</tr>
<tr>
<td>Cooper et al.</td>
<td>1997</td>
<td>Supply chain management is “… an integrative philosophy to manage the total flow of a distribution channel from supplier to the ultimate user.”</td>
</tr>
<tr>
<td>Monczka, et al.</td>
<td>1998</td>
<td>SCM requires traditionally separate materials functions to report to an executive responsible for coordinating the entire materials process, and also requires joint relationships with suppliers across multiple tiers. SCM is a concept, “whose primary objective is to integrate and manage the sourcing, flow, and control of materials using a total systems perspective across multiple functions and multiple tiers of suppliers.”</td>
</tr>
<tr>
<td>Lambert et al.</td>
<td>1998</td>
<td>SCM is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other shareholders</td>
</tr>
<tr>
<td>Tan et al.</td>
<td>1998</td>
<td>SCM encompasses materials/supply management from the supply of basic raw materials to final product (and possible recycling and re-use). SCM focuses on how firms utilize their suppliers’ processes, technology and capability to enhance competitive advantage. It is a management philosophy that extends traditional intra-enterprise activities by bringing trading partners together with the common goal of optimization and efficiency.</td>
</tr>
<tr>
<td>Handfield et al.</td>
<td>1999</td>
<td>The SC encompasses all activities associated with the flow and transformation of goods from raw materials stage (extraction), through to the end user, as well as the associated information flows. Material and information flow both up and down the SC. SCM is the integration of these activities through improved SC relationships, to achieve a sustainable competitive advantage</td>
</tr>
<tr>
<td>Mentzer et al.</td>
<td>2001</td>
<td>SCM is defined as the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the SC, for the purposes of improving the long-term performance of the individual companies and the SC as a whole.</td>
</tr>
<tr>
<td>Simchi-Levi et al.</td>
<td>2003</td>
<td>SCM is a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations. And at the right time, in order to minimize system-wide costs while satisfying service level requirements.</td>
</tr>
<tr>
<td>Christopher</td>
<td>2005</td>
<td>The management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the SC as a whole.</td>
</tr>
<tr>
<td>Council of SCM Professionals</td>
<td>2006</td>
<td>SCM encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. It can be seen as an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-performing business model.</td>
</tr>
<tr>
<td>Stadtler et al.</td>
<td>2008</td>
<td>SCM is the task of integrating organizational units along a SC and coordinating material, information and financial flows in order to fulfill (ultimate) customer demands with the aim of improving the competitiveness of a SC as a whole.</td>
</tr>
<tr>
<td>Institute for SCM</td>
<td>2008</td>
<td>The design and management of seamless, value-added processes across organizational boundaries to meet the real needs of the end customer. The development and integration of people and technological resources are critical to successful SCM.</td>
</tr>
</tbody>
</table>

Table 1 Definitions of SCM
Summarizing the above various definitions, we can find several common viewpoints in defining SCM among different researchers.

A. The essence of SCM is to manage the processes. Every key business process in SC from the original suppliers to the end customers, including materials flow, information flow, and funds flow, should be well-managed.

B. The main aims of SCM include the reduction of SC related costs, deliver superior customer value, increasing profitability and a sustained competitive advantage for all SC participants.

C. All participants in SC should be brought together in SCM process and cooperate for the common aims.

In this thesis, the definition proposed by Mentzer et al. (2001) will be accepted as the best summarization of the SCM definition. So, SCM is defined as “the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole” (Mentzer et al. 2001, p18).

2.2.2. The Key Elements in Supply Chain Management

The literature on SCM suggests numerous elements which should catch managerial attention when conducting SCM. In order to deepen our research in this thesis, we need to grasp the key elements.
Lambert et al. (1998) identified nine management components as the key elements in a successful SCM. In order to identify some fundamental distinctions, they sorted the nine components into two groups: physical & technical management components (including planning and control methods, work flow/activity structure, organization structure, communication and information flow facility structure, and product flow facility structure), and managerial & behavioral management components (including management methods, power and leadership structure, risk and reward structure, and culture and attitude) (see Figure 7). Generally, the five components in the first group are “the most visible, tangible, measurable, and easy-to-change components” (Lambert et al., 1998) and they can be easily understood and applied in the SC. But only focusing on these components is not good enough to manage the SC successfully. The performance of the SC is also supported by organizational behaviors which need to be driven and reinforced by the managerial & behavioral management components (Lambert et al., 1998). However, these four components in this group are less visible. Therefore, they are often difficult to be implemented.
For Lambert et al. (1998), presenting the nine key elements in SCM was more or less inspired by the thinking of business process reengineering (BPR) which aims to help enterprises re-engineer their business processes fundamentally so that they can decrease operational costs, enhance customer service, and increase competitiveness. The authors tried to integrate the SC components as a system of business processes, but when they presented the nine key elements in SCM they analyzed from a more general management angle rather than SCM angle.

Simchi-Levi et al. (1999) induced the key elements based on the different level of activities in SCM. They believed that the SCM covers a wide scope of a company's activities on different levels including the strategic level, the tactical level, and the operational level. Activities on strategic level, e.g. deciding the size of the manufacturing plants and selecting the location of the warehouse, have a long-lasting effect on the company. On the tactical level, the effect of activities is considered in a shorter time span which is usually a quarter or a year. Activities concerned with procurement, inventory
policies, and transportation strategies are on this level. Operational level activities refer to the daily decisions, e.g., lead time quotations, truck loading, and dispatching (Simchi-Levi et al., 1999).

2.2.3. The Model of Supply Chain Management

From their definition of SCM, Mentzer et al. (2001) also developed a conceptual model (see Figure 8) which could imply more about the management of a supply chain.

In Figure 8, Inter-functional coordination examines the role of individual business functions by considering trust, commitment, risk, dependence, and behaviors. Inter-corporate coordination examines how individual business functions are coordinated across both functions and companies. We can see from the figure that the functional scope of SCM covers all of the business functions in the conventional sense. All companies in the SC should be in the range of organizational scope of SCM, and they must construct their competitive advantage by setting up a series of cooperative relationships which means to share information, risks, and benefits mutually and work
together closely (Cooper et al., 1993). In modern marketplace, many companies have to go beyond domestic boundary and compete in a global scale. So, for many companies, SCM must be conducted in the global environment. When a SC is pictured as a pipeline, the directions of SC flows (including products, services, financial resources, and information, etc.) can be shown clearly. Through these flows, companies in the SC can achieve competitive advantage and profitability by adding value and improving satisfaction for customer.

2.3. Lean

Lean was proposed following the trend of the development of modern industry. Back to the first half of the twentieth century, some American automakers such as Ford and GM were leading the whole auto industry because they took the first step from the craft production toward mass production gained significant benefit from economies of scale. However, mass production has its own disadvantages, e.g. high requirement of the fixed asset investment and low feasibility of product variety. Lean production is considered as a new generation of production mode which overcomes the disadvantages of craft production and mass production and combines the advantages of them (Womack et al., 1996). Lean Thinking is a useful antidote to enhance the efficiency of not only the production process but also the other processes and fields in a general business including SCM.

2.3.1. Toyota Production System

As we introduced in the foregoing chapter, Lean production was mainly developed from TPS, it is necessary to start from reviewing TPS in order to get a clear understanding of the structure and main features of this world-recognized efficient production system.

TPS which was invented and developed by Toyota and is being adopted by many other companies all around the world can be seen as a new production management system with epoch-making sense after the Taylor system (scientific management) and the Ford system (mass-assembly line) (Monden, 2011). Before TPS became world famous, Toyota learned a lot from American automakers and mass production approach, but they didn’t follow blindly. Led by Eiji Toyoda, Taiichi Ohno, and some other eminent managers, Toyota established their own production system which was considered as a more advanced and effective one (Ohno, 1988). Liker (2004) pointed out that TPS and the Toyota way were more than tools and techniques, and there were 14 principles
which made TPS unique and efficient. These principles were sorted into four categories (see Figure 9):

**Category 1: Long-term philosophy.**
- Principle 1: Toyota’s management decisions are all based on a long-term philosophy in order to avoid any short-term decision making.

**Category 2: The right process of eliminating waste.**
- Principle 2: Create continuous process flow.
- Principle 3: Use Pull systems to produce flexibly.
- Principle 4: Level out the workload.
- Principle 5: Fix problems at once by stopping.
- Principle 6: Standardized tasks.
- Principle 7: Use visual control to let hidden problems nowhere to hide.
- Principle 8: Use reliable and completely tested technology only.

**Category 3: Add value by developing people and partners.**
- Principle 9: Cultivate leaders who can understand the whole work.
• Principle 10: Support the teams and employees who agree with and practice the company's philosophy to develop.

• Principle 11: Respect and help to improve your partners and suppliers.

**Category 4: Solving problems by continuous learning.**

• Principle 12: Observe and practice in person to understand the real situation completely.

• Principle 13: Make decisions slowly but implement decisions rapidly.

• Principle 14: Build a learning organization.

Monden (2011) believes that the TPS is a viable production method and its ultimate goal, creating and increasing profit, can be driven by two engines which are cost reduction and productivity improvement. And wastes elimination is the most important fuel. There are two pillars, just-in-time (JIT) and autonomation, which are supporting the TPS houses. JIT means “to produce the necessary units in the necessary quantities at the necessary time” (Monden 2011, p7). Kanban system plays an important role in maintaining JIT. As a different concept with automation, autonomation, the other pillar, can be considered as a mechanism to prevent abnormal and defective work in the production process. There are automatic stopping devices attached to the machines in production line. Even in manual production line, there is also similar mechanism exists. Toyota’s visible control system helps autonomation to be a fully functioning mechanism.

Adapted from the abovementioned authors, I give the TPS house in Figure 10. The foundations of the house are long-term philosophy, leveled production, standardized tasks, reliable technology, people and partner development. There are two pillars supporting the house: Just-in-Time and Autonomation. The top of the house consists of the ultimate goal (profit), cost reduction, productivity improvement, and wastes elimination.
2.3.2. Lean Production and Lean Thinking

Distilled from TPS, LP was elaborated by Womack et al. (1990) in their book, *The Machine That Changed the World*. The authors contrasted craft production and mass production with LP, and pointed out the main features of LP. Craft production which is conducted by highly skilled workers using simple but flexible tools can satisfy personalized customer demand. But its cost is often exclusively high because it fails to achieve economies of scale. By using automatic machines and unskilled or semiskilled workers, mass production decreases the marginal cost of products dramatically but sacrifices variety. LP draws on the strengths of craft production and mass production, and, simultaneously, avoids their weaknesses. Ballard et al. (2003) summarized LP as a production system which can produce more and better with less space, time, material and labor.
Womack et al. (1996) further developed the concept of LP and coined a relatively completed theoretical framework of Lean production which was called Lean Thinking. From their point of view, there are five principles in Lean Thinking:

Principle 1: Provide the value that customers demand. Value is a fundamental and key concept in Lean Thinking. The traditional definition of value is challenged by Lean Thinking through joint analysis. In the process of value creation, there are many different companies involved. Each one may tend to define value in its own way according to its own demand. Values with different definitions cannot be added up for the ultimate customer. So, value should be defined by the ultimate customer rather than any specific firm in the whole SC.

Principle 2: Identify the value stream and find out wastes. By value stream mapping, we can observe every step in the process of value creation (including the flows of information and materials), summarize them visually, and then find out all of the waste and envision an improved performance in the future (Jones et al., 2002). Three types of actions will be analyzed here: (1) value-adding actions (VAA); (2) non-value-adding actions but can’t be eliminated immediately, which are also called required non-value-adding actions (RNVA); and (3) non-value-adding actions (NVA) which can be eliminated immediately.

Principle 3: Make value created in continuous flow. After the value is defined, value stream is identified, and wastes are found out, the next step is to ignore the traditional boundaries of production and management and rethink the specific work practices in order to remove all the backflows, scrap, and stoppages which are impediments to the continuous flow.

Principle 4: Produce according to the pull system. The term of pull means that “no one upstream should produce, a good or service until the customer downstream asks for it” (Womack et al., 1996, p67). This is also the principle of eliminating overproduction.

Principle 5: Pursue perfection. Lean Thinking leads to an infinite process of pursuing perfection. After applied the previous four principles, the company would be able to find out more and more wastes that can be eliminated. Although trying to achieve perfection is actually impossible, this principle provides “inspiration and direction essential to making progress along the path” (Womack et al., 1996, p94), so that the company can get sustainable development in the long term.
The great value of the five principles has been widely accepted by scholars and practitioners. They are considered as a basic guideline for understanding Lean and how to transfer Lean from production to other areas in an enterprise. Based on Womack and Jones’ Lean Thinking principles, Burton et al. (2003) point out that, there are three distinct generations for the companies which are applying Lean Thinking. The first generation is called Lean Manufacturing. Companies in this generation just make their efforts on applying Lean Thinking within the manufacturing floor. By doing so, companies can effectively improve performance by eliminating waste, decreasing lead time, and increasing value. But they are only “Harvesting the low-hanging fruit” (Burton et al., 2003, p101). The second generation is Lean Enterprise. Companies expand Lean Thinking from the production line to other support areas such as developing new product, marketing, sales, procurement, etc. In these areas, companies are dealing more with information and fund flows than material flows. The final generation is Lean Extended Enterprise. In this generation, companies view all the participants in the total value stream as an integrated entity, because in the whole process of value creation the effectiveness and competitiveness of each company will be connected and interactive. Lean Thinking is further extended to eliminate waste, improve quality, and enhance flexibility and responsiveness across the total value stream (Burton et al., 2003).

2.4. Lean Supply Chain Management

The concept of Lean extended enterprise describes an advanced status of implementing Lean Thinking, and in the meantime, there are many viewpoints which are in common with SCM philosophy. The combination of Lean and SCM seems to be an inevitable trend that happened naturally.

2.4.1. Principles of Lean Supply Chain Management

Womack et al. (1996) proposed Lean Thinking principles from production area and aimed to use them as a general business philosophy and a set of practical tools for every common enterprise. When it is applied to SCM, we need to understand that there are many differences between these two areas. Principles of Lean Thinking will need to be appropriately adjusted when we combine Lean with SCM.

Anand et al. (2008) compared the different meanings of the five Lean Thinking principles for production and SCM.

Principle 1: Provide the value that customers demand. The concept of value should be common for production and SCM.
Principle 2: Identify the value stream and find out wastes. There are many differences exist in the value stream. In the production area, there is an only limited amount of information flows through the whole process, and the predominant topic is the flow of materials. By contrast, SCM deals with the flow of materials, information, and funds which all flow beyond the boundaries of the company. So the value stream in SCM is much longer than that in production.

Principle 3: Make value created in continuous flow. Lean Thinking refers to eliminate the none-value-added activities in order to create a continuous flow of the product or service. From this perspective, this principle seems to mean the same thing for both production and SCM. However, the wastes in a SC can be very different with the ones in production. As for the detailed differences, we will discuss in the following part of this section.

<table>
<thead>
<tr>
<th>Principles of Lean Thinking</th>
<th>Production Management</th>
<th>SCM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>A huge volume of production; Provides maximum profit to the enterprise.</td>
<td>A huge demand from the customers; Provides maximum profit to the members of the SC.</td>
</tr>
<tr>
<td>Value stream</td>
<td>Includes all the activities from raw material sourcing, manufacturing and delivering the products to the end customer, but not in detail.</td>
<td>Involves the flow of materials, information and funds in both directions, all the activities in detail.</td>
</tr>
<tr>
<td>Flow</td>
<td>The movement of the product within the shop floor.</td>
<td>The movement of material, information and funds along the value stream of the supply chain.</td>
</tr>
<tr>
<td>Pull</td>
<td>The pull system focuses on the materials from the previous stage.</td>
<td>The pulling system focuses on the flow of information from a downstream member on the SC in the form of information flow, rather than material flow.</td>
</tr>
<tr>
<td>Pursue perfection</td>
<td>Continuous and relentless efforts to eliminate wastes in production.</td>
<td>Continuous and relentless efforts to eliminate wastes in SCM.</td>
</tr>
</tbody>
</table>

Table 2 Different Meaning of the Five Principles of Production and SCM

Principle 4: Produce according to the pull system. In the production area, pull system can be established within the factory because the main participants are the internal departments. By contrast, it is not so easy when we try to build a pull system on SCM level. There are multiple tiers of roles in a SC where many different companies and relationships are related.
Principle 5: Pursue perfection. It can be considered as a common principle for both production and SCM area.

2.4.2. Identifying the Wastes in a Supply Chain

It is undeniable that waste can exist in anywhere in the business processes. We believe that Lean Thinking is a powerful antidote to wastes. The primary essence of Lean is to reduce costs by eliminating wastes, which paves the way for companies to “do more and more with less and less” (Womack et al., 2010). As waste is one of the most important concepts in Lean Thinking, and when combining Lean with SCM the scope, form, and content of waste can be very different with the traditional ones, it is necessary to review the literature about this concept and how to identify it in a SC.

With regard to the waste, there is a Japanese word, Muda, we have to be fully aware. Muda is a similar word with “waste”, and it refers to any resource-absorbing human activity that creates no value. Ohno (1988) listed seven categories of muda:

A. Defects.

Any product or service with defects will not satisfy customers’ demand and should not be passed on to customers. When defects are found, no matter in which step of the value stream, extra costs will be incurred in forms of investigating, recycling, rescheduling, reworking, and so on.

B. Overproduction of goods not needed.

If the number of products produced overpasses the real number that the customers need, the extra products constitute waste in the form of overproduction. Overproduction not only wastes the resources of production, but also leads to extra costs of inventory.

C. Inventories of goods awaiting further processing or consumption.

The raw materials, work-in-progress, or finished products which have not produced any income for the producer enterprise or outcome for the customers are considered as wastes.

D. Unnecessary processing.

It’s a little different with the traditional notion of waste. Lean Thinking proposes that value is determined by the customer’s demand. If the demand can’t be satisfied, the enterprise fails to create value. However, when the product or service is provided with higher degrade in quality, complexity, or design, etc. than what it’s required by the customer, waste emerges.
E. Unnecessary movement of people.

The unnecessary movement may cause extra damage to products, additional wear and tear on the equipment, and unnecessary injuries for employees. What’s more important is that the entire production flow can be affected.

F. Unnecessary transport of goods.

Extra transportation doesn’t add value for the consumers, and may generate unnecessary cost, damage, loss, delay, etc.

G. Waiting.

When materials and products are not being transported or processed but waiting for their next procedure, it brings waste.

Ohno (1988) originally identified this waste list from the physical production area. There were some other researchers tried to supplement the list to make it more complete. Womack et al. (1996) considered the design of goods and services which failed to satisfy the customer demand as another waste. Liker (2004) claimed that he found the eighth kind of waste which was the unused employee creativity that resulted in making employees lose their time, ideas, skills, improvements, and learning opportunities.

Even though, Ohno’s (1988) typology of identifying waste applies to most of the basic activities of any business (Womack et al., 1996). Anand et al. (2008) compared the differences between production and SC and applied the seven wastes to the SC processes (see Table 3).

2.4.3. Implementing LSCM

There are many techniques, practices, and procedures in Lean which have already help Toyota and many other companies to succeed. However, just implement a few Lean tools a company may achieve some improvements, but it would never be able to obtain the same effect with implementing the whole system (Liker, 2004). In this part, literature about the processes of implementing Lean, the conceptual framework of implementing Lean in SCM, and the tools for LSCM will be reviewed.

Through my literature review, it turns out that the topic of LSCM implementation is still a relatively new and special-interest. There is only a limited amount of academic articles available which provide systematic discussion about this topic. On the one hand, the insufficient research in this area is beneficial to show the meaning of this thesis; on
the other hand, it also requires greater efforts on reviewing and learning from other relevant literature.

<table>
<thead>
<tr>
<th>Waste Categories</th>
<th>Wastes in SC processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defects</td>
<td>Wrong shipment;</td>
</tr>
<tr>
<td></td>
<td>Defective parts from material supplier &amp; defective finished goods to the customer;</td>
</tr>
<tr>
<td></td>
<td>Faulty purchase order &amp; sales order;</td>
</tr>
<tr>
<td></td>
<td>Wrong or exaggerated information during communication;</td>
</tr>
<tr>
<td></td>
<td>Products rejected by customers for various reasons.</td>
</tr>
<tr>
<td>Overproduction of goods not needed</td>
<td>Producing more than demanded;</td>
</tr>
<tr>
<td></td>
<td>Too many product varieties and models;</td>
</tr>
<tr>
<td></td>
<td>Dispatching more goods than what is required;</td>
</tr>
<tr>
<td></td>
<td>Multiple suppliers to produce the same part/component;</td>
</tr>
<tr>
<td></td>
<td>Redundant development of parts.</td>
</tr>
<tr>
<td>Inventories of goods awaiting further processing or consumption</td>
<td>Storing more materials, WIP, or FG than what is required by the customer;</td>
</tr>
<tr>
<td></td>
<td>Storing outdated and unnecessary documents, etc.;</td>
</tr>
<tr>
<td></td>
<td>Storing unnecessary and obsolete components/designs;</td>
</tr>
<tr>
<td></td>
<td>Procuring in bulk due to distance or the uniqueness of the parts/components;</td>
</tr>
<tr>
<td></td>
<td>The lack of use of standard parts.</td>
</tr>
<tr>
<td>Unnecessary processing</td>
<td>Unnecessary efforts caused by supplying defective products to customers;</td>
</tr>
<tr>
<td></td>
<td>Purchase order or sales order which is processed wrongly;</td>
</tr>
<tr>
<td></td>
<td>Unnecessary inspection of the products;</td>
</tr>
<tr>
<td></td>
<td>Unnecessary dismantling or packing before shipment;</td>
</tr>
<tr>
<td></td>
<td>Too much detailed information of a component provided to the supplier;</td>
</tr>
<tr>
<td>Unnecessary movement of people</td>
<td>Too many trips or movements due to changing priorities or requirements;</td>
</tr>
<tr>
<td></td>
<td>Improper layout in the warehouses resulting in more movements of workers;</td>
</tr>
<tr>
<td></td>
<td>Decision-makers located in various locations resulting in the unnecessary movement.</td>
</tr>
<tr>
<td>Unnecessary transport of goods</td>
<td>A long, multistage SC involving many stakeholders;</td>
</tr>
<tr>
<td></td>
<td>Circuitous routes between two locations;</td>
</tr>
<tr>
<td></td>
<td>Multiple subcontractors for a given part lead to multiple movements;</td>
</tr>
<tr>
<td></td>
<td>Sending the wrong information to suppliers, distributors, retailers;</td>
</tr>
<tr>
<td></td>
<td>Sending same information in both paper and electronic format.</td>
</tr>
<tr>
<td>Waiting</td>
<td>Waiting for trucks to arrive;</td>
</tr>
<tr>
<td></td>
<td>Waiting for raw materials from suppliers</td>
</tr>
<tr>
<td></td>
<td>Waiting for logistics company to collect products;</td>
</tr>
<tr>
<td></td>
<td>Suppliers waiting for instructions of sample confirming, production proceeding, and</td>
</tr>
<tr>
<td></td>
<td>shipment arranging;</td>
</tr>
<tr>
<td></td>
<td>Transportation delayed by force majeure;</td>
</tr>
<tr>
<td></td>
<td>Waiting for payment;</td>
</tr>
<tr>
<td></td>
<td>Waiting for approval of the purchase order, shipping documents, custom clearance, etc.</td>
</tr>
</tbody>
</table>

Table 3 Seven Wastes in SC
(Adapted from Anand et al., 2008, pp327-328)

Paez et al. (2005) presented a systematic process of implementing Lean in a common company. There are four steps:

Step 1. The management’s commitment to Lean Thinking is the most important condition to get started.

Step 2. The activity scope of Lean implementation must be clearly identified.
Step 3. Develop the employee capability which mainly constitutes of problem-solving focus, teamwork, and creative thinking, etc.

Step 4. Choose and apply Lean tools.

This four-step process guideline also fits for implementing LSCM. The main differences exist in the first two steps. On the top management level, the company must accept LSCM rather than just Lean Thinking as a strategic philosophy. When identifying the scope of activities, the company should follow the complete SC structure. This guideline is about some basic steps and practices which are very important.

With regard to the specific practices fit the LSCM, Taylor (2006) listed some which include: the establishment of first-tier suppliers, the development of supplier associations, pull systems, the reduction of intermediary mechanisms, and closer proximity and strategic management (Taylor, 2006). However, these practices are not tangible and Lean enough to guide the implementation of LSCM. In this thesis, I believe that a company must choose the right Lean tools based on a complete and deep analysis of its whole SC structure and value creating process. As for the particular tools, we can refer to the traditional Lean tools.

Burton et al. (2003) summarized the traditional Lean tools as what are shown in Figure 1. We know that there are many different tools in Lean, but not all the tools are...
necessarily the right ones for every company, and Lean tools must be used in an integrated and systematic way to maximize the effects. In practice, if the manager of a company doesn’t fully understand this, he/she may directly jump into the tools without identifying the real situation of the company and selecting the right tools. As a result, the company falls into the outcome trap and fails to achieve Lean (Burton Boeder, 2003).

These Lean tools consist a basic arsenal when a company migrate Lean to the SCM. Table 4 shows the features of the above-mentioned Lean tools which we need to understand before we select.

<table>
<thead>
<tr>
<th>Lean Tool</th>
<th>Brief Description</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Stream Mapping</td>
<td>Constructing a map of the whole process of value creating. In LSCM, three components must be contained: materials flow, information flow, and funds flow.</td>
<td>Visualize the entire current-state value stream. Shows linkages and connections among different flows. Form the basis of identifying and eliminating wastes. Provide a common language for discussing the future-state value stream.</td>
</tr>
<tr>
<td>SS Visual Management</td>
<td>Seiri (sort), Seiton (set in order), Seiso (shine), Seiketsu (standardize), Shitsuke (sustain).</td>
<td>Improve communication, quality and productivity, workplace safety, appearance of the facility, and morale and pride in the workplace, etc. Reduce workflow problems, training time, lead time, materials handling, and equipment breakdowns, etc.</td>
</tr>
<tr>
<td>Failure Mode and Effects Analysis (FMEA)</td>
<td>A systematic method of identifying potential failures by team-based participation and preventing problems by brainstorm.</td>
<td>Identify process problems and root causes. Improves the quality, reliability, and safety of the products and processes. Reduce costs. Increases customer satisfaction.</td>
</tr>
<tr>
<td>Standard Work</td>
<td>Standardize the work procedures set.</td>
<td>Make the processes smoothly executed. Make training programs effective and productive. Make the quality consistent. Identify the wastes exist in or between processes.</td>
</tr>
<tr>
<td>Total productive maintenance (TPM)</td>
<td>Include five major components: predictive maintenance, preventive maintenance, autonomous maintenance, early equipment management, and focused equipment improvement</td>
<td>Eliminate chronic and sporadic breakdowns of the equipment. Eliminate dangerous and unnecessary motions. Make the ongoing operation of the equipment effective and consistent. Reduce in the amount of planned downtime.</td>
</tr>
<tr>
<td>Single-minute exchange of die (SMED)</td>
<td>A series of operator techniques which targets to make the changeovers time of production equipment, fixtures, or processes in less than ten minutes.</td>
<td>Simplify the setups of the changeovers. Standardize the setup tools and methodologies. Reduce the over motion waste when changeover happens. Reduce lead time. More flexible reaction to the changing customer demand.</td>
</tr>
</tbody>
</table>
Mistake-Proofing (Poka-Yoke)  
A technology of using devices or procedures to prevent defect and malfunction during the operation of equipment and processes.  
Promote employee’s individual responsibility.  
Achieve full inspection with limited cost.  
Detect and eliminate defects in the early process.  
Get feedback immediately.  
Establish a system of successive checking.

Level Mix Model Production  
A method of scheduling daily productions of different types of products and synchronizing them to the market demand.  
Transfer production from large lot to small lot.  
Improve the distribution of inventory.  
Accelerate the response to the changing market demand.  
Support Kanban and one-piece flow production.  
Increase assets return.

Kanban  
An information system that shows the signals between the upstream and downstream operations in order to achieve a steady and consistent work flow.  
Link the production with customer demand.  
Simplify the procurement.  
Visualize the hidden wastes.  
Make everyone know the current situation.  
Support the elimination of overproduction.

One-Piece Flow  
A continuous production flow in which the layouts and operations are sequential and each part is pulled through one piece at a time.  
Reduce lead time and operating costs.  
Improve value-added ratio.  
Improve the company’s degree of flexibility to the changing customer demand.  
Save operational space.  
Lower the risk of damage, deterioration, and obsolescence.  
Enhance employees’ capability.  
Support high-variety production.

Table 4 Features of the Traditional Lean Tools  
(Adapted from Burton et al., 2003, pp109-123)

To better understand the LSCM implementation, we still need to have a comprehensive percept about the conceptual framework. Anand et al. (2008) proposed the LEADER framework for LSCM which classified the sequence of activities of implementing LSCM into 6 phases (see Figure 12).

Phase 1. List out. It refers to identifying and listing out one or multiple products, which is also the process of defining the value. Value is the very first principle of Lean Thinking (Womack et al., 1996) and the foundation of implementing LSCM.

Phase 2. Enumerate. After the critical product(s) being identified and the value being defined, the next phase is to understand the activities of the whole SC process. It requires to mapping the current SC processes utilizing the proper process mapping tools and classifying all the activities into three categories: VAA, RNVA, and NVA. By doing so, the exact start point and end point of the value creating process are identified according to the SC structure, and the wastes in the process are revealed.

Phase 3. Analyze. This phase is about finding out the root cause of each waste in LSCM process and then estimating the future value-creating state after eliminating
wastes. Phase 2 and phase 3 actually consist with the principle 2 of Lean Thinking, to identify the value stream and find out wastes.

Phase 4. Develop. It is related to the third principle of Lean Thinking (make value created in continuous flow). In this phase, it's time to find out the appropriate solutions of eliminating wastes.

Phase 5. Execute. Once the solutions are identified, the following step is to execute them to eliminate each waste. In the meantime, some necessary changes can be made in creating the pull system (the fourth principle of Lean Thinking).

Phase 6. Repeat and replicate. This phase refers to the last principle of Lean Thinking. Since the performance of the solutions has already been measured during the process of executing, all of the previous 5 phases should be repeated and replicated through the whole process along with time. This phase corresponds to the last principle of Lean Thinking (pursue perfection).

---

Repeat and replicate  
List out

Execute  
Enumerate

Develop  
Analyze

Figure 12 The LEADER Framework  
(Anand et al., 2008, p347)
3. Research Methodology

After the relevant literature being reviewed, it is essential to think about choosing the appropriate methodology for the whole research before I directly start to analyze and answer the research questions. This chapter will discuss what the necessary methodological foundation consists of and how it guides the data collection and analysis, and the development of theory.

Saunders et al. (2009) proposed and developed the research “onion” as a methodology for business research. There are multiple layers in the business research process including research philosophy, research approaches, research strategies, time horizons, and the data collection method, which is just like the physical structure of an onion. In this chapter, based on a simplified version of research onion (see Figure 13), we will peel off it layer by layer, from the research philosophy, research approach, research strategy, to the methods of data collection and analysis which constitute the core of the onion. At last, the credibility of research findings and ethics of research design will be introduced.

3.1. Research Philosophy

As the outmost layer of the research onion, research philosophy can provide the fundamental ideas about how we perceive this world and knowledge (Saunders et al., 2009). It consists of a system of thinking and provides a general organizing framework.
for the whole research. We know that, to some extent, all research is based on and guided by the researcher's individual beliefs (of reality, existence and truth) and practical considerations (Collins, 2010). Each researcher may have a different way of viewing the world, and this is just one of the key assumptions of the research philosophy. Furthermore, the research strategy and the research methods will be developed based on the research philosophy (Saunders et al., 2009).

According to Saunders et al. (2009), within the scope of business studies, there are several different perspectives for contemporary research. In this section, I will introduce the research philosophy of this thesis from the following three perspectives: positivism, interpretive, and Realism.

3.1.1. Positivism

Positivism is an old-line and widely-used research philosophy of science among researchers. Auguste Comte (1798–1857) who is regarded as the father of positivism and one of the founders of modern sociology outlined many principles of positivism in his academic work, ‘Course of Positive Philosophy’, which was published in six volumes between 1830 and 1842. These principles are still effective and being used nowadays.

Positivism insists a fundamental idea that the social world exists objectively and externally, and positive knowledge only comes from the observation of the natural phenomena. It assumes that the researcher(s) is independent of the research object, which means the researcher(s) cannot affect or be affected by the research object (Remenyi et al., 1998). So collecting numeric data by observations and experiments is the main data collection method for the positivists (Easterby-Smith et al., 2008). The researcher is playing a very important role of an objective analyst to collect data, analyze data, and propose results for answering the research questions. After generating the research strategy of collecting data, researcher can develop hypotheses by using existing theory, test these hypotheses with the collected data, and achieve the further development of theory (Saunders et al., 2009).

Although positivism is working in a way of how the traditional natural scientists work, the social sciences have been using it for a long time since the twentieth century. In business study, through positivism philosophy, the research can get the end product similar to the derivation of laws or law-like generalizations which are produced by natural scientists in their research (Remenyi Williams, 1998). In this thesis, I’m not going to use statistical analysis and hypothesis testing which are mainly based on
quantifiable observations. But some of the characteristics of positivism will be adopted in the strategy of collecting and using data especially in the in-depth interviews.

3.1.2. **Interpretivism**

Because of the higher complexity of the social world of business and management, there are many limitations and constraints when we use positivism in this area. A series of law-like generalizations gained from positivism philosophy is usually not adequate to cover the whole complex story. That’s why positivism is just partially used in this thesis and another research philosophy must be considered.

Some researchers believe that the interpretivism philosophy is highly appropriate for business and management research in which people are mainly dealing with the social structured reality and question. Interpretivism emphasizes that conducting research among people is different with researching the physical objects (Saunders et al., 2009). The researcher is not standing outside of the research object, but looking at it from the inside. This is the only way that the researcher can deeply understand a specific social phenomenon. With the help of social constructions, interpretive researchers can get personal contact with the object of study which is often consist of or related to a group (or groups) of people and then obtain an insider’s view (Tuli, 2010).

It is argued by the interpretivists that there is no objective knowledge which is independent of the researcher because attaining knowledge and meaning is an act of interpretation conducted by thinking and reasoning humans (Gephart, 1999). When facing to social roles, people often give them particular meanings and then develop further interpretations (Saunders et al., 2009). Researchers will do the same thing when they conduct social research. During the research, the researcher will try to understand a certain phenomenon by interpreting it and drawing meanings from it. The researcher will not only influence but also be influenced by the research object and environment.

In this thesis, as an employee in the case company, I will adopt an empathetic stance, enter the company, and observe the research phenomenon from the inside of the company. Under the instruction of interpretivism philosophy, it will be more possible for me to collect valuable data, understand the real situation, and conduct deep analysis.

3.1.3. **Realism**

Realism philosophy is another important philosophy that is helpful to this thesis. Being similar with positivism, realism also relates to scientific inquiry and believes that the existence of external and objective reality is independent of human values and
minds. Moreover, this philosophy believes that the real world situation can influence people’s behavior and interpretation.

Saunders et al. (2009) contrasted the two different forms of realism: direct realism and critical realism. The former believes that we can get knowledge directly from what we see. While, the latter argues that there should be two step to perceiving the real world: to see real things and get the direct sensations, and then to find out the truth behind the phenomenon. By comparison, direct realism doesn’t take the second step, and this is one of the main differences between direct realism and critical realism. Another difference is that the direct realism believes the real world is relatively static and the study is conducted on a certain level, while the critical realism suggests the real world is constantly dynamic and multi-level study is of great importance (Saunders et al., 2009).

In this thesis, I get a valuable inspiration from the critical realism philosophy. In business and management research, the research object exists in the social world in which we live. What we can see is just a part of the whole picture, only if we use both of the practical and theoretical social science process, we can see through the direct phenomenon and identify the truth behind (Bhaskar, 2010). In business and management area, for example the SCM, there is a great variety of processes, procedures, and structures which are connected and interactive with each other in a constantly changing social world. So this thesis will be a multi-level study which consists of the study level of the individual, the company and the industry.

3.2. Research Approach

The research philosophy in the first layer of the research onion is about the way in which the researcher views the world and the foundation that underpin the whole research. After we get a clear mind of the research philosophy, we need to peel the second layer, research approach, which is an important question with significant impact on the design of the research.

Easterby-Smith et al. (2008) believe that there are three reasons for why choosing research approach is important. Firstly, it enables the researcher to get a clear idea about the how to design the research. Secondly, it’s helpful for the researcher to choose a proper research strategy. Third, it helps the researcher to overcome constraints by adapting the research design.

There are two main approaches to research: deduction and induction. In deduction, the researcher proposes a theory and develops hypothesis, and then tests the hypothesis
by designing a research strategy. In induction, the research is developed in a different order: data collection, data analysis, and then theory proposing which is the outcome of the analysis (Saunders et al., 2009).

### 3.2.1. Deduction

Deduction is a research approach which works from the general to the specific. It often starts from a general statement or theory, and then develop some related hypotheses. Data collection and analysis are conducted according to the hypotheses. At last, a logical conclusion is achieved by examining the possibilities that the hypotheses come true. Deductive approach is often used for testing theory.

According to Saunders et al. (2009), deduction possesses several important characteristics:

A. **Explanation.** The researcher uses deduction to search for explanations of the causal relationships between variables.

B. **Independence.** The relationship between the researcher and what is being observed must be independent.

C. **Operationalization.** The researcher operationalizes the concepts by transforming variables into quantitatively measurable factors.

D. **Generalization.** That means it is necessary to have a big enough sample volume in order to support the result of the research to be generalized statistically in a larger scope.

Judging from the functions and characteristics of deduction, it is not an appropriate approach for this thesis.

### 3.2.2. Induction

Comparing with deduction, induction works in the other way, from the specific to the general. It allows using the data to guide the research, and starts from observing the real world and then constructs explanations and theories about the observed object.

We noted that the deductive approach originates in the natural sciences research and has been gradually applied in social sciences research. By contrast, there are some advantages of the induction:

A. **Through induction approach, the researcher can understand how people interpret the social world; while deduction emphasis explaining the cause-effect relationship between variables;**
B. Induction supports the researcher to find out alternative explanations of a social phenomenon, while deduction only tends to build a rigid methodology (Saunders et al. 2009).

Saunders et al. (2009) compared the main differences between these two research approaches (see Table 5), which is very helpful when I choose research approach for this thesis. The topic of this research is relatively new and there is little existing literature about LSCM (especially for SME). I need to understand the research context closely, and qualitative data will be of much help. As the researcher, when I conduct data collection, I am also involved into the real circumstances and the business operations. Then, through data analysis, I will try to construct a deep explanation of how the case company implements LSCM and why it works. So, the induction should be an appropriate research approach and will be used.

<table>
<thead>
<tr>
<th>Deduction emphasizes</th>
<th>Induction emphasizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Scientific principles</td>
<td>● Gaining an understanding of the meanings humans attach to events</td>
</tr>
<tr>
<td>● Moving from theory to data</td>
<td>● A close understanding of the research context</td>
</tr>
<tr>
<td>● The need to explain causal relationships between variables</td>
<td>● The collection of qualitative data</td>
</tr>
<tr>
<td>● The collection of quantitative data</td>
<td>● A more flexible structure to permit changes of research emphasis as the research progresses</td>
</tr>
<tr>
<td>● The application of controls to ensure validity of data</td>
<td>● A realization that the researcher is part of the research process</td>
</tr>
<tr>
<td>● The operationalization of concepts to ensure clarity of definition</td>
<td>● Less concern with the need to generalize.</td>
</tr>
<tr>
<td>● A highly structured approach</td>
<td></td>
</tr>
<tr>
<td>● Researcher independence of what is being researched</td>
<td></td>
</tr>
<tr>
<td>● The necessity to select samples of sufficient size in order to generalize conclusions.</td>
<td></td>
</tr>
</tbody>
</table>

Table 5 Major Differences between Deduction and Induction (Saunders et al., 2009, p127)

3.3. Research Strategy

Saunders et al. (2009) listed 7 different research strategies: experiment, survey, case study, action research, grounded theory, ethnography, and archival research. There is no superiority or inferiority of any specific research strategy to another. The research strategy (or strategies) selected in a thesis should be guided by the criterion that if it can enable us to answer the research questions and achieve our research purpose. According to the research questions and objectives in this thesis, I will choose case study as the main research strategy.
3.3.1. Case Study

Case study has been widely applied in many different research fields such as psychology, anthropology, education, and many others including business and management. Considered from different perspectives and objectives, case study can be used as a research strategy, a research design, a methodological approach, or a monographic approach, etc. (Mariotto et al., 2014). In this thesis, I accept the definition given by Robson (2002): case study is “a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence” (Robson, 2002, p178).

Yin (2002) compares the relevant situations for different research strategies and proposes that when we are selecting the research strategies there are 3 conditions playing a decisive role (see Table 6).

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Form of Research Question</th>
<th>Requires Control of Behavioral Events?</th>
<th>Focuses on Contemporary Events?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>how, why?</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Survey</td>
<td>who, what, where, how many, how much?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Archival analysis</td>
<td>who, what, where, how many, how much?</td>
<td>No</td>
<td>Yes/No</td>
</tr>
<tr>
<td>History</td>
<td>how, why?</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Case study</td>
<td>how, why?</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 6 Relevant Situations for Different Research Strategies (Yin, 2002, p5)

Condition 1: the form of research questions.

Through case study, we are more likely to obtain an in-depth understanding of the research context and the enacted processes (Morris et al., 1991). So, case study is suitable for answering “how” and “why” questions which aim at discovering what is happening in the study case and exploring some reasonable explanations. The main research questions are just raised in these two forms.

Condition 2: the extent of control over the behavioral events.

Case study is preferred in discovering what is happening in practice when the relevant behaviors are not manipulated. In this thesis, controlling the behavioral events in the study case is not only unnecessary but also unavailable.
Condition 3: the degree of focus on contemporary events.

Although, there might be some historical data being used, the main concern of case study is still the contemporary events which are just the focus in this thesis. I have chosen the company by which I have been employed as my case, and all of the research questions are related to contemporary events.

Some scholars with positivism orientation may feel that case study has an unscientific outlook as a research strategy. The biggest limitation of case study is that it can hardly provide a sound basis for the research findings to be generalized to a larger research scope (Donmoyer, 2000). However, this is a conclusion draw from the prerequisite that there exist invariant and universal laws in the business and management field. As we know that the research objects in business and management are existing in a constantly changing social context, even if we can find invariant laws under stringent conditions, they would not be valid in most real-world examples (Numagami, 1998). Therefore, to some extent, there should be some social research focuses on gaining a deep understanding of a particular case rather than finding universal laws. I believe that the research strategy of case study is highly valuable in developing existing theory and exploring sources for further research questions (Saunders et al., 2009).

Furthermore, single case study will be conducted in this thesis. Saunders et al. (2009) pointed out that to selected single case study as the research strategy mainly because it is a typical case or, alternatively, an extreme or unique case, or because it can provide the researcher with an opportunity to research a new phenomenon. The case company in this research is one of the best companies in New Zealand’s promotional products market, and the research questions about LSCM are relatively new (especially in this particular industry). Although, the abovementioned criticism about case study will get more fierce when it comes to the single case study, this research strategy can make the understanding of the case company’s scenarios more precise and the analysis and conclusion more reliable.

3.3.2. Case Study Protocol

As “a major way of increasing the reliability of case study research” (Yin, 2002, p. 67), creating a case study protocol is helpful to enhance the transparency of the research procedures so that other researchers will be able to replicate the work. Additionally, for the researcher, it’s beneficial to retain focus on the research questions and carry out the data collection (Yin, 2002). The case study protocol of this study is outlined in Table 7.
3.4. **Data Collection and Analysis**

Now we reach to the core of the research onion: data collection and analysis methods. From philosophy to approach and strategy, the research methodology is getting clearer, and then it is time to decide the data collection and analysis methods. According to the order of time, data analysis comes after data collection, but from the perspective of research methodology, data analysis method is actually selected before data collection method. Therefore, in this section, the first part will introduce the data analysis method in this research succeeded by the introduction of data collection methods in the next part.

This thesis employs interpretivism as the major research philosophy, induction as research approach, and single case study as research strategy. The context of the research object will be particularly concerned. It seems to be a natural outcome that qualitative data analysis and a variety of data collection method will be required.

### 3.4.1. **Data Collection Methods**

Qualitative data for this research will be collected through case study conducted in the case company that implements LSCM. Both secondary data and primary data will be involved in the data collection range.
Secondary data is the data that has been collected or compiled for some other purpose. It embraces a wide range of data forms. It can be raw data which hasn’t been processed or compiled data which has been summarized or analyzed somehow (Kervin, 1999). Saunders et al. (2009) sorted the secondary data into three main sub-groups based on some other researchers’ ideas (see Figure 14).

![Figure 14 Types of Secondary Data](Saunders et al., 2009, p259)

Documentary secondary data will be the major type of secondary data in this thesis. It includes written materials such as books, articles (on the journal, magazine, or newspapers), notices, minutes of meetings, reports to shareholders, and administrative and public records, etc. Non-written materials can also be included into documentary secondary data scope, for example, pictures, audio and video recordings, and company’s databases, etc. can be used to support the research. For this research, I have been granted access to many of the case company’s management files and databases, which can be an advantage for data collection.

To collect only secondary data is not able to provide enough data for deep understanding of the real situation about the implementation of LSCM in the case company. Primary data must be used as well. There will be two methods used for collecting primary data in this thesis: observation and interview.

With regard to observation, it is a systematic data collection method which involves “observation, recording, description, analysis and interpretation of people’s behavior” (Saunders et al., 2009, p288). Decided by the qualitative nature of this research, I will use participant observation which is an observation method aiming at discovering the delicate nuances of meaning in the research setting. Through fully participating in the activities of the study case, I will be able to not only observe what is happening but also
feel the specific process and discover something more beyond phenomena. The observation will cover how the case company implements LSCM on both the strategic level and the daily operational level, and what happens in the whole SC.

Interview is another way of collecting the primary data. It is a purposeful discussion between the researcher and interviewee(s) which is helpful for gathering valid and reliable data related to the research questions (Saunders et al., 2009). There are many different ways to categorize interviews. The one we use here is from Healey and Rawlinson (1994) who differentiate interviews as standardized interviews and non-standardized interviews. Generally speaking, the standardized interviews are used in quantitative data collection; the non-standardized interviews are used in qualitative data collection (Saunders et al., 2009). So, in this thesis, non-standardized interviews will be used.

Saunders et al. summarized the forms of the interview (see Figure 15). In this thesis, the interviews will be conducted on a one-to-one basis mainly through face to face meeting with a single interviewee each time. And because some of the interviewees are currently working and living abroad, the interviews with them will be conducted by telephone or internet instant messaging applications such as Skype, QQ, or Wechat.

3.4.2. Data Analysis Method

For a specific research, to distinguish between quantitative and qualitative is very helpful for the data collection and analysis process. Bryman et al. (2007) outlined the
fundamental differences between quantitative and qualitative research in term of research philosophy, approach, and ontological orientation (see Table 8).

Comparing with quantitative research, qualitative research emphasizes the interpretation of the social world rather than the quantification. It should be guided by interpretivism philosophy (rather than positivism philosophy) and induction approach (rather than deduction approach) (Bryman et al., 2007). Moreover, qualitative research treats the social reality as a constantly changing research object that is closer to the actual situation, so it’s suitable for generating or developing theories.

<table>
<thead>
<tr>
<th></th>
<th>Quantitative</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research philosophy</td>
<td>Deductive; testing of theory</td>
<td>Inductive; generation of theory</td>
</tr>
<tr>
<td>Research approach</td>
<td>Natural science model, in particular positivism</td>
<td>Interpretivism</td>
</tr>
<tr>
<td>Ontological orientation</td>
<td>Objectivism</td>
<td>Constructionism</td>
</tr>
</tbody>
</table>

Table 8 Fundamental Differences between Quantitative and Qualitative Research (Adapted from Bryman et al., 2007, p28)

From what is mentioned above, we can see that quantitative research method is proper for this thesis. LSCM is a relatively new topic for the academic research in New Zealand. It is a good chance for me to conduct research from the inside of the case company and try to understand how Lean Thinking is implemented to SCM and why some practices work or some fail. Through qualitative analysis, I can get valuable data with thick and thorough abstraction or description which can cover the contextual conditions in the research object and represent the perspectives and views of the participants in this research (Yin, 2002).

3.5. Validity and Reliability

Case study as an important research strategy often emerges as an obvious option for seeking to generate and test theory. Although case study has been traditionally criticized in terms of lacking rigor and objectivity when it is compared with other social research methods, it is advocated by Eisenhardt (1989) and Yin (2002) that we can refer to the criteria proposed by many positivist researchers and try to increase the rigor of case study. In the tradition of positivist, the rigor of a particular research is often assessed by the following four criteria: internal validity, construct validity, external validity, and reliability (Campbell et al., 1963). Each of these criteria will be discussed briefly in this section.
3.5.1. Internal Validity

For a specific research, the internal validity is about the causal relationships between the conclusions and variables. In a case study, in order to gain internal validity, the argument must be developed in a consistent and causal structure (Yin, 2002). There are three measures to improve internal validity:

A. Clear research framework;
B. Pattern matching logic;
C. Theoretical triangulation.

In this research, I formulated a clear research framework from the literature review in order to get a clear idea of causality and distinguish genuine relationships from spurious relationships. Yin (2002) advocates that researchers should define the predicted pattern of the dependent or independent variables of the research before data collection, and then compare with the empirically observed patterns. The initial variables which are the key elements in LSCM implementation are also derived from the literature review, and they will be observed in the process of data collection and compared with the patterns established in previous studies. Moreover, multiple sources of data will be used so as to better verify research findings (Yin, 2002).

3.5.2. Construct Validity

The construct validity of research focuses on the quality of the operational measures when we study on the concepts. It is criticized that the researchers usually fail to develop an adequate set of measures through case study, and, as a result, subjective judgments are used in collecting the data (Yin, 2002). In order to improve the construct validity of the case study research, three measures are listed:

A. Multiple data sources and data collection methods;
B. Chain of evidence;
C. Research review conducted by key informants.

In this thesis, the qualitative data in form of primary data and secondary data will be collected by different methods including collecting primary data by observation and interview, and obtaining documentary data from written and non-written materials. A chain of evidence will be established. All the data will be clearly labeled and properly stored. Any progress in the process of analysis will be recorded. The participants of the interview have the opportunity to check the accuracy of their interview transcript, and after data analysis they will have another opportunity to review the analysis process and
conclusions. Data retained from observation and documentary data collection will also be reviewed by key informants.

### 3.5.3. External Validity

The external validity of a research mainly refers to the generalization of the findings (Yin, 2002) and whether the conclusions in the study can be extended to make predictions in a broader scope. It is criticized that the case study cannot support the researcher to develop statistical generalization (Yin, 2002). Especially for the single case studies, a sound basis for generalization is hard to be provided. However, Yin (2002) believes that case study research can use analytical methods to generalize from a set of conclusions to a wider theory. The analytic generalization is distinct from statistical generalization.

In this thesis, the analytic generalization can be conducted from the perspective of the SC structure. Because the companies in the same promotional products industry tend to have similar business model and SC structure which are critical factors to the implementation of LSCM.

### 3.5.4. Reliability

Reliability refers to the consistency or dependability in measurement. It’s required that if the subsequent researchers followed the same procedures to conduct the study, they can gain the same conclusions just as the ones gain by the original researcher (Denzin et al., 2000; Yin, 2002). There are two important factors need to be considered when improve reliability:

A. The transparency of the research procedures;
B. The case study database.

Researchers should ensure that the research procedures have a certain extent of transparency in order to allow other researchers to replicate the work (Eisenhardt et al., 2007). In this thesis, a case study protocol which describes the whole process of case study was produced in detail, so that the transparency of the research procedures can be effectively enhanced. Moreover, it is important to create a case study database, so that new research investigators will be more easily to replicate the study. A case study database for this research will be established, and the case study notes, the unclassified documents of the case company, tabular materials, and the interview transcripts and audio records will be included in this database.
4. **The Context of the Study Case**

This chapter will introduce the background information of the case company and the Lean reform which has been being conducted since early of 2016. It starts from introducing its brief history and basic business structure, and then, reason why the case company is classified as an SME will be explained. The features of the promotional industry in New Zealand will be beneficial for us to understand the specific circumstances of case company and its SC. At last, the challenges and opportunities that the company is facing to will explain the necessity of the Lean reform.

4.1. **The Case Company**

In 1987, the case company, Tuapeka Gold Print, was founded in a small town called Lawrence which is with only about 500 residents. The word “Tuapeka” was the name of one of the three counties which composed Clutha District. “Tuapeka, was centered on Lawrence, and included the inland valleys of the Clutha River and its tributaries the Pomahaka River and Tuapeka River” (Wikipedia, 2016). After years of development, Tuapeka Gold Print has become the largest company in the promotional product industry in New Zealand.

“We are the largest in promotional products, and our closest competitor is probably half of our size in New Zealand market.” (Informant 3)

Even though Tuapeka Gold Print is a large and competitive company in a specific industry market, it still should be considered as an SME in this thesis, because an international outlook is used here to classify the case company by size. First, Tuapeka Gold Print is a typical role in a highly internationalized SC. Most of its suppliers are from overseas, and its target market is the whole Australasia area. Second, due to the limitation of the New Zealand market size, participating international competition is an important development path for many New Zealand enterprises including SMEs such as the case company. So, possessing an international outlook is of important significance for both of the business practitioners and researchers.

As a matter of fact, on a global scale, there is no universal definition of SME, and it varies significantly among different countries. In New Zealand, the official classification of enterprise size is very simple (see Table 9). According to the European Commission’s standard, those enterprises are classified as SMEs if they "employ fewer than 250 persons; and have either an annual turnover not exceeding EUR 50 million or an annual balance sheet total not exceeding EUR 43 million" (European Commission, 2015, p10). In
the USA, an enterprise in wholesale trade\textsuperscript{1} has 500 or fewer employees can be classified as an SME (SBA, 2016). According to the definition made by Australian Bureau of Statistics, enterprises with less than 200 employees are SMEs (Trewin, 2002).

Although, Tuapeka Gold Print can be considered as a "large business" by New Zealand standard, for the purposes of this research, referring to the classification standards of enterprise size in Europe, the USA, and Australia, I classify the case company as an SME.

<table>
<thead>
<tr>
<th>Company category</th>
<th>Staff headcount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td>0</td>
</tr>
<tr>
<td>Micro</td>
<td>1-5</td>
</tr>
<tr>
<td>Small</td>
<td>6-19</td>
</tr>
<tr>
<td>Medium</td>
<td>20-49</td>
</tr>
<tr>
<td>Large</td>
<td>\geq 100</td>
</tr>
</tbody>
</table>

Table 9 Classification of Enterprise Size in New Zealand (MBIE, 2014)

Because of the distinguishing features of the promotional product industry, companies in this industry normally have a comparatively long product line. Tuapeka Gold Print also supplies a wide range of promotional products (see the product line structure from Table 10). From Table 10, we can see that its product line is composed of 12 categories and 75 sub-categories which involve over 1,000 kinds of product and each product may have several different models, colors, or designs. By the end of November 2016, there are 4,047 products on its purchasing list. To a large extent, the feature of the product line has a decisive effect on the SC structure. Such a wide range of products requires a strong ability of SCM. Additionally, the company can also supply multiple printing and manufacturing processes (see Figure 16) which put a higher requirement on the SCM ability, especially for the internal material flow and information flow within the company which are also an important part of the whole SC.

\textsuperscript{1} The U.S. small business administration doesn’t have a size standard for the promotional product industry. We refer the size standard for wholesale industry because of the wholesale business model of Tuapeka Gold Print.
<table>
<thead>
<tr>
<th>Product Line</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pens</td>
<td>Plastic, Metal, Deluxe, Stylus, Mix and Match, Novelty, Presentation, Refills</td>
</tr>
<tr>
<td>Drinkware</td>
<td>Drink Bottles, Plastic Cups and Tumblers, Ceramic Mugs, Thermal Mugs, Vacuum Flasks and Bottles, Glassware</td>
</tr>
<tr>
<td>Key Rings</td>
<td>Key Rings, Key Lights, Bottle Openers</td>
</tr>
<tr>
<td>Business</td>
<td>Stationery, Notebooks, Portfolios, Desk Items, Lanyards, Calculators, Clocks</td>
</tr>
<tr>
<td>Print</td>
<td>Business Cards, Resin Labels, Magnets, Ad Labels,</td>
</tr>
<tr>
<td>Promotion</td>
<td>Beach Balls, Stubby and Can Holder, Confectionery, Stress Items</td>
</tr>
<tr>
<td>Technology</td>
<td>Flash Drives, Speakers, Headphones, Power Banks, Selfie Sticks, Phone Wallets, Phone Cases, Tablet Cases, Laptop Bags, Car Chargers, Tech Accessories</td>
</tr>
<tr>
<td>Bags</td>
<td>Paper Bag, Tote Bags, Jute Bags, Drawstring Backpack, Cooler Bags, Satchel Bags, Laptop Bags, Duffle Bags, Wine Carriers</td>
</tr>
<tr>
<td>Personal</td>
<td>Sunscreen, Hand Sanitizer, Lip Balms, Amenities, First Aid</td>
</tr>
<tr>
<td>Tools</td>
<td>Tape Measures, Lights, Multi Tools, Tools Other</td>
</tr>
<tr>
<td>Leisure</td>
<td>Sunglasses, Umbrellas, Sports, Golf, Travel, Home and Living, Coasters</td>
</tr>
<tr>
<td>Headwear</td>
<td>Caps, Hats, Beanies</td>
</tr>
</tbody>
</table>

**Table 10 Product Line Structure**

![Diagram of Printing and Manufacturing Processes](image_url)

**Figure 16 Printing and Manufacturing Processes**
4.2. The Promotional Product Industry in New Zealand

In this section, I will introduce the promotional product industry in New Zealand from 3 different perspectives: market size, industry characteristics, and business models.

4.2.1. Market Size

The statistical data from the Promotional Products Association International (PPAI) indicates that the annual turnover of the global promotional product industry of 2014 has exceeded 20 billion USD, and more than 60% of the promotional products were made in China. In the Australasian market, according to the Australasian Promotional Product Association (APPA), the current market size of the promotional product industry is $1.34 billion (AUD) in Australia and $144 million (NZD) in New Zealand (APPA, 2016).

“I tend to think that is a bit light. Because I think, you know, a lot of things that they wouldn’t be counted...I think it would be bigger than that. It wouldn’t surprise me if the industry in New Zealand is close to half billion.” (Informant 2)

Because of the special geographical position, the economic structure, and the small population, the market size of the promotional product industry in New Zealand is smaller than other developed countries such as Australia, Europe, and the USA, and the competition here is relatively less fierce. Most companies are developing in a traditional model, and there is no corporate investment or venture capital involved in this industry.

“...if you step outside, that in Europe or the US, you know, the market is so much bigger, and there are many corporate moneys involved in it. So it’s big enough there for corporates to get them involved. While in New Zealand and Australia, we haven’t seen that, we don’t see corporate investment, we don’t see big companies coming in and buying companies.” (Informant 2)

4.2.2. Industry Characteristics

Comparing with the general consumer goods, the promotional product is unique. It’s the merchandise (usually imprinted with a company's name, logo, or message) used in marketing and communication programs. The companies (it can also be organizations or individuals) who buy promotional products are normally not the end users of the products. They just distribute the products to the real end users for free or at a very low price in order to promote their corporate image, brand, and reputation, or to promote their products and services.
For a company in this industry, the supply chain is very different with the traditional one of a company in the general consumer goods industry.

A. There is a huge substitutability among suppliers at the upstream of the supply chain. There are thousands of products from hundreds of industries involved in promotional product industry. For every single procurement project, buyers are facing to lots of similar products from different suppliers.

B. To a promotional product, its buyer and ultimate user are separated. The downstream buyers of promotional products are normally distributors, retailers or brand organizations. They are not the real receivers and users whom their customers are.

C. To a large extent, a promotional product company is usually a trader who is a channel connecting suppliers in upstream and buyers in downstream. In this industry, product information from manufacturers is hardly broadcasted to ultimate users, and the feedback from the ultimate users are difficult to be precisely collected directly by the manufacturers. So, promotional product companies not only have great power in products selection and designing but also act as an important role in the information circulation.

From the abovementioned characteristics, we see that for the companies in the promotional product industry the level of their SCM is highly important to their business success. Tuapeka Gold Print, as a leading company in New Zealand’s promotional product industry, treats SCM as an important part of its corporate strategy and has obtained huge benefits from their SCM improvement. In the recent two years, Tuapeka Gold Print also believes that Lean Thinking could be a critical optimizer for the SCM and the whole competitive advantage of the company. So, all these facts make this company to be a suitable case company for this research.

4.2.3. Business Models

In the promotional product industry in New Zealand, there are 3 main business models for the companies to develop their business: wholesale only, wholesale and resale, and resale only. These 3 business models directly decide the related company’s SC structure and its role in the SC.

The companies who use the first model, wholesale-only model, will only trade with their distributors and never sell directly to the end buyers of their products. They are in a comparatively upper stream position in the SC. It requires the companies to have a big range of products, a certain advantage on the prices, and the ability to supply goods in large quantities. Tuapeka Gold Print is using this model and playing a leading role in New Zealand’s market.
The second model, wholesale and resale model, means the company will sell to distributors and the end buyers in the meantime. It seems to be more beneficial for expanding sales, but there are some potential problems with this model. This model may cause the distributors feel unsafe because in some occasions the distributor’s customer can bypass the distributor and come directly to the wholesaler.

“We had a competitor that does both. That competitor does the whole sell and does retail. And the resellers, the distributors in the market avoid this company because they always worry. So, this competitor is going down, because no one will promote, the distributors only promote the products they have to.” (Informant 3)

Most companies in this industry are using the third model, resale only model. It means that the companies play a role as a reseller and they purchase promotional products from wholesalers and sell them to their clients who are, in general, the end buyers. So, this type of company is in a more downstream position in the SC.

4.3. Challenges and Opportunities

Given the market position of Tuapeka Gold Print in this industry, it is not difficult to understand that the case company is surrounded by challenges and opportunities in this competitive market.

4.3.1. Challenges

From 2013 to 2016, Tuapeka Gold Print has been developing at a rapid speed. Figure 17 shows the real development rate in the last 3 years and the estimated (targeted) development rates for 2016 and 2017. No matter to the average level of the same industry or many other industries, this is a significantly high speed of development which brings huge benefits to the company, but at the same time, the fast development speed can cause big challenges as well.

![Figure 17 Development Rates (2013-2017)](image)

The first challenge is to the corporate culture and management style. When a company steps into the fast growth stage, its original corporate culture and management...
style are going to face too many problems along with the expansion of the business scale and organization size. There are more people involved, more work processes added, more machines purchased, and more buildings constructed. All these changes may lead to a series of problems which can affect the further development and even the survival of the company.

“... there will be much pressure on the company, and so normally as a company growth, you know, you constantly have to put new processes and procedures in place to do with things... So, in order to deal with the growth, we have to become better organized.” (Informant 3)

“There is danger in growth. You have to realize it does not just happen by itself. As you are getting bigger, you almost have to reinforce the culture of the company to cope with it.” (Informant 2)

The second challenge is to the human resource management. Because of the rapid expansion of the business, it requires more employees to do the work. Staff recruitment needs to be improved to grow talent demand, training programs need to be more systematic to enhance employees’ competency, performance evaluation system needs to be improved to better the work efficiency of each department, and remuneration and incentive system need to be modified to encourage employees’ enthusiasm.

“As we are growing fast at the moment, we know that there is an area in the company we need to do better, we need more skills, but it takes the time to get them. And in almost the time you got them, you need somebody else.” (Informant 2)

“If you want smart people working for you, you’ve got to give them real challenges, because smart people just get sick of coming to work doing the same things every day.” (Informant 2)

The third challenge is the waste control. As long as the company is developing fast, the existing wastes will be magnified, and there will be more and more new wastes turn up together with recruiting more people, purchasing more machines, and adding more processes, etc. Without a good control of the wastes, the profitability of the company will be seriously affected. So, how to find out and eliminate wastes is a problem demanding high attention.

“The thing is that the bigger you get the mistakes become bigger, and the waste becomes bigger...as the company gets bigger, every person is a part in that, and the processes become small. Therefore, you have to have some sort
of system to control that. And the other thing is that there are more and more people become involved in it. If everybody has just a little bit of waste in what they are doing, all those bits of waste just magnify." (Informant 2)

Furthermore, there are some other challenges appear with the fast growth. For example, the supplier management needs to be improved. In order to consolidate and enlarge the turnover, the company needs to develop new products and new suppliers. In order to maintain and improve the stability of the product supply and the quality consistency, the company needs to make incessant efforts to strengthen the supplier relationship; meanwhile, to set up an appropriate supplier evaluation system and supplier reward and punishment mechanism are becoming necessary. The rapid growth causes the cash flow getting tight sometimes and the fixed asset investment such as machines, office space, and warehouse space becomes insufficient. All these challenges will affect the company’s SC performance.

4.3.2. Opportunities

The management team of Tuapeka Gold Print has realized there are so many challenges along with the fast growth, and they believe that Lean Thinking is an effective weapon to arm the company to face challenges and seize opportunities.

The first opportunity is to have a chance to improve the corporate culture. “Just as an individual must have a personality, a company must have a culture.” (Flamholtz et al., 2012, p87). Corporate culture can deeply influence how and how well a company works. Flamholtz et al. (2012) even consider the corporate culture as the “ultimate strategic asset” for a company. From the evolutionary perspective of corporate culture, a company should have a different corporate culture at different times. For the new companies, many of them may have a corporate culture which is mainly dominated by the founders (Oden, 1997). As the company is growing fast, the corporate culture needs to be adjusted accordingly in order to cope with the growth and build a solid foundation for the further development.

“Lean drives us as a team. You know, Lean is about the way people think, it’s about culture. And if people don’t fit into that, then as we grow further, they are going to fall off. So, Lean is a good way of training people think differently and hopefully more of them can grow.” (Informant 2)

“It doesn’t matter how well we do, there must be some way we can do it better. So, I think Lean is just an official name to build a culture of efficiency, accuracy, and engagement.” (Informant 2)
The other important opportunity is to make the original non-Lean SC become LSC. Through waste elimination, lower inventory level, reduced cost, better quality, shortened lead time, and better customer satisfaction, etc., the SC will be more efficient. For Tuapeka Gold Print, the SCM contributes massively to the competition advantage. They have a printing factory in New Zealand and can supply many different printing services and some assembling services, but they are just some normal business abilities which are neither technology intensive nor capital intensive. After years of operating, the company has built up a broad supply and distribute network which are actually a key part of their core competitiveness.

SCM is “something that it doesn’t matter how good we get at it; we should always want to get it better.” “The only way we can smooth that is to have great systems and make sure our supply chain is Lean.” (Informant 2)

In summary, along the way of operating in the promotional product industry in New Zealand, Tuapeka Gold Print has achieved significant development and built up the rudiment of its own SCM frame. In recent years, the rapid growth brings some new challenges and opportunities. To cope with the new circumstances, the case company decided to introduce Lean Thinking into the corporate culture, management strategy, and SCM. To some extend, the research questions of this thesis are the key questions for the case company in the process of its future development as well.
5. Case Study: LSCM Implementation

In this chapter, I will introduce how the case company implements Lean in the organization and the SC in order to achieve LSCM. Then, combining the real practices conducted by the case company and theoretical analysis, I will discuss the main questions of this research in the last section of this chapter.

The LSCM implementation will be introduced mainly from two aspects: Lean principles and Lean implementation processes. By discussion, I will try to figure out if the universally accepted 5 Lean principles need to be adjusted when an SME use them in the SCM, how to properly arrange the Lean implementation process, what is LSCM for an SME, and how to achieve it.

5.1. Lean Principles in the Case Company

The five principles of Lean Thinking proposed by Womack and Jones (1996) are well acknowledged by many scholars and practitioners in this field. They are considered as the foundation of Lean implementation. Tuakeka Gold Print also treats these five principles as the basis of the whole process of their Lean reform.

5.1.1. Principle 1: Value

To define the value from the perspective of the ultimate customer is considered as a critical and fundamental change for Tuapeka Gold Print. Before implementing Lean, the case company had recognized the great importance of the customer demand. But this recognition was only possessed by some key members of the board of directors rather than being clearly defined and then promoted throughout the whole company. Most of the time, they used to only focus on their direct customers’ interests rather than the ultimate customers’.

Through the first principle of Lean Thinking, Tuapeka Gold Print defined their ultimate customer as “the end user is actually the company that uses the products for their own business purposes” (Informant 3). This definition changed people’s way of thinking from the managers to the employees. They must think even further beyond the direct customers, the distributors, to their customer’s customer. The value which is delivered throughout the whole SC is for the ultimate customer at the end. So, for the case company, adding value for the ultimate customer is their meaning of existence and motive force of development.
“Our whole objective is to make their businesses stronger. So, what can we do is to make their business stronger because we can do that, then that is going to help them to be more successful, and of course they will come to us through more and more business.” (Informant 1)

5.1.2. Principle 2: Value Stream

According to this principle, Tuapeka Gold Print did the value stream mapping analysis. Each existing step of the value creation process within the organization was visualized on the current state VSM (see Figure 18). From this map, different kinds of waste could be identified. Based on the “7 wastes” presented by Ohno (1988), Tuapeka Gold Print made a supplementary and identified 8 wastes in the organization which were represented by the acronym TIM WOODS (Transport, Inventory, Motion, Waiting, Overproduction, Over-processing, Defects, and Skills). The first 7 wastes in TIM WOODS didn’t have much difference with Ohno’s “7 wastes”, and the new waste, “skills”, refers to the underutilized skills of the employees including knowledge, ability, and some specialized skills, etc. After the wastes were identified, the Lean tools and practices would be more objectives-oriented. Then, the future state VSM (see Figure 19) would be achievable.

"Your value definition is around culture, and value stream is around identifying waste in the processes all the way through." (Informant 1) Before the VSM was completed, “we understood a lot of our waste were anyway” (Informant 1), but after that, “we knew there are other areas of waste we do have”. (Informant 1)
Figure 18 VSM – Current Status  
(Tuapeka Gold Print)

Figure 19 VSM – Future Status  
(Tuapeka Gold Print)
5.1.3. Principle 3: Flow

The principle of creating value in continuous flow was also accepted by the case company. For a company in promotional product industry, the lead time is one of the most important factors which constitute its competitive advantage. By implementing Lean tools and practices which can support the company getting the continuous flow, the lead time can be reduced largely with better quality. (The specific Lean tools and practices that Tuapeka Gold Print is using will be discussed later.)

“I think the biggest thing that we identified, and that’s why I’m glad we entered into Lean in January, is our mentality of how we manage our plant, in terms of production, in terms of getting the flow.” (Informant 1)

“It’s critical when you look at our industry, one of the biggest issues we face every day is lead time. Most of the phone calls coming to our customer service team were about getting it quick, how quick to have it.” (Informant 2)

“Bringing your lead time down is the way of continuously improving the speed of flows to the market.” (Informant 1)

5.1.4. Principle 4: Pull System

From the perspective of production and sales, the pull system is an innate characteristic for Tuapeka Gold Print. Most of the sales orders are printed orders which mean the printing factory must print on the exact quantity of products that the customer has ordered according to the artwork confirmed by both parties. Through effective communication and information sharing, JIT and pull system can be achieved and the related wastes can be effectively reduced.

“We are lucky we are not here to make stock, and then there is a pull system which is as classic as Just-in-time. So, everything is pulled through production.” (Informant 1)

But this is only a half-truth in the case company. There is barely no cost of WIP (work in progress) inventory and FG (finished goods) inventory in the company, because the main production process is just printing on the products, which is arranged after the order has been placed by the customer, and most sales orders can be finished and dispatched in a short time. From this point of view, it is a simple and good pull production system. However, Tuapeka Gold Print relies heavily on its RM (raw materials) which are various kinds of unprinted products (and these products can be considered as FG in the ordinary retail industry). Due to the unique national economic developing pattern, the
manufacturing industry in New Zealand is less developed. So, most of the products in the case company’s product range need to be imported from overseas. Moreover, the geographical location of New Zealand is far away from the major manufacturing nations. Taking China for example, it takes an ocean-going freighter 4 weeks on average to travel from a Chinese port to Port Chalmers (Dunedin, New Zealand). Additionally, in consideration of the production time (in the supplier’s factory) and the time for other operation procedures, it takes 14 to 16 weeks from placing the purchase order to receiving the products. In order to meet customers’ demands on getting their products as promptly as possible, Tuapeka Gold Print has to keep adequate quantity of RM inventory which takes up a big part of the operating costs. By applying pull system from the downstream SC members (customers) to the company itself and then to the upstream SC members (suppliers), the company will be able to make better use of its resources to produce products that will be sold in a short time.

5.1.5. Principle 5: Pursue Perfection

Lean Thinking advocates conducting an infinite process of pursuing perfection. This principle was admitted unanimously in the board of directors of the case company. All the Lean tools and practices implemented by Tuapeka Gold Print are aimed at continuously improving its operating processes. Every improvement is considered as a step towards perfection.

“The underlining thing is just continuous improvement. So, if our company continues to improve in every area of the business, it’s going to become stronger and smarter. So, the reason for us to embrace Lean was because we recognized we needed to do that, we needed to focus on continuous improvement.” (Informant 1)

Continuously pursuing perfection is considered as an important part of the company culture that the company tries to rebuild along with the Lean implementation.

“It's something that never ends. What we are trying to do it to implement Lean as a culture.” (Informant 3)

5.2. Lean Implementation

In this section, the process of the Lean implementation in the case company will be discussed from the perspective of wholeness, and then the Lean implementation within the company and on the scale of the SC will be discussed in detail respectively.
5.2.1. The Process of Lean Implementation

The journey of implementing Lean Thinking in Tuapeka Gold Print formally started from January 2016. But the generation of the original idea that use Lean Thinking to enhance the management and support further business growth can be traced back to 2014. The period from generating the idea to starting the implementation is not meaningless; on the contrary, it is considered as an important part of the whole process of Lean implementation. From the whole picture of the Lean implementation in the case company, I divided it into four phases (see Figure 20).

![Figure 20 Lean Implementation Process in the Case Company](image)

The thought of introducing Lean Thinking into the company as an important driving force for the further development was presented by the CEO of Tuapeka Gold Print in 2014. However, the board of directors failed to achieve a unanimous agreement on this proposal. It was not because of any suspicion of the effectiveness of Lean Thinking but the unripe and unstable conditions of the company at that time.

"I didn't want to bring it in until we all felt we were ready to adopt it. Because it would be a big waste of money to try or we would lose confidence of the staff."

(Informant 1)

Tuapeka Gold Print had just moved from Lawrence to Dunedin in 2013, although it was considered as a positive change because it could help the company to get rid of the big disadvantage of the low logistics capacity and efficiency in Lawrence and get more skilled workers in Dunedin (Informant 3), they still needed time to get positive feedback from the business performance and recover from the huge cost of the relocation and constructions.

In the second half year of 2015, the conditions of adopting Lean Thinking were ripe. First, the growth rate of the business leaped after the relocation, and the turnover grew 38% in the last two consecutive years. So, the company had enough funds to introduce Lean Thinking which would require it to hire a consulting firm, recruit experienced managers, office staff, and skilled workers, invest in employee training, upgrade the
information management system, purchase machinery equipment, and increase some other necessary fixed assets investment, etc. Second, the rapid growth of the business objectively required the company to make changes accordingly in order to cope with the growth (Informant 1, 2, and 3).

After the decision of introducing Lean had been made, Tuapeka Gold Print went to the preparation phase which consisted of two parts: training and assessment. A training program to the key members in the company was considered as a necessary condition before the Lean journey formally started. The company conducted a two-day centralized training in a weekend of the second half of 2015. The main purpose of this training is: first, to let all the key members perceive, agree to, and support the Lean introduction; second, to teach each trainee some basic knowledge and skills of Lean, so that they would be more confident to improve their respective work and cooperate with each other as a team (Informant 6 and 7). The training program is still continuing at irregular intervals after the Lean journey has started.

“I wanted it to be in a point I could control it and I also believed that it was understood properly (by everyone in the company). Because people have their own perception of what Lean is. I had to get to a space where we felt that our thinking is in alignment.” (Informant 1)

Lean assessment is another part of the preparation phase. Just like a patient needs a diagnosis for his/her illness, the case company needs to identify its defects via troubleshooting, and then it could find out a route to make improvement, especially when the company decided to make a critical change to its whole management system and company culture. The Lean assessment was conducted by a consulting company which would probably give professional intellectual support about Lean during the whole process of the implementation. Because the case company had never implemented Lean before, the Lean assessment was conducted at a starter level. As we can see from the result of the assessment (see Figure 21), there were four areas being assessed, which were shop floor operations, production system, mindsets and behavior, and management infrastructure. The overall Lean score was 13%, which was low but not unexpected. In all the assessment items, the company did comparatively good at waste awareness and management, vision and values, and safety; but it got very low scores at many other assessment items, especially at team task boards, separate value streams, flow, performance management, and skill and knowledge management.
From the result of the Lean assessment and the following step of SWOT analysis (see Figure 22), the case company got a clearer knowledge about the real situation of its Lean operating performance, and then was aware of where the opportunities existed.

**Figure 21 The Result of the Lean Assessment (Tuapeka Gold Print)**

**Strengths**
- Technical Innovation
- People: Effort, Intention, Respect
- Senior Conflict Resolution

**Weakness**
- Middle Management Firefighting
- Stock Work-in-progress
- 5s

**Opportunities**
- Low-level Continuous Improvement
- Leader Standard Work
- Visual Management/Flow Controls
- Task Board & Kpis

**Threats**
- Factory Flow
- People: Critical Positions

**Figure 22 SWOT Analysis on the Lean Assessment Result (Tuapeka Gold Print)**

The last phase is to formally implement Lean in both inside (in the company) and outside (in the whole SC). There are five sub-phases of the implementation: initiating, developing, building, refining, and sustaining. As we can see from Figure 23, the whole process is like building a pyramid, each lower level is the foundation of upper levels, and
there is no cap for the “pyramid” because they believe Lean implementation in the company will never end, which just embodies one of the 5 Lean principles, endlessly pursuing perfection. There are some items appear more than one time in the pyramid. For examples, value definition, value stream, flow, and pull, etc. It means that these processes which embody Lean principles need to be revised or reinforced along with the development of the Lean implementation. Additionally, implementing Lean in the whole SC is different with doing it within the organization.

"Each of those triangles is basically a tool or something that a business needs. So, if you follow in all of that, that is certainly going to help. But the reality is that you only get so much money for a certain period before you run out, and when you are growing the right way." (Informant 1)
Figure 23 Pyramid of the Lean Implementation Plan
(Tuapeka Gold Print)
5.2.2. Lean Implementation within the Company

Tuapeka Gold Print started the substantial Lean implementation from January 2016. According to their plan, the implementation would be conducted inside the company first and then extended to the external SC. Although all the items in the pyramid (Figure 23) were beneficial and needed, it was still very important to select some priorities. There were 3 areas being identified as priorities in the initial stage of the implementation: People, Factory Flow, and Basic Lean systems.

5.2.2.1 Priority 1: People

The whole implementation process would be finally conducted by each employee in the company. So, to enhance employees’ understanding of the company strategy and their skills base was the highest priority.

First, through several rounds of training programs, it helped all the team leaders in each department to deeply understand the Lean implementation plan and then communicate it to every employee; through cross-training programs in each department, it helped each team member to become familiar with multiple job positions.

Second, the case company set some new senior management positions such as Operation Manager and CSR/Order Processing Manager, and recruited managers who were with rich experience of Lean management for these positions.

Third, gradually liberated the team leaders from particular detailed work and made them focus on their management responsibility more than ever before. Every department started to establish active development plans including weekly, monthly, and annually plans. These plans would be periodically reviewed. New KPIs for each member of the department were applied to track personal performances. Moreover, regular one-on-ones meetings started to be hosted in order to guarantee that every team member’s voice could be heard.

The goal of this part is to achieve the following desirable future state:

- Build depth / remove “single points of failure”;
- Leaders building People and Process as their first priority;
- Skills matrix / cross-training / skills planning;
- Build role “redundancy” – reduce dependency on top managers;
- Effective delegation;
- Effective Performance Management (Active development plans, Regular 1:1s, Periodical Reviews).
5.2.2.2 Priority 2: Factory Flow.

During the period of Lean assessment, problems existing in factory flow were starkly exposed. For example, there were stock WIP, RMs, packaging cartons everywhere on the shop floor; material and information is out of sync, messy layout of the machines, too many reactive behaviors, etc. After the VSM analysis was completed, wastes in the factory flow were identified. By implementing work cell scheduling, dedicated material handling, and visual control systems (including Kanban, Heijunka Box, and Obeya), the shop floor got tidier, and people knew the current status of each job better, so the quantity of reactive behaviors was decreased. Through utilizing JIT and synchronized stock movement, the information flow among office, factory, and warehouse was more efficient, so was the material flow. Using smaller batches would also benefit the material flow.

The objective was to achieve a Lean factory flow with the following features:

- Value stream structure;
- Scheduling to work CELL;
- JIT & synchronized stock movement, in line with Information flow;
- Smaller batches;
- Visual control systems;
- Dedicated material handling.

5.2.2.3 Priority 3: Basic Lean system

All of the above-mentioned priorities were the basis to build up a basic Lean system for the whole company. This system consisted of the following features:

- Team task boards;
- Working menus;
- Simple problem-solving mechanism (5 whys);
- Visual project planning (A3 and stand up meetings);
- Basic KPIs – KISS (keep it simple, stupid), SQDCM (Safety, quality, delivery, cost and morale/people);
- 5S both in both factory and office.
5.2.3. **Lean Implementation on the Scale of Supply Chain**

After a basic completion of those 3 priorities, the status of company operations improved markedly and the growth rate of the business accelerated largely (Informant 1, 2, and 3). Up to June of 2016, the turnover was as large as the total turnover of the previous year. Then the board of directors made a more aggressive business plan which is called “4 × 4 Plan”.

“We are at the business plan stage; we had a strategy meeting, from that we created 4×4 which is 4 times in our turnover in 4 years. And then how we are going to achieve that? We are going to need a sales operations plan, we are going to do a better capacity plan, and we need a cash flow to support the capital that we are going to need to buy to support the growth. And then we need inventory investment, we need to understand how many power locations of the storage we are going to need for the stocks growth, how many dollars of inventory we are going to have to purchase to support the growth.” (Informant 1)

In order to make this plan achievable, Tuapeka Gold Print continued to deepen the Lean implementation and, at the same time, extend the scope of Lean practice from the inside of the company to the other players in the SC.

“There is an excellent supply chain network already in place and that’s very robust, but it needs to be twisted to get more efficiency out of it.” (Informant 1)

5.2.3.1 **Restructuring Procurement Department**

The procurement department used to be a small department which consisted of 3 people, and 2 of them were board members who served concurrently in other positions in the company. Along with the process of the Lean implementation, the headcount was increased to 7. The function of the department and the assignment of responsibilities were redefined and specified. Dedicated personnel were appointed to respectively take charge of new products and new suppliers development, existing suppliers relationship management, stock purchase order management, indent purchase order management, and quality control. The procurement department was still led by the 2 board members who had the highest authorities to make the final decisions regarding to department strategy and dealing with disputed issues.
“Because the experience I have got, you just can’t hire people who have got 30 years of experience. But also, you have to have a bit of understanding of the industry and the products. And you can only get that with learning. And what I found is even for some very big American company that turnover is hundreds of millions of dollars, the owner is still buying the product, going to China and buying the product, because they know what makes it work.” (Informant 2)

5.2.3.2 Defining New Driving Forces

With the purpose of supporting the 4 × 4 Plan, the case company adjusted its business development strategy and defined its two main driving forces for the future growth: expanding product range and developing indent order business.

It is a normal logic that a company can increase its sales volume by expanding the existing product range, especially when there are potential customer demands in the market. So, it became a natural choice for Tuapeka Gold Print.

“What we have to do is to feed it (the potential customer demands). We need to add products we haven’t been selling. Because our customers tend to sell a full range of products, and if we don’t have the particular product, they will buy it from somewhere else… We got a lot to learn, but we’re learning it across a wide range of categories. And the categories will move into like headwear, umbrellas, and apparel, those categories still don’t have suppliers that to offer similar service. “(Informant 2)

Except for expanding product range, to develop indent order business is another important engine for the company’s further development. Indent order is an order placed for the products both produced and printed by the overseas suppliers (mostly in China). After a customer placed an indent order, what Tuapeka Gold Print needs to do is to design the printing artwork and then notify the supplier to arrange production, printing, and shipment. The products may be delivered to the case company first and then transferred to the customer, or delivered to the customer directly. Normally, the case company needs to offer its customers a higher Minimum Order Quantity (MOQ) for indent order than stock order. Actually, indent order was an existing business form in the case company before it introduced Lean into the organization. But back then, it was just a beneficial supplement for the stock orders. Because sometimes it was inevitable that some products were out of stock when customer inquired, in order to meet the customer’s needs as well as possible, the company provided indent order as another option for the customer.

After conducted the VSM analysis, it was found that indent order had a great growth
potential. Firstly, the cost of printing the products in China is much cheaper than the cost of doing it in New Zealand mainly because of the significant difference in labor costs between these two different countries. Secondly, when the order quantity of the indent order reaches a certain high volume, the price per unit is lower enough to cover the freight cost. Thirdly, there is no inventory cost for indent orders. In sum, it was considered by the case company that the indent order promised to become a strong driving force for the business in the future. So, the sales target of indent order in 2016 was increased to 10 million NZD from 2 million NZD in the previous year.

5.2.3.3 Lean Purchasing

A. Flexible payment method.

On many occasions, payment is a critical factor which can affect the lead time. The suppliers are not willing to arrange production if the deposit payment (if requested) is unpaid, or release the Bill of Lading if the balance payment is outstanding. But for a company, temporarily tight cash flow is a problem it has to deal with from time to time. So, to have a more flexible payment method will be beneficial to achieving a more stable lead time. Through communication and negotiation, Tuapeka Gold Print reached agreements about the flexible payment method with 5 key suppliers. According to the agreement, payments to these suppliers could be postponed for one or two months (varies among different supplier due to the different agreement details) if the payer’s cash flow was tight.

B. Decrease the lot sizes.

It is not an uncommon problem for Tuapeka Gold Print that when it place purchase orders with suppliers, the required MOQ for some products is too high, and it may take a long period (sometimes 1 year or even 2 years) to digest the inventory from a single purchase order. This problem often causes a high cost of inventory management and a risk of unexpected quality issues. Before the Lean implementation, it was considered as an unavoidable cost and nobody took it seriously. But since then, people started to realize that small lot size was very helpful for eliminating wastes and improving the efficiency of material flow and value creation. So, the case company started to make more efforts on negotiating with the suppliers about the MOQ requirement for each product.

5.2.3.4 Lean Logistics

Tuapeka Gold Print has 84 regular suppliers for the stock orders, fifteen of them are located in Ningbo or its surrounding area, and eight of them are located in Shenzhen or its surrounding area. The value of the purchase orders with these 23 suppliers takes up more
than 80% of the total purchase orders’ value. In most cases, each individual purchase order is not big enough to fill up a full 20-foot shipping container. If all of the purchase orders are separately shipped out from each supplier via LCL (less than container load), the total cost of ocean shipments would be very high, because there is a big difference in price between LCL shipment and FCL (full container load) shipment.

“The cost per CBM for the full container is about 50 NZ (dollars), but if we are going to LCL them, it costs 250 per cubic meter (CBM).” (Informant 10)

So, the case company found 2 Chinese suppliers, one in Ningbo and the other one in Shenzhen, who were willing to help with arranging consolidated shipment and charge 1% of the order value as commission. In this way, the cost of ocean shipments from Ningbo and Shenzhen port was decreased by large. All the suppliers related to the consolidated shipment can share the one document fee which should be one for each supplier if ship via LCL (Informant 3).

In the meanwhile, the lead time was also shortened because of the consolidated shipment arrangement. As we can see from Figure 24, the efficiency of loading and unloading a FCL container is higher than a LCL container, and it is also faster to arrange domestic transport of a FCL container.

![Figure 24 Comparison of the Transit Times](image)
5.2.3.5 Lean Quality Control

The waste caused by quality issue is one of the most obvious types of waste in Tuapeka Gold Print. Before the company introduced Lean into itself, quality control responsibility was assigned to the warehouse manager. But this work related to different parts of the SC, which was beyond the boundary of warehouse management. With implementing Lean quality control, this responsibility was transferred to procurement department, and dedicated personnel were appointed to be in charge. Since then, quality control in the case company was defined as managing two kinds of quality issue: quality issue caused by the company itself and quality issue comes from the supplier.

With regard to the quality issue caused by the company itself, there are many different reasons for why it happens. It can happen during storing period, printing process, packing process, or internal transport process. There are many Lean quality tools such as PDCA (plan-do-check-act) method, 5 whys, poke yoke and some other visual control tools can be used within the company (especially in the printing factory) to control and decrease the occurrence probability of this kind of quality issue.

However, for the quality issue comes from the supplier, it is a more complicated situation because there are suppliers involved. In most cases, this kind of problems cannot be solved through the efforts of only one party of the two sides. Tuapeka Gold Print made some changes regarding this part of work under the instruction of Lean Thinking.

A. Daily Wastage Report

By making a daily wastage report which tracks the over issued RM for all the sales orders in that day, the company is able to get a clear picture of the situation of the defect waste. In this wastage report, any over issued RM that is worth 5 NZD or more will be recorded and reported to the factory managers, and the QC manager in procurement department.

B. 5 whys

In the daily wastage report, any item which is with 10% or more waste rate will be given higher priority, and the related department will use 5 whys to find out the route reason(s) that cause the problem and make a record for the whole process of problem-solving. Then, if the problem is caused during printing, the factory will work on improving printing process by better training, equipment adjustment, or process adjustment, etc.; if the problem is caused by defective RM, procurement department needs to report the problem to the supplier within one week and discuss the succeeding compensation arrangement and improvement plan with the supplier.
C. Normalized and regular QC issue communication mechanism

Procurement department has already established a normalized and regular QC issue communication mechanism with the top 5 largest suppliers (by the end of November 2016). These suppliers can be able to get monthly updated information about the quality issues with their products, so that they can constantly track and solve the problems. Most importantly, Tuapeka Gold Print considers the quality issue as a common difficulty for both of the supplier and itself, and treats quality control as a cooperative work with the supplier. The company is trying to broaden this communication mechanism to a larger scope of suppliers.²

5.3. Discussions

The two main research questions of this thesis will be discussed in this section. Before defining what characteristics the LSCM has, Lean principles and Lean implementation process will be discussed according to the case company’s practices. As for the question about how to apply Lean principles, the first 2 principles are necessarily being reconsidered when the research object is the LSCM in an SME. The matters needing attention in each phase of the Lean implementation will be summarized. Then, this thesis will list 7 characteristics of the LSCM. In the end of this section, how an SME achieve LSCM will be discussed in a holistic perspective.

5.3.1. How to Apply Lean Principles?

Although, in the academic circles, Womack and Jones’ (1996) five principles of Lean Thinking have been widely accepted as the basis for Lean implementation, it is a worthy question to explore that if there is any necessity of making adjustments when it comes to an SME in a non-typical manufacturing industry.

The first Lean principle, value, is also the most key concept and fundamental way of thinking when people or companies adopt Lean. Womack and Jones (1996) and many other researchers believe that a Lean enterprise must understand what is the value of its product (or service) for its ultimate customers, because this value will determine the market price that the ultimate customers would like to accept. Then, this enterprise will be able to ask the next question: what is the target cost which means the waste-free cost of the product (or service)?

This is the way that we define value when we discuss Lean on the level of individual

² This practice has just been conducted for a few months, and it needs a longer period to collect actual data which can demonstrate its effect. Because of the time limitation of this research, further statistical data are temporarily unavailable.
enterprises. On this level, we focus on the product (or service) which is actually the carrier of the value from the enterprise to the customer. However, in this research, the main research object is LSCM, so we need to step out from the single company, and look through the situation on a higher level, the level of the whole SC. If we see value on this level, the value stream should be bidirectional rather than unidirectional (from upstream to downstream).

As an intermediate link on the SC, a company, such as Tuapeka Gold Print or any other company, connects with suppliers in the upstream and customers in the downstream. If a company only focus on decreasing cost in order to get close to the “target cost” and squeezing the suppliers’ profit margin, it is impossible to establish a sustainable long-term partnership with its suppliers, especially when the company only has weak buying power. Without a stable supply source, it is impossible to ensure an adequate supply, a prompt delivery, and the guaranteed quality. Then, losing customers would be a foreseeable and unavoidable result.

![Diagram: Bidirectional Value in SC]

Figure 25 Bidirectional Value in SC
The view that value is created and delivered to the downstream only reflects the direction of material flow in the SC (see Figure 25). It is a good way of thinking to remind the company that to control the product cost by eliminating wastes is important for the business, because no customer wants to pay for any waste. But, it is also important for the company to understand that providing value to both directions on the SC is the key to maintain and consolidate its SCM. The value in the SC is carried by all the 3 flows: material flow, information flow, and fund flow. As we can see from Figure 25, the material mainly flows from upstream to downstream, the information flows bidirectionally, and the fund mainly flows from downstream to upstream. When a company tries to introduce Lean to its SCM, defining value as a bidirectional concept will help it to obtain a lot more impetuses and opportunities to use Lean tools to smooth the information flow and the fund flow which have mutual promoting relationship with the material flow.

For a company in the promotional product industry, how to establish and maintain a sustainable long-term partnership with its suppliers is a subject worth paying more attention to. Because, in many cases, the promotional product company stands in a relatively weak power position in the SC, especially in front of its suppliers. Take Tuapeka Gold Print for example, it has very limited buying power to most of its suppliers.

“Most of our suppliers are much bigger than us. We are very tiny. For Sylooon (one of the case company’s biggest suppliers), for example, we might not be in its top 50 customers. So, how do you get value from that? How do you get them to work for us?” (Informant 1)

Before introducing Lean into the company, what Tuapeka Gold Print did was keeping good relationship on the top management level with the key suppliers. In its 29-year history, some suppliers who have been doing business with the case company for more than 10 years are developing together with Tuapeka Gold Print. Through frequent mutual visits, the top managers established good personal relationships with each other. Through prompt delivery and timely payment, they built up the mutual trust. Managers of Tuapeka Gold Print even introduce new customers to the suppliers (Informant 1 and 12), which is beneficial for the suppliers to develop their business. These are good examples for creating value for the upstream players in the SC. After Lean Thinking was implemented in the case company and its SCM, there are more Lean tools can be used. But the first step is to realize that value in the SC is bidirectional and keep on practicing it.

If we apply the first Lean principle in a different way as above-mentioned, then there would be a derivative work which is how to do the VSM analysis. Since we recognize the
value in the SC flows in both directions, the VSM must adequately consider this characteristic.

In this case study, the case company has only conducted the VSM analysis in the scale of the company itself. It is not enough to get a whole VSM of the SC, and many wastes existing outside the company (but existing in the SC) will be difficult to be identified. What the company should do is to create a VSM covering the whole SC. All the process steps must be listed out, including material flow, information flow, and fund flow. Especially, the process boundaries must be well defined, because they are where wastes can easily thrive. By identifying all the current wastes in the SC, the company can be able to construct the ideal future status of the VSM. From the observation and interviews conducted during the data collection process in this research, I summarize the wastes in the case company's SC in the following table (see Table 11).
<table>
<thead>
<tr>
<th>WASTE</th>
<th>EXAMPLES</th>
<th>RISKS</th>
</tr>
</thead>
</table>
| Transport | • Circuitous routes between two warehouses at different locations;  
• The same raw materials get delivered twice;  
• Change the bin locations of some products because of poor arrangement;  
• Transport of the defective products (ship back to supplier, or deliver to the outsourcing company who will remedy the quality issues.);  
• Send samples of defective product to the supplier, in order to find out the exact reason of quality issue and then get a proper solution;  
• Send standard product samples to the supplier, because the supplier is not keeping a full set of standard product samples for production;  
• Store products in the wrong bin locations, and then adjust;  
• Unnecessary transport from printing department to dispatch area, because of the improper area layout;  
• Supply defective products to customer, and products are returned; | • Increases unnecessary transport cost;  
• Adds waiting time which may cause delays;  
• Increases the risk of damaging or losing the products. |
| Inventory | • Purchase and store bulk of raw materials which are more than the quantity demanded by the customers in a certain period;  
• Store defective products which are unlikely to be sold;  
• Store discontinued products for too long time;  
• Store outdated and unnecessary documents, etc.;  
• Purchase and store "just-in-case" products;  
• Store printing machines which are not being used frequently; | • Unnecessary inventory takes up space in the warehouse;  
• Costs human resources to look after;  
• Increases the risk of damaging the products.  
(However, insufficient inventory leads to the risk of losing sales orders and even customers.) |
| Motion | • Too many trips or movements due to changing priorities or requirements;  
• Too many defective products found during printing a particular job, which needs to apply for replacement;  
• Improper layout in the warehouses resulting in more movements of workers;  
• Improper layout of different functional areas (for example: digital printing department, pad printing department, screen printing department, unpacking department, packing department, and dispatch department);  
• Walk a long distance to use the printer;  
• Conduct quality inspection on one product which is being stored in two different warehouses;  
• Search for missing products in warehouse;  
• Some printers have to walk more steps to reach raw materials because of the limited space of the work cell; | • Costs more time to complete a particular job;  
• Increases labor cost;  
• Consumes employees’ energy;  
• Increases the risk of mistakes and injuries. |
<table>
<thead>
<tr>
<th>Waiting</th>
<th>Over production</th>
<th>Over-processing</th>
<th>Defects</th>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Waiting for reply from an irresponsible supplier, forwarder, or logistics company;</td>
<td>• Producing more than demanded;</td>
<td>• Provide too much detailed information of a standard product for the supplier;</td>
<td>• Defective raw materials supplied by the suppliers;</td>
<td>• Insufficient training for the new employees;</td>
</tr>
<tr>
<td>• Suppliers waiting for instructions of sample confirming, production proceeding, and shipment arranging;</td>
<td>• Too many product varieties and models;</td>
<td>• Unnecessary efforts caused by supplying defective products to customers;</td>
<td>• Defective finished goods supplied to the customers;</td>
<td>• Insufficient cross-training among different positions within the</td>
</tr>
<tr>
<td>• Waiting for arranging payment for purchase orders;</td>
<td>• Dispatching more goods than what is required;</td>
<td>• Purchase order or sales order which is processed in a wrong way;</td>
<td>• Defective artworks;</td>
<td>same department;</td>
</tr>
<tr>
<td>• Waiting for all the suppliers to complete production when organizing consolidation shipments;</td>
<td>• Multiple suppliers to produce the same part/component;</td>
<td>• Fail to design the artwork according to customer's requirement;</td>
<td>• Pick up incorrect raw material quantity from the warehouse;</td>
<td>• No operation manual for machines;</td>
</tr>
<tr>
<td>• Waiting for approval of the purchase order, shipping documents, custom clearance, etc.</td>
<td>• Redundant development of parts.</td>
<td>• Unnecessary inspection or confirmation;</td>
<td>• Pack the finished goods improperly;</td>
<td>• No processes instructions for different tasks;</td>
</tr>
<tr>
<td>• Waiting for completing customs clearance for some special products (especially when the supplier failed to do</td>
<td>• Costs more time to complete a particular job;</td>
<td>• Unnecessary dismantling or packing before shipment;</td>
<td>• Defective raw materials caused by long storage time;</td>
<td>• No universally accepted standards for particular jobs;</td>
</tr>
<tr>
<td>the customs declaration properly);</td>
<td>• Increases the cost of sales order;</td>
<td></td>
<td>• Defective raw materials caused by poor storage conditions;</td>
<td>• Not using some employees' talent.</td>
</tr>
<tr>
<td>• Waiting for product to be delivered from the other warehouse which is not located close to the factory;</td>
<td>• Causes other wastes such as transport, inventory, defects, waiting, and motion.</td>
<td></td>
<td>• Wrong or exaggerated information during communication;</td>
<td>• Make employ feels unfulfilled and frustrated;</td>
</tr>
<tr>
<td>• Waiting for customer to confirm artwork design;</td>
<td></td>
<td></td>
<td>• Cause rework;</td>
<td>• Decrease the labor productivity;</td>
</tr>
<tr>
<td>• Waiting for getting replacement for the defective raw materials;</td>
<td></td>
<td></td>
<td>• Decrease customer satisfaction or even lost customer;</td>
<td>• Increase the rate of brain drain;</td>
</tr>
<tr>
<td>• Waiting for arranging payment for purchase orders;</td>
<td></td>
<td></td>
<td>• Cost more materials and time to complete a job;</td>
<td>• Increase the risk of professional morality.</td>
</tr>
<tr>
<td>• Waiting for all the suppliers to complete production when organizing consolidation shipments;</td>
<td></td>
<td></td>
<td>• Lead to other wastes such as transport, inventory, defects, waiting, and motion;</td>
<td></td>
</tr>
<tr>
<td>• Waiting for approval of the purchase order, shipping documents, custom clearance, etc.</td>
<td></td>
<td></td>
<td>• Lead to other wastes such as transport, inventory, defects, waiting, and motion;</td>
<td></td>
</tr>
<tr>
<td>• Waiting for completing customs clearance for some special products (especially when the supplier failed to do</td>
<td>• Costs more time to complete a particular job;</td>
<td>• Unnecessary efforts caused by supplying defective products to customers;</td>
<td>• Defective raw materials caused by long storage time;</td>
<td></td>
</tr>
<tr>
<td>the customs declaration properly);</td>
<td>• Increases the cost of sales order;</td>
<td>• Purchase order or sales order which is processed in a wrong way;</td>
<td>• Pick up incorrect raw material quantity from the warehouse;</td>
<td></td>
</tr>
<tr>
<td>• Waiting for product to be delivered from the other warehouse which is not located close to the factory;</td>
<td>• Causes other wastes such as transport, inventory, defects, waiting, and motion.</td>
<td>• Fail to design the artwork according to customer's requirement;</td>
<td>• Pack the finished goods improperly;</td>
<td></td>
</tr>
<tr>
<td>• Waiting for customer to confirm artwork design;</td>
<td></td>
<td>• Unnecessary inspection or confirmation;</td>
<td>• Defective raw materials caused by poor storage conditions;</td>
<td></td>
</tr>
<tr>
<td>• Waiting for getting replacement for the defective raw materials;</td>
<td></td>
<td>• Unnecessary dismantling or packing before shipment;</td>
<td>• Wrong or exaggerated information during communication;</td>
<td></td>
</tr>
<tr>
<td>• Waiting for arranging payment for purchase orders;</td>
<td></td>
<td></td>
<td>• Cause rework;</td>
<td></td>
</tr>
<tr>
<td>• Waiting for all the suppliers to complete production when organizing consolidation shipments;</td>
<td></td>
<td></td>
<td>• Decrease customer satisfaction or even lost customer;</td>
<td></td>
</tr>
<tr>
<td>• Waiting for approval of the purchase order, shipping documents, custom clearance, etc.</td>
<td></td>
<td></td>
<td>• Cost more materials and time to complete a job;</td>
<td></td>
</tr>
<tr>
<td>• Waiting for completing customs clearance for some special products (especially when the supplier failed to do</td>
<td>• Causes other wastes such as transport, inventory, defects, waiting, and motion.</td>
<td></td>
<td>• Lead to other wastes such as transport, inventory, defects, waiting, and motion;</td>
<td></td>
</tr>
<tr>
<td>the customs declaration properly);</td>
<td></td>
<td></td>
<td>• Lead to other wastes such as transport, inventory, defects, waiting, and motion;</td>
<td></td>
</tr>
</tbody>
</table>

Table 11 “Tim Woods” Wastes Identified
(Adapted from interviews and observation)

5.3.2. How to Arrange Lean Implementation Process?

The company considers that there are 4 phases: Idea Generation, Decision Making, Preparation, and Formally Implementation. In this thesis, in order to get a clearer idea
about the Lean implementation process which can be helpful for generalizing. I divide the whole process into two phases: pre-implementation phase and implementation phase.

In the pre-implementation phase, the company is still in a non-Lean status and its main task in this phase is to create all the prerequisites of Lean implementation. The prerequisites include at least the following conditions:

A. People’s commits to Lean Thinking.

The word “people” here refers to two groups: the top managers and the employees. The top managers are the people who are directly running the company. They make the decision of introducing Lean Thinking into the company or not. They decide to use Lean as a set of problem-solving tools or an overall business development strategy. They decide to apply Lean in the factory floor, the office, or the whole SC. So, it is the most important condition for all the top managers to achieve an agreement on the strategic decision of Lean implementation. Then, they have to learn about Lean Thinking and master all the essentials of it.

The second group of people is the employees. Every strategy of the company, no matter how grand it is, needs to be broke down into specific rules or practices which rely on supports from the middle-level managers and other employees. If the staff number is fairly small, it is necessary for the company to organize training program of Lean Thinking for all the staff before the Lean journey formally starts. If the staff number is relatively big, a training program only for the middle-level managers is also necessary.

B. The business operation status.

After the company decides to go Lean, the operation status of the business is an important condition that affects when to start it. For example, the case company decided to introduce Lean as a business development strategy and change the company in all dimensions including its SCM. So, it requires many resources to make this change, and the company would have to suffer a period of throe during the change. If the business operation status is not good enough to support the company to run smoothly through this period, it would be risky to implement Lean or any other new strategies immediately. So, Tuapeka Gold Print waited for another 2 years to formally get started.

C. Lean assessment.

Lean assessment is another process needs to be completed before the Lean implementation. Lean assessment can provide an overall assessment of the company’s management level and operation stability. By the assessment, it is helpful to identify a company’s weakness and strength, find out its threat and opportunity, and then provide a
customized Lean implementation plan which can bring effective improvements to the company. After all, there is no universal pattern of Lean for all companies to use. It is not wise to blindly copy other company’s pattern. Each company has its own specific circumstances, and each company has different problems to solve and unique goals to pursue. If a company wants to make its Lean implementation really work for itself, it is a highly-recommended procedure to conduct Lean assessment.

The second phase is implementation phase which will be an endless process, because consistently pursuing perfection is the essence of Lean according to the fifth Lean Thinking principle. In this phase, the following items are significant to the success of the Lean implementation and the business development.

A. Making a long-term implementation plan.

A well-designed long-term implementation plan can be beneficial to keep the consistency of the Lean implementation in a relatively long period and avoid the deviation in the direction between the company’s current status and long-term vision. This long-term implementation plan should have the following features:

a. Duration time.

The duration time of the implementation plan would better to be four to five years (or more). It is because an important strategy requires enough time to be completely implemented. And only after a relatively long period of time, the outcome of the strategic change can be seen. Take Tuapeka Gold Print for instance, it is impossible to improve the SCM efficiency and rebuild the corporate culture in a short time after implementing Lean.

b. Well-structured.

The plan should not be oversimplified or too rough. Otherwise, it will lose its practicability for the real operations. The case company’s implementation plan divides the whole plan into five different levels which form a pyramid structure. This kind of layout reflects the chronological order of the implementation steps and the logic relations among different levels.

c. Clear objectives.

The objectives of the plan, including the ultimate objectives and the interim objectives, must be clear enough for everyone in the company to understand and follow.

d. Engaged people.

People are the most important factor in the implementation process. Lean
Thinking also advocates that the company can add value for its customers by developing its own people (Liker, 2004). So, in Tuapeka Gold Print’s implementation plan, engaged people is an overarching principle in the whole process.

B. Implementing with emphases.

During the actual process of the implementation, it is important to identify the priorities of each period according to the analysis on the current situation of the company and the periodical objectives. It does not mean that other items will never be tackled, but only because of “the general principle of doing one thing at a time and working on it continuously until completion applies to improvement activities” (Womack et al., 2010, p95).

C. Constantly conducting assessment and adjustment.

Along with the process of the Lean implementation, the situation is continuously changing. New problems may be generated when old problems are solved. Even if there are no more new problems appear, the company is likely to adjust its development objectives. So, constantly conducting Lean assessment is helpful for the company to precisely understand the updated status of the whole business operation and adjust the plan for the next step.

5.3.3. What is LSCM?

In the academic circles, we can find some publications discussing implementing Lean in organizations and the SC. But there is an absence of a broadly and generally accepted definition of LSCM, which may lead to a disordered situation of the academic research on LSCM. Sometimes the practice area walks well ahead of the academy area, and many enterprises have already been conducting explorations and experiments about LSCM. Tuapeka Gold Print is one of them. From the research on the practices, we can gain some beneficial supplements to the current theoretical development in this area, and then the improved theories will be able to influence more practitioners to make improvements.

When we discuss LSCM, there are different situations of it. It can be a research on the SCM in a Lean enterprise or a research on the LSCM in an enterprise which is not complete Lean enterprise. In the first situation, the enterprise considers the Lean Thinking as an overall management strategy for the whole business and applies Lean into every field of the business including its SCM, just like what Tuapeka Gold Print is doing. For the second situation, the enterprise hasn’t introduced Lean into the whole business but started from its SCM. So, it just applies the Lean as a set of tools to solve the problems in their SCM.
No matter in which situation, the different LSCMs have some common characteristics because they are all achieved through the combination of Lean Thinking (principles and tools) and SCM method. If we review SCM from its definition (refer to Chapter 2), we can see that Lean well fits in many characteristics and functions of SCM (see Figure 26).

**Figure 26 The Characteristics of SCM Match-up with Lean**
From the literature review and the case study of this research, I summarize the characteristics of LSCM as follows: customer-oriented, long-term partnership with supplier, all SC members involved, people engaged, smooth flows, waste free, and continuous improvement (see Figure 27).

- **Customer-oriented**: LSCM must pay great attention to providing value to the ultimate customers in the SC, because this is the ultimate goal of the SC and the source for enterprise development.

- **Long-term partnership with supplier**: The value in the SC should flow to both directions, upstream and downstream. Without the awareness of creating value for suppliers and establishing long-term partnership with them, it will be difficult for a company to develop or even survive in a competitive market.

- **All SC members involved**: If we want LSCM to be effective at its full potential, we need all the SC members to be involved in the Lean implementation. At least the first-tier suppliers, first-tier customers, third party logistics, market researchers, financial providers, and any other members who directly cooperate with the core company in the SC should participate in the implementation process.

- **People engaged**: It is well accepted that the people are the most important assets in a company. Likewise, the people are one of the key factors in LSCM,
because it is the people who execute LSCM in the daily practical operations. So, all the people including top managers, middle-level team leaders, and frontline staff should be engaged in Lean implementation continuously.

- **Smooth flows**: LSCM dedicates to smoothening the material flow, information flow, and fund flow of the SC with Lean tools. Only with these smooth flows, a higher efficiency of the SC is achievable.

- **Waste-free**: Eliminating wastes is one of the most important features and functions of Lean Thinking. After implementing Lean in SCM, wastes existing in the SC can be identified and eliminated more easily.

- **Continuous improvement**: This is a fundamental philosophical thought of human beings. It can be applied as a principle in too many areas from personal life to business management and society development. In LSCM area, it reminds the company that there is nothing perfect in the world but continuously pursue perfection will always make you better.

### 5.3.4. How to Achieve LSCM in an SME?

Different types of enterprises are facing to different problems in their SCM. In those various characteristics which can be used to classify enterprises into different categories, size is a frequently-used one. Tuapeka Gold Print, as an SME in the promotional product industry in international scope, is operating in a very basic SC structure (see Figure 28).

![Figure 28 The Case Company’s SC Structure](image)

Focal company: Tuapeka Gold Print is playing a role of focal company in this SC. It purchases RMs from its suppliers, assembles (if need) and prints on the products, and then sells to its customers.
Distributor: The focal company is trading in a wholesale-only model, it only trade with its distributors which are mainly located in Australasian area.

Ultimate customer: In most cases, there is no other intermediate between the distributor and the ultimate customer. The distributor's direct customers are the ultimate customer of the promotional products. However, they are not the end users of the products.

Supplier: The suppliers provide RM for the focal company. By the end of November 2016, the case company had 84 suppliers who were keeping regular business transactions with it, and 75% of the suppliers were from China (see Figure 29).

Third party logistics: For the international sea transportation, the focal company uses Röhlig Logistics as the forwarder shipping agent to arrange booking shipments, process shipping documents, arrange connecting domestic transportation after the ocean shipments arrive, etc. For the international air transportation, the focal company uses DHL and FedEx as the couriers. For the domestic transportation, PBT and Posthaste are the main couriers.

Financial institution: In this SC, the financial institutions are just playing as a payment channel. There are very little financial services that the focal company can use in its SCM.

Because of the relatively small size of the business, Tuapeka Gold Print has to face some disadvantages when operating in this SC. The most obvious disadvantage is the limited buying power to the suppliers, which can put the company in a passive position when negotiating with the suppliers about price, lead time, payment terms, quality issue, and new product development. What is worse is that the company has to accept the MOQ
requirement which is always much bigger than its actual procurement demand. This can cause a huge burden of inventory cost and some other wastes. Taking the Bluetooth speaker product for example, the manufacturers in China require the MOQ for some particular models to be 2,000 pieces. But for the case company, this amount of Bluetooth speakers may take it more than 2 years to sell. Some other items in its product range, such as glassware, headphones, power banks, and outdoor goods, are in the similar situation.

Comparing with the buying power to the suppliers, the case company is in a slightly better position judging from the selling power to its customers. Due to the significant market share in New Zealand, the company has gained some good reputations and a stable customer base.

“Because we have such a significant market share, especially in New Zealand, all the distributors, pretty much everyone deals with us. And because of the size of our range and the stock we have and the market share we have, they all have to do with us one or another, even if they decide that they are not their favorite supplier, they still have to buy something of us.” (Informant 3)

But, after all, the size of the New Zealand market is limited, and Tuapeka Gold Print has to pay more attention to developing the international market, especially the Australia market. In Australia, the case company is operating as a newcomer who is doing business with many larger distributors in this new market with more opportunities and competition.

The size of the business does not only give Tuapeka Gold Print disadvantages, it also provides some advantages. Without the drag of a huge complicated bureaucracy, an SME has better flexibility to make change. It is easier for the top management to raise a new issue, discuss it, and finally reach consensus. Any necessary adjustment to the organization structure can be completed with fewer obstacles. Because the organizational hierarchy in an SME is relatively simple, the information flow can be more direct, prompt, and precise. Moreover, due to the small staff number, it is easier for an SME to let all of the people understand the business strategy and get involved into it.

Under the conditions of the above-mentioned disadvantages and advantages, how to achieve LSCM in an SME such as Tuapeka Gold Print becomes different with how a large enterprise like Toyota does. It has been mentioned several times in this research that there are 3 flows in the SCM: material flow, information flow, and fund flow. By analyzing the situation of the case company’s SCM, it shows the following features about the relationships among these 3 flow (see Figure 30).
A. Different importance.

Material flow is the most predominant flow for the case company. The company pays the greatest attention to improving material flow efficiency during implementing LSCM, because to provide the products to the customers with right quantity and good quality within the agreed time is the key to survive and develop. Comparing with material flow, the importance of information flow and fund flow is inferior. Because of the limited influence power in the SC, there is not much space for the case company to make improvement in fund flow. So, the fund flow is playing the smallest part in the case company’s SCM.

B. Mutually act on each other.

There are complicated relations of interaction among these 3 flows. They can pairwise interact with each other, and the influence of one flow can be transmitted via another flow to the third flow. For example, the wrong information about arranging payment can encumber the fund flow and then the material flow will stop.

If we divide the SCM into internal SCM and external SCM, what the case company does to achieve LSCM are 3 steps: strategic thinking, internal LSCM, and external LSCM.

Step 1: Strategic thinking.

One of the most important prerequisites for any new strategy in a company is to reach an agreement among the top managers. Regarding the specific strategy of LSCM for the case company, it is vital to get a systematic perspective first. For the company, Lean is considered as a long-term management strategy and cooperate culture, and as an
important part of the Lean implementation, LSCM involves all the members of the SC which are recognized as a group of long-term partners rather than as a tool of making money.

Step 2: Internal LSCM.

Theoretically, from a systematic perspective, all the members in the SC should be involved in LSCM. However, in practice, a company is often restricted by some particular conditions such as company size, management level, finance status, etc., it is not every company is influential enough to the other members in the SC. But, its own organization is what it can control and improve. Tuapeka Gold Print implemented Lean inside the company first, so that a basic internal Lean system can be constructed as a solid foundation for the internal LSCM. The case company’s internal LSCM was mainly built up by improving its internal material flow and internal information flow with Lean tools.

Step 3: External LSCM

Because of the relatively small size of the case company, it only has a minor influence on the other part of the SC. Unlike the internal LSCM, the case company is not able to directly improve the external material flow, because it can only passively accept the standard service from the logistics companies, and it is also very hard for an SME to ask its suppliers and customers to conduct the same Lean implementation in their own organizations just in order to gear with this one company. What the case company can do is to improve the information flow and fund flow via implementing Lean in the boundary processes, and exert indirect influence on the material flow.

Figure 31 Three Steps to LSCM
However, judging from the characteristics of LSCM which were discussed in the former section, there are still some unsolved problems which need the case company to continuously work on.

Firstly, unlike the TPS which can be characterized as a low-mix and high-volume production, the case company's production system possesses the opposite features: high-mix and low-volume, and the customer orders are relatively variable. This is a big disadvantage when the company tries to level the mix value stream because the forecast of customer orders and procurement demands is often inaccurate. Currently, how the case company is doing the forecast and making the short term purchasing plan is that the procurement manager periodically estimates a rough amount according to the latest daily Inventory Planning Report which is automatically generated by the ERP system. But the Inventory Planning Report can only provide a limited number of parameters such as on-hand quantity, on order quantity, future free quantity, YTD 6 month sales average amount, total sales previous 6 months, YTD monthly sales average amount, YTD total sales amount, and reorder quantity. Sometimes, it is not good enough to accurately reflect the real procurement demands. So, how to forecast more accurately and how to level the high-mix-variability value stream are two important questions for the case company to find out the answers.

Secondly, there are still some problems with the implementation of 5S in the case company. For examples: not all the unnecessary items have been removed from the work area, especially in the office; cleaning the work area is still considered by some employees as a burden rather than a part of the daily work; different teams are deploying 5S in different levels, which results in multiple standards are being used in similar jobs; new team members are not getting enough training about 5S implementation; the focus on implementing 5S is not sustainable enough; etc. 5S is a workplace organization method which aims at improving the efficiency and effectiveness at the work cell, and it is a foundation for establishing a pull system and improving the flow efficiency.

Thirdly, the case company is still using an ERP system which is called SYSPRO system as its core IT system. This is a “quite minimal and quite manual” (Informant 11) system which is “not quite meeting the needs” (Informant 11), although, along with the years of using it, some other programs with custom functions have been developed by their own IT engineers and added into SYSPRO. The problem is that these different programs don’t talk to each other, and the information can not be synchronized well among different departments. So, the case company needs to have an integrated IT system which can do
all the different functions as an integrated single organism and synchronize information among departments without redundancy and error. Especially, the current warehouse management program is dragging down the warehouse management efficiency (Informant 1, 4, 11, 13). Moreover, some IT hardware, such as computers and servers, cannot satisfy the requirement of high efficiency. So, to upgrade the IT system and hardware is another direction of deepening the lean implementation.
6. Conclusions

Chapter 4 introduced the necessary background information of the case company and its Lean reform, and Chapter 5 discussed how the case company does to achieve LSCM together with the other three research questions. This chapter will summarize the conclusions to each research question, and then discuss the generalizability of this case study. Finally, the limitations of this research and future research opportunities will compose the ending of the thesis text.

6.1. Conclusions to the research questions

As mentioned in Chapter 1, there are two main research questions which lead the direction of the discussions in section 5.3. But the discussions were conducted in a different order with the research questions. To close the research loop of this thesis, it is necessary to explicitly return to each research question and clearly summarize the conclusions in the last chapter.

Question 1: What is LSCM for an SME?

Comparing with large enterprises, SMEs usually have a simple-structured SC, and they are often in a relatively disadvantaged position in the SC structure. For an SME, LSCM is both a strategy and a set of tactics of optimizing its SCM by using the Lean Thinking. The target of LSCM is to achieve an optimized SCM status which has the following characteristics: customer-oriented, long-term partnership with supplier, all SC members involved, people engaged, smooth flows, waste free, and continuous improvement.

Question 2: How can Lean be implemented practically into an SME’s non-Lean SC?

With regard to the aspect of the practical implementation, I consider the Lean principles and the Lean implementation process are the most crucial factors. This is the reason why I divided this research question into two sub-questions.

Sub-question 1: How should a small and medium-sized enterprise apply Lean principles in supply chain management?

For an SME, Lean principles need to be adjusted according to the company’s particular situation and the features of its SC. In the five Lean Thinking principles, it is highly likely and necessary that an SME wants to adjust the first two principles. Value is the most fundamental concept of running a business and operating the SCM. How to identify the value stream will be decisive for identifying and eliminating wastes. When applying these two principles, an SME must bear in mind that the value flows
bidirectionally rather than unidirectionally, and the VSM analysis must be conducted in the scope of the whole SC.

Sub-question 2: How should a small and medium-sized enterprise arrange the Lean implementation process?

When an SME implements its LSCM, no matter how many steps there will be, it is always important to understand that the pre-implementation phase has the equal importance with the implementation phase. In the pre-implementation phase, the enterprise needs to create all the prerequisites that the Lean implementation requires, including people's commits to Lean Thinking, a stable status of the business operation, and the lean assessment. The implementation phase will be an endless process of pursuing perfection. A well-designed long-term implementation plan is a key to implementing the LSCM consistently. Implementing with emphases is a general principle of the implementation, and assessment and adjustment need to be conducted constantly along with the continuously changing circumstances.

6.2. Generalizability of the Case Study

Using single case study strategy, this research goes into the case company's particular circumstances in detail, finds out how it reforms its management mechanism and corporate culture and improves its SCM with implementing Lean Thinking. As a research focusing on the SMEs, this thesis tries to establish a theoretical framework for LSCM in SMEs which consists of two parts mainly, what LSCM is for an SME and how to achieve it. With the intention of filling the gap in the theoretical research on LSCM in SMEs, I do wish this thesis can be a beneficial complement to the existing research achievements in this area.

As an SME which is operating in the promotional product industry internationally, the case company has been operating for a relatively long period of time (nearly 30 years), and it has just entered a rapid development track since recent years. Comparing with many of its oversea suppliers, the case company has a small scale. Additionally, the wide product range dilutes its buying power in the SC. It is not able to exert significant influence on other SC participants and push forward a strong set of Lean reforms in the whole SC as what Toyota does. But it still gets its own way of establishing LSCM which starts from
internal reform and then building up the external interfaces with Lean characteristics to connect with upstream and downstream enterprises and improve its SCM efficiency.

I believe that some problems that the case company encounters are similar to the ones other companies have, especially for the companies in the same industry and some SMEs with similar SC structure. So, it is necessary and meaningful to generalize the findings of the case study to a wider scope.

Firstly, for an SME, the LSCM should have the following characteristics: customer-oriented, long-term partnership with the suppliers, all SC members involved, people engaged, smooth flows, waste free, and continuous improvement.

Secondly, due to the advantages and disadvantages of the SMEs, the Lean principles should be reconsidered according to their own situation instead of accepting them blindly. For example, providing value to the suppliers should be carefully considered when they define the value flowing through the SC; VSM should cover all steps that the value stream flows through the whole SC.

Thirdly, when an SME arranges the Lean implementation process, the pre-implementation phase should not be ignored. After the top managers reaching to a clear vision of applying Lean as a long term strategy or as a set of short problem-solving tools, preparations need to be conducted from the following 3 aspects: people’s commitment, business operation status, and Lean assessment. During the actual implementation phase, a feasible implementation plan is needed; the staged objectives and achievements need to be reviewed; and the implementation plan needs to be adjusted according to the updated business development plan.

6.3. Limitations of this Research

The limitations of the present case study are in the following aspects.

First, the inherent disadvantages of the single case study method. As discussed in section 3.3, it is criticized by some scholars from the perspectives of validity and reliability, so the research findings of case study are hardly to be generalized to a larger research scope. When it comes to single case study, the limitation can be more obvious. Because of the different business environment, history, culture, size, people, etc., each company has its uniqueness. By conducting single case study, it is possible for the researchers to get an
in-depth understanding of the case company, but it is not necessarily to be enough for providing a sound basis for generalizing the findings to other companies.

Second, the limited time of the research. Any new management strategy for a company should be a long-term project, it requires prudent decisions, step-by-step plan and implementation, continuously adjustments, etc. So, it is unlikely to have an effect immediately. As a systematic management strategy, Lean is an endless process of pursuing perfection. Surely, the effect of the Lean implementation both in the case company itself and its SC needs a considerably long time to be fully presented. However, due to the limited time of this research, some actions in the current implementation plan have not been implemented, such as total productive maintenance, overall equipment effectiveness, and single minute exchange of die. It is impossible to get the whole picture of how the case company implement and adjust its LSCM and build up the Lean culture. Moreover, for all the Lean tools and practices which have been implemented, the author may be able to get a deeper understanding if a longer time is available.

6.4. Future Research Opportunities

The above-mentioned limitations of this research imply some directions for the future research.

First, other research methods can be considered to be applied. By increasing the sample capacity, multiple case study can be used to avoid the particularity of single case study and obtain a better universality. By increasing the proportion of quantity analysis and statistical regression, the rigor and objectivity of the research can be enhanced. The case company in this research is from the promotional product industry, so, to investigate the SMEs in other different industries and develop a set of theory and practices for them will be an extension of this study. Additionally, comparative research on LSCM in large enterprises and that in SMEs can be expected to obtain research achievements from different perspectives.

Second, if a longer research time is available in the future, the effect of the Lean implementation in the case company can be inspected and assessed more deeply. There are a lot more aspects of the LSCM in an SME can be researched further. For example, how to make the forecast of future sales volume and inventory demand of the wide product range more accurate? How to level the procurement and production in a high-mix-variability value stream? Safety issue is another research opportunity in LSCM, which includes work safety during production and product safety of the FG. A more sufficient
research time will also make me able to pay attention to some other factors, such as social capital, Guanxi, etc., which may influence an SME’s decision on how to implement LSCM and the subsequent effects.

In summary, this thesis just goes through one of the multiple research lanes, and there is more potential needs to be explored.
7. References


Cooper, R., & Slagmulder, R. 1999. Supply chain management for lean enterprises:


8. Appendices

8.1. Participant Information and Consents

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

What is the aim of the project?

By constructing the Lean Supply Chain Management (LSCM) theoretical frame and examining the LSCM situation in the case company, this thesis will try to add value into this company, and provide references for enhancing supply chain management in small and medium enterprises (SMEs) in general.

The main research questions of this thesis are:

1) For SMEs, what is the theoretical frame of LSCM?
2) What are the differences between an SME’s LSCM and a large company's LSCM?
3) How can Lean be implemented practically into an SME’s non-Lean SC?

This project is being undertaken as part of the requirements for Chen Gao’s Master of Commerce degree.
What types of participants are being sought?

- Selection criteria: people who are working in a position in the supply chain or who may have access to sufficient information about the supply chain. Managers from the case company’s suppliers.
- Number of participants to be involved: 12 (approximate).
- Recruitment method: by face to face conversation or email to invite the participants to take part in data collection. No reward or payment will be offered.
- Participants will be offered the opportunity to access their interview transcripts and correct any information they deem inaccurate.

What will participants be asked to do?

Should you agree to take part in this project, you will be asked to

- Attend the interview; confirm and correct (if needed) interview transcripts.
- The time commitment required: within one hour (for the interview).
- Only the pseudonym and job title of the interviewees will be used in the research; other personal information will be considered private.

Please be aware that you may decide not to take part in the project without any disadvantage to yourself.

What data or information will be collected and what use will be made of it?

- The interview will be audio recorded (with your permission), with the electronic files stored in the researcher’s personal computer protected by an administrator password. For the participant’s personal information, a pseudonym will be assigned and the job title will be collected. Data collected during interviews will be used to understand the case company and its supply chain management, and the researcher, Chen Gao, will use them in completing his thesis.
- Only the researcher and his supervisor will have access to the data.
- All the data collected will be stored securely. Only the researcher and his supervisor will have access to it. Electronic files will be stored in the researcher's personal computer protected by an administrator password. The memory sticks used in data collection will be stored in a locked cabinet while not in use. Hardcopies of the data will also be stored in that locked cabinet. After the project is completed, all personal information will be destroyed but any raw data on which the results of the project depend will be retained in secure storage for at least five years.
• The results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve your anonymity.

• Participants will be offered the opportunity to access their interview transcripts and correct any information they deem inaccurate.

• The participants can be provided with the results of the study on request.

• This project involves an open-questioning technique. The general line of questioning includes company history, management strategy, supply chain management, Lean reform, customer service, factory management, and IT management. The precise nature of the questions which will be asked has not been determined in advance, but will depend on the way in which the interview develops. Consequently, although the Department of Management is aware of the general areas to be explored in the interview, the Committee has not been able to review the precise questions to be used.

• In the event that the line of questioning does develop in such a way that you feel hesitant or uncomfortable you are reminded of your right to decline to answer any particular question(s).

Can participants change their mind and withdraw from the project?
You may withdraw from participation in the project at any time and without any disadvantage to yourself.

What if participants have any questions?
If you have any questions about our project, either now or in the future, please feel free to contact either:

Gao Chen  
Department of Management  
Telephone: 64 3 478 8532 ext. 726  
Email: chech380@student.otago.ac.nz

Prof. André Everett  
Department of Management  
University Telephone: 64 3 479 7371  
Email: andre.everett@otago.ac.nz

This study has been approved by the Department stated above. However, if you have any concerns about the ethical conduct of the research you may contact the University of Otago Human Ethics Committee through the Human Ethics Committee Administrator (ph 03 479-8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.
Lean Supply Chain Management in SMEs
A Case Study of a New Zealand Company

CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I know that:-

1. My participation in the project is entirely voluntary;
2. I am free to withdraw from the project at any time without any disadvantage;
3. Personal identifying information will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for at least five years;
4. This project involves an open-questioning technique. The general line of questioning includes company history, management strategy, supply chain management, lean reform, customer service, factory management, and IT management. The precise nature of the questions which will be asked has not been determined in advance, but will depend on the way in which the interview develops. In the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind.
5. A summary of the research outcomes will be offered to me if requested, but this should not be construed as a payment or reward;
6. The results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve my anonymity.

I agree to take part in this project.

............................................................................. .........................................................
(Signature of participant) (Date)

.............................................................................
(Printed Name)
8.2. The Outline of the Interview Questions

Questions for Informant 1:

Part One: Fixed Questions
1. Could you please state your name and job title?
2. Could you please briefly describe your job responsibilities?

Part Two: Specific Questions
1. Lean
   1) What is the reason that we decide to implement Lean in the company?
   2) Who is in charge of the Lean reform?
   3) What is the decision making process?
   4) What role is the consulting company playing in this whole reform?
   5) What is the overall planning of the Lean reform?
   6) Some scholars believe there are at least 5 principles for implementing Lean in a company. What are our principles when we implement Lean here?
   7) What kinds of waste do you think are affecting the company badly?
   8) What kinds of Lean tool are we using?

2. Lean Supply Chain Management
   1) From the perspective of supply chain management, do you think Lean can be an important catalyst in improving the whole supply chain efficiency?
   2) Do you think it’s possible for extending the effect of Lean to the other participants in the supply chain? If yes, how?

3. Overall evaluation & future planning
   What are the main achievements and deficiencies (or shortcomings) of the Lean reform?
Questions for Informant 2:

Part One: Fixed Questions
1. Could you please state your name and job title?
2. Could you please briefly describe your job responsibilities?

Part Two: Specific Questions
1. Company & Industry
   1) Can you please introduce the promotional industry in New Zealand?
   2) Where is the competitive position of Tuapeka in this industry?
   3) Comparing with the general consumer goods, what features does the promotional product have?
   4) Can you please introduce the corporate governance structure?
2. Supply Chain
   1) In the last 4 years, we’ve been developing in a rapid speed.
   2) How do you evaluate the importance of supply chain management to this company?
   3) What are our advantages in supply chain management?
3. Lean
   9) There is going to be another big leap in development rate this year. What factors do you think determine this development trend?
   10) What triggers us to go Lean?
   11) What kinds of waste do you think are affecting the company badly?
   12) What are the main achievements and deficiencies or shortcomings (if any)?
   13) What is the future development planning of the company?
Questions for Informant 3:

Part One: Fixed Questions
1. Could you please state your name and job title?
2. Could you please briefly describe your job responsibilities?

Part Two: Specific Questions
1. Company & Industry
   1) Can you please introduce the promotional industry in New Zealand?
   2) Where is the competitive position of Tuapeka in this industry?

2. Supply Chain
   1) “Tuapeka Gold Print is strictly a TRADE ONLY supplier of promotional products”, is this a formal positioning? (It’s also a business mode which can decide the supply chain structure. Why do you think this business mode fits our company?)
   2) Do you think the following figure describes the typical supply chain structure for Tuapeka?
   3) Comparing with the rivals in Auckland, we don’t have advantages in logistics cost, business cluster, and talents, what are our advantages?
   4) How do you evaluate our buying power and selling power in the supply chain?
   5) Can you please introduce the information flow between Tuapeka and customers? And Tuapeka and suppliers.

3. Lean
   1) What is the reason that we decide to implement Lean in the company?
   2) What are the benefits of Lean to Tuapeka?

4. Overall evaluation & future planning
   1) How do you evaluate the effect of our Lean journey?
   2) What are the main achievements and deficiencies (or shortcomings)?
Questions for Informant 4:

**Part One: Fixed Questions**
1. Could you please state your name and job title?
2. Could you please briefly describe your job responsibilities?

**Part Two: Lean and Warehouse Management**
1. After we started the Lean reform this year, what has been changed?
2. What kinds of waste do we have in the warehouse?
3. Do you think the Lean reform is effectively eliminating the wastes in our warehouse?
4. How do you evaluate the efficiency of the information flow and the material flow after we started the Lean reform?
5. Do you think there is any shortcoming of the Lean reform?
Questions for Informants 5, 6, 7, 8, 9, and 15:

**Part One: Fixed Questions**
1. Could you please state your name and job title?
2. Could you please briefly describe your job responsibilities?

**Part Two: Lean**
1. After we started the Lean reform this year, what has been changed in your work scope?
2. What kinds of waste exist in your work scope?
3. Do you think the Lean reform is effectively eliminating the wastes?
4. Do you think there is any shortcoming of the Lean reform? (Or, is there any improvement we should do but we are not doing it?)
Questions for Informant 10:

Part One: Fixed Questions
1. Could you please state your name and job title?
2. Could you please briefly describe your job responsibilities?

Part Two: Lean and Procurement
1. Can you please introduce how are we arranging the consolidation shipments in China?
2. Can you please introduce how are we dealing with back orders?
Questions for Informant 11:

**Part One: Fixed Questions**
1. Could you please state your name and job title?
2. Could you please briefly describe your job responsibilities?

**Part Two: Information Flow**
1. Can you please introduce the information technologies (or tools, software) we are using?
2. Do you think the Lean reform is improving the information flow efficiency?
3. Do we have information flow map?
Questions for Informants 12, 13, and 14:

Part One: Fixed Questions
1. Could you please state your name and job title?
2. Could you please briefly introduce your company?

Part Two: Lean
1. Comparing with the other customers of your company, what features do you think Tuapeka has?
2. Does Tuapeka have some sort of agreements on payment issue with your company?
3. During the process of cooperating with Tuapeka, what factors are affecting the efficiency of production and delivery, or causing quality issues etc.? (it can be the factors coming from both sides)