PRINCIPLES OF GLOBAL SUPPLY CHAIN MANAGEMENT

Yui-yip Lau, Adolf K.Y. Ng and Jorge Acevedo

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FOREWORD

I agree with the authors that there could be gaps between professional practices and academic knowledge. I am happy that this book, by providing a comprehensive introduction to key functional areas of supply chain management, makes a successful attempt to bridge these gaps. Readers will find the case studies, many of which are drawn from the Asia-Pacific region, relevant and specific. In an era of digitization, supply chain management will undergo rapid changes. Hence, it is even more important now, than ever before, to get the fundamentals right. A solid foundation will empower us to surf successfully on these "disruptive" tides.

Mr. Sunny Ho (BSocSC, FCILT, FCIM)
Immediate past president, The Chartered Institute of
Logistics and Transport in Hong Kong
Executive director, The Hong Kong Shippers' Council

PREFACE

> Absorb what is useful, discard what is useless and add what is specifically your own.
> Knowing is not enough, we must apply. Willing is not enough, we must do.
>
> —Bruce Lee, martial artist (1940–73)

When we were designing and planning for this book, a few quick questions came to our mind: how could we transform new knowledge into practice? How important were infrastructural issues in supply chains? Were there any key research topics that have been seriously neglected in previous books publication? Were active scholars participating in research dedicated to industrial practitioners? Indeed, these are core objectives of applied research that can contribute to academic, industry and community in an ever-changing world.

This book addresses the role of supply chain in the global economy and organizations. Although global supply chain management is critical with different stakeholders within policymakers, students, researchers, logistics associations, participators, even for governmental actors who need to make strategic decisions in sustaining economic competitiveness for their countries and citizens, the core topics are often overlooked. Understanding such deficiency, we strive to include interesting, innovative, and timely topics. The contents may be similar, but different readers may have diversified expectations. Industrial practitioners may look for insight to generate appropriate strategic decisions; students and researchers may look for new ideas to develop new research areas and secure research grants; policymakers may look for best practices that will help them to develop appropriate public policies; logistics associations may look for new knowledge to review their professional training programs that align with international academic/professional standards. Taking three years to complete this book (from writing the proposal to its final publication), we based it on four main principles, namely, "clarity" (which makes it simple for readers to comprehend), "richness" (which identifies questions from various academic experiences and disciplines to encourage readers to find out possible unexplored research or key issues), "innovations" (which stimulates readers to

reflect on changing traditional, day-to-day operations for enhancement) and "practicality" (which equips learners with the skills and knowledge to work in the real world).

This book offers fundamental knowledge with many practical cases that can fulfill the needs and expectations of different parties. Readers can get invaluable insight on the future direction of supply chain development. Moreover, to the best of our knowledge, this is the first book on global supply chains that involves close collaboration between Asian, North American and Latin American scholars and industrial practitioners—the first author has been appointed as an associate by the Transport Institute of the University of Manitoba (2016-18); the second author has been appointed as a visiting scholar in the College of Professional and Continuing Education of the Hong Kong Polytechnic University (2016); and the third author has been invited to visit the Hong Kong Community College of the Hong Kong Polytechnic University as an expert consultant in holistic logistical infrastructures and industrial development topics (2016). The knowledge exchange and collaborative activities have surely contributed to new opportunities in exploring new areas of interdisciplinary research, conducting sophisticated investigations to enhance credentials, and professionalization.

The completion of this book has been achieved via important support that we would like to acknowledge. First, this project is supported by the Insight Grant (project no. 47360 and sponsor award no. 435-2017-0735) of the Social Science and Humanities Research Council of Canada (SSHRC). Second, we would like to acknowledge the College of Professional and Continuing Education of the Hong Kong Polytechnic University via Visiting Scholar Program which catalyzed the development of this collaboration. Third, we acknowledge the publisher, Anthem Press, for offering us such a worthwhile opportunity. Fourth, we would like to thank Yantian International Container Terminals, Huayang (Hong Kong) Shipping Ltd, Helmsman Supply Ltd, government of Guanajuato, and Nuevo Laredo for their support, sharing of information and successful experiences, and contributing useful photos to this book. On a more personal note, the first author wants to thank his wife Tracy's continuous, unconditional support of his vision of an academic career path. Also, he wants to thank his friends, colleagues, students and doctoral classmates for their encouragement. The second author wants to thank his family's continuous, unconditional support as he pursues an academic career. The third author wants to thank his wife (Maria), kids (Jorge Andres and Alejandro), family and colleagues for always pushing and inspiring him to develop a better world. Last but not the least, we want to thank our readers,

who have decided to use it for studying, research, and professional training purposes. We hope that they enjoy reading it and appreciate what we have tried to achieve.

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Holistic Vision Model (Hvm) and Holistic Infrastructure Model (Him) and is a professor at different universities in Mexico. Prof. Acevedo makes dreams and business projects become reality. He was a CEO of GTO Inland Port; worked as an international business development consultant in CentrePort, Canada; is the president and CEO of JA Group, focused on the development of new businesses, planning, logistics, infrastructure and trade; and the founder of the Logistics Regional Council in Mexico. Prof. Acevedo is the author of the national initiative for the creation of the AFAM, which would be similar to the CBP in the United States. Today, he participates in the development of different logistics platforms in several states of Mexico and other countries. He is also a consultant of the Inter-American Development Bank (IDB).

Chapter 1

INTRODUCTION

1.1 Setting the Scene

This book provides a comprehensive introduction to the understanding of global supply chains. In the twenty-first century, firms encounter untold pressures including market expansion, globalization, keen competition and increasing customer expectations in a dynamic business environment, where competitors continuously upgrade capabilities so as to remain competitive. This encourages firms to provide superior customer service and reduce total cost via upgrading logistics capabilities. Firms such as General Electric, Wal-Mart, Dell, Cisco and Southern Book Company are able to control supply chains and root out volatilities. Indeed, a competitive supply chain is the key driver for firms to accomplish a competitive edge by improving productivity, decreasing operating cost, keeping strong partnership, increasing revenue and improving customer services (Chan et al., 2012). Hence, today business competition often is "a supply chain against another supply chain" rather than a company against another company (Bowersox et al., 2013). In this regard, the boundary between logistics and supply chain management (SCM) is often confused. The former is a subgroup of SCM that covers additional issues beyond the flow of products and services and incorporates logistics into a core supply chain focused function (Tang and Lau, 2013). The Council of Supply Chain Management Professionals (2007) distinguishes logistics management from SCM. Logistics management is defined as "part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements." SCM, however, "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. In essence, supply chain management integrates supply and demand management within and across companies." Logistics includes all relevant processes pertaining to warehouse, materials handling, packaging, transport, distribution, reception,

customer relationship management, demand forecasting, inventory management, procurement and reverse logistics, to name but a few. When it comes to SCM, it is related to coordinated materials management and information flows (direct and reverse) from the supply of materials and components (purchases/supplies) to the transformation of those components and materials (production) to the delivery to the final customer (physical distribution) (García et al., 2011). In addition, SCM involves all scientific, productive, commercial, technical, structural and policy activities in satisfying a consumer need for the products and services (Silva, 2004).

In this way, efficiency in SCM depends not only on the level of integration/internal coordination within each firm/organization, but also on the link with other stakeholders along the supply chain. Higher supply chain collaboration (i.e., internally and externally) fosters innovation in business models adopted by firms in more globalized markets where competitive levels are, as mentioned earlier, no longer measured between firms but among the supply chains themselves (García et al., 2011). In a globalized era, more volatility of supply and demand, shorter product life cycle and the blurring of traditional organizational boundaries arise. Therefore, supply chains must be flexible and responsive enough to encounter unpredictable environments. Keeping this in mind, the objectives of the SCM can be understood as follows:

- to improve customer service based on competitiveness and quality (it considers customer service to be a customer value and not part of the primary product and is measured by the customer's perception);
- to manage expansion and growth;
- to reduce operating costs in order to gain profitability;
- to consolidate the leadership position of the supply chain; and
- to provide an intense flow of information, products and funds in different stages of supply chain operations.

The Second World War (1939–45) is a milestone in the evolution of logistical functions. Since then, firms have become more interested in the advantages of managing material flows efficiently and establishing new physical distribution channels using an institutional approach. Until the early 1960s, logistics activities were performed as isolated and segmented functions independently managed by different agents/departments. It was essentially linked to the physical distribution, that is, to the management of the physical flow from production to final customers. The importance of physical distribution, especially transport, was the main focus during this period. Since then, there has been a boom in the logistical functions in business. Simultaneously, logistics management and its application were dramatically extended. Due

to major influences from marketing and social science research, behavioral aspects of interfirm relations and customer perceptions of logistical systems are seriously considered in integrated logistics management (Bowersox et al., 2013).

The study of the integration of the logistics functions along the entire supply channel in a globalized era. The ultimate objective is to create a differentiated supply chain for providing superior value to the final customers. By 2005, the concept of holistic vision model (HVM) came into practice. It combines best practices and logistical studies to make a sustainable development of supply chains and physical infrastructure. As early as the 1990s, the United Nations (UN) launched the key concept of "sustainable development." From then on, relevant supply chain stakeholders considered that the sustainability of supply chains matters. Supply chain is a complicated system that is closely associated with socioeconomics and government policy that pose significant impacts on resource allocation and ecological environment (Wang et al., 2017). Reverse and closed-loop supply chains are a core part of sustainability. Hence, the magnitude and importance of the reverse flows of products also needs to be explored (Coyle et al., 2013). Various scholars and researchers have developed frameworks for sustainable SCM (e.g., Hervani et al., 2005; Srivastava, 2007; Pagell and Wu, 2009; Sharma et al., 2010). Surprisingly, sustainability has become an increasingly significant objective for profit-making organizations in the twenty-first century. At the beginning, firms concentrated on sustainability due to social and political pressure and their identification of the momentousness of their social responsibility. Recently, a propitious occasion to improve profits and reduce cost is the driving force for the firms to boost supply chain sustainability (Coyle et al., 2013).

1.2 Objectives and Contributions

As a textbook in global supply chains, *Principles of Global Supply Chain Management* offers several unique features. SCM is a cornerstone of the competitive strategies of many organizations nowadays, and it has evolved from the operational to the strategic level. Understanding such, this book offers a deep insight into the global supply chain sector—analyzing the strategic and operational aspects of the industry, as well as addressing the key elements in the management of global supply chains. Many existing textbooks in logistics and supply chains are technical and/or theoretical in nature and, in our view, may not be most ideal for undergraduate and sub-degree students who are in the embryonic stage of learning the concepts and basic practices. To fill this gap, we introduce a wide range of chapters that cover traditional and

contemporary topics (i.e., reverse logistics, logistics association, logistics education, sustainability in SCM, climate change in a global environment, dry ports). These topics have been largely neglected in many existing textbooks and publications. After reading this book, we are confident that readers will gain a much deeper understanding and wider logistics knowledge. The publication of this book is timely due to globalization, advanced technology, organizational consolidation, the empowered consumers, and rapid changes in public policymaking. Also, the key topics of each chapter demonstrate fundamental issues in the supply chain industry, including: What are the supply chain markets? What is the supply chain cost structure? What are supply chain strategies? How do supply chain firms design and implement strategies? What are the key roles of logistics service providers, logistics education operators and logistics associations? How to manage supply chain operations? How to create sustainable and innovative supply chain structure? To solidify the contents, we put much emphasis on comparative practical case studies from Hong Kong, (Mainland) China, Canada, and Mexico in different chapters. These regional comparative cases illustrate examples of how firms do the "best practice" in managing supply chains efficiently and effectively in the real world. Nowadays, the competitive advantages of firms are "supply chains against supply chains." By doing so, we believe that the gap between professional practice and academic knowledge can be significantly reduced. Readers will gain deep insight and understand the future direction of global supply chain development. In addition, many similar textbooks strongly rely on the so-called Western experiences. Understanding such, we pay much attention to a comparative approach from the Asia-Pacific experiences, notably Hong Kong and China as well as Latin American experience in Mexico. They are now emerging logistics hubs in the world, notably after the introduction (and renewal) of the North American Free Trade Agreement and the Belt and Road Initiative (BRI). Also, to the best of our knowledge, this is the first book on global supply chains that involves close collaboration among Chinese, Canadian, and Mexican scholars and practitioners. Our collaborative work contributes to new opportunities for future research. In addressing professional qualifications, it aligns with the requirements and demands for logistical associations. It does not only adopt strategic management theories, but also includes real-world SCM case studies. It is a valuable study guide for students' independent learning in the management of global supply chains. Admittedly, some aspects, for instance, supply chain finance, supply chain inventories, port logistics, international trade, operations management and information technologies in global supply chains and so on, are excluded in this book. We hope to address the stated issues in the near future.

1.3 Structure of the Book

The rest of this chapter introduces the contents of the book. In Chapters 2–4, we provide a fundamental knowledge about various SCM and activities. Chapter 2 addresses downstream supply chain operation. Outbound logistics is the downstream of SCM. The critical role of outbound logistics is to distribute the products or service to the final end users at the right time, to the right place, for the right people and at the right quality and quantity. It provides the key roles of distribution in supply chain, followed by an explanation of various supply chain strategies. In a context of outbound logistics, transport management mainly participated in the planning and coordination of delivering goods or persons from one place to another. The development of ports and airports shapes the evolution and development of transport in the twenty-first century. Also, it highlights the critical factors determining transport management and operations, as well as the continual emphasis on developing efficient distribution networks using good infrastructure. In SCM, both an upstream supply chain operation and a downstream supply chain operation are equally important.

Chapter 3 addresses supplier selection and procurement, which is the upstream part of SCM. In this regard, the role of supplier and supplier selection criteria is identified. Also, it studies the principles of globalization in procurement management.

In Chapter 4, warehouse management is defined. In a globalized era, the role of warehouse has fundamentally changed from operational to strategic. First, warehouse activities and management are investigated, since they carry out key performance measures of SCM. Also, it investigates the adoption of information technology at air cargo terminals, together with bonded warehouses at container terminals. This offers readers a clear understanding on the interaction between warehouse, logistics, SCM and contemporary international trade.

To apply our theoretical knowledge in the current business environment, we have created two case studies on the management of global supply chains, which can be found in Chapter 5. These two cases studies provide practical examples to help readers apply the theories to various scenarios. Halal food and wine are two emerging issues in global supply chains. Recently, the market of halal food has received much attention worldwide and its demand is increasing tremendously. In this chapter, we review the halal food market in different parts of the world, explain its SCM and analyze how to improve halal food supply chains in the Asia-Pacific region. On the other hand, cold chain involves the transport of temperature-sensitive products through thermal and refrigerated packaging methods and logistical plans so as to protect the integrity of these shipments. In this case, wine is a schematic exposition. Thanks to globalization,

wine has become an important commodity in the global trading activities in this century. In this chapter, we focus on cold chain operations (i.e., shipment preparation, modal choice, custom procedures, the "Last Mile," integrity and quality assurance), the wine market in Asia, the SCM of wine and constructive recommendations to the wine supply chain market in the Asia-Pacific region.

Chapter 6 explains the components of inland ports and logistical systems. Due to capacity expansion, environmental considerations, community restrictions and complex SCM, inland ports have emerged as notable stakeholders to connect between hub port and hinterland area. In this chapter, we demonstrate an illustrative example on inland ports in global supply chains in Mexico. It discusses a movement from a traditional supply chain with many middlemen to cheaper supply chains that are reliable and agile, without middlemen involved to achieve direct benefit for Mexican producers. Also, we underpin the development of free trade negotiations (consortium) by delivering safer, low cost, higher quality products, and promote supply chain infrastructure and use of the CentrePort Canada partners. Simultaneously, we will see how physical infrastructure based on logistical models has become a useful tool for attracting investments, greater efficiency in production processes and reducing costs in supply chains.

Climate change has recently drawn substantial attention to different supply chain stakeholders. Chapter 7 addresses this issue. Port is not only closely associated with human welfare and global economy, but also significantly affects the ecological resources and environment (Wang et al., 2017). The time has come to investigate how ports, as key components in global supply chains, plan for and implement new strategies. We use two port studies in North America, namely, San Diego (United States) and Vancouver (Canada). It presents how climate change adaptation planning has been conducted by ports. The chapter illustrates how institutions have affected adaptation planning and decision-making.

In Chapter 8, we explain the concept of sustainable infrastructure–based supply chains. The United States launched the concept of sustainable development in the environment and development conference in 1992 (Wang et al., 2017). To maintain sustainable competitive advantage, logistics organizations design and implement sustainable supply chains. A logistical firm's competitiveness reflects its ability in managing the supply chain processes in a cost-effective manner. A particular focus is on the importance of HVM and holistic infrastructure model in the management of global supply chains. The role and cost of infrastructure in the supply chains are discussed.

Chapter 9 reviews the mainstream reverse logistics management. The development of reverse logistics is one of the urgent needs for logistics firms to incorporate into the development of logistics and supply chains. Reverse

logistics is the process of moving goods from their typical final destination for the purpose of capturing value, or proper disposal. Reverse logistics management activities also may be included in the definition of reverse logistics. Typical examples in reverse logistics management will be integrated into various reverse logistics management activities.

Apart from logistics hardware and policy mentioned in previous chapters, human capital is one of the key drivers for strengthening supply chain competitiveness. As such, we explain the relationships between key stakeholders (i.e., logistics associations and logistics education) and the management of global supply chains in Chapters 10 and 11, respectively. The emergence of logistics association generates the tremendous growth in the logistics industry. Logistics associations are one of the important platforms for logistics professionals to meet and generate business opportunities. In Chapter 10, we introduce different logistics associations in Asia and Canada and identify the major roles of these associations.

Nowadays, logistics associations recognize that education and training leads to a first mover advantage in logistics and SCM. Education generates human capital and competitive advantages of nations, including the logistics and supply chain sectors. In order to meet ever-changing logistics in the business environment, logistics education has undergone significant changes in the postmodern era. By focusing on Hong Kong, Chapter 11 presents the evolution of logistics education, pertaining to its past, present and future trends. Specifically, it introduces to readers how Hong Kong's "3-3-4" education policy influences the development of its logistics education. In addition, it introduces the restructuring of logistics education in Hong Kong.

Chapter 12 offers a wide variety of case exercises in global supply chains so as to enhance students' understanding. The objectives are to provide additional learning tools to complement a textbook and help students achieve the expected learning outcomes by giving them supplementary case studies.

Acknowledgment of Previous Publications

Some parts of this book were published in different forms as conference proceedings and/or scholarly journals before. They include Lau and Ng (2017), Lau et al. (2016), Lau (2015), Lau and Ng (2015), Lau et al. (2014), Tang and Lau (2013) and Chan et al. (2012).

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Chapter 2

MANAGING OUTBOUND LOGISTICS AND DISTRIBUTION

Outbound logistics is the downstream of supply chain management (SCM). The critical role of outbound logistics is to distribute products and services to final end users at the right time, to the right place, for the right people and at the right quality and quantity. In this chapter, we accomplish the following:

- understand the concept of SCM;
- investigate a supply chain strategy;
- explain the role of distribution in supply chains;
- analyze different distribution channels;
- compare different types of port operations, namely, container ports, midstream operations, dry bulk cargo terminals, liquid bulk cargo terminals, roll-on/roll-off terminals and inland ports; and
- learn about Hong Kong's airfreight industry.

2.1 Supply Chain Management

The field of SCM emerged over a half century ago and continues to evolve. In the early 1980s, scholars began to connect SCM to "systems theory" and "holism" (New, 1997). In the 1990s, research on SCM significantly increased (Huan et al., 2004). However, the definitions of "supply chain" and "supply chain management" are not universally shared, with different scholars providing different perspectives. Before reviewing the role of outbound logistics in supply chains, we may develop a clear understanding of the supply chain. Thus, we examine some central concepts as follows.

Many scholars have tried to provide effective interpretations of SCM through different approaches. Simchi-Levi et al. (2009, p. 1) offered the following definition: "supply chain management 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 systemwide costs while satisfying service level requirements." SCM

concerns the coordination of all activities related to the entire supply chain, starting with raw materials and concluding with a satisfied customer. The main objective of SCM is to reshape the supply chain to maximize an operator's competitive advantage over others (Heizer et al., 2017). In addition, Christopher (1992, p. 12) provided this explanation: "The supply chain is the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer." Harrison et al. (2014) highlighted that SCM is a process converting inputs (information and materials) into outputs (products and services). A supply chain is also a network of various partners who collectively transform raw materials or components (upstream) into the finished goods (downstream) that are valued by end users and who control returns at every step. In addition, the Council of Supply Chain Management Professionals (CSCMP) provides a comprehensive definition of SCM, referring to it as the planning and management of sourcing, procurement, conversion and logistics. This process requires cooperation between supply chain members such as suppliers, intermediaries and customers. This process is also associated with the management of supply and demand within and between companies (Stock and Boyer, 2009).

Because of globalization, fierce competition, market expansion and empowered customers in an ever-changing business environment, designing and implementing an integrated, globally optimal supply chain becomes critical for firms (Simchi-Levi et al., 2009; Chan et al., 2012). The management of relationships is a key issue in SCM. The traditional supply chain limits contact between members, and thus the relationships remain very much at arm's length. With the advent of globalization, the supply chain has evolved into a model of multiple contacts (diamond), encouraging interaction between members engaged in various logistical activities (Harrison et al., 2014). Consequently, multiple supply chain members try to establish competitive advantages by sharing technology and information, exchanging resources, attempting joint projects, reaching common agreement on decision-making and gaining mutual benefits. These members aim at maximizing the profitability from end users and the value of members along the supply chain (Singh and Power, 2009; Kiessling et al., 2014). This concept of multiple contacts is an extension of SCM. Rather than simply being a case of management, the model suggests a closer and more collaborative relationship between supply chain members because they share more than just basic business operations and processes. The ultimate goal is to realize competitive advantage and profitability (Singh, 2016).

Kiessling et al. (2014) pointed out that the content and strength of a relationship is the trust generated between interconnecting parties. "Trust" is defined by Uzzi (1997, p. 52) as "the belief that an exchange partner would not act in self-interest at another's expense." The significance of trust in interorganizational relationships is now emphasized in global SCM (Simchi-Levi et al., 2009).

2.2 Supply Chain Strategy

In this section, we illustrate SCM and strategy for paper consumables in Airport Authority Hong Kong (AAHK). We mainly focus on the centralized management method on optimizing the paper consumables supply chain. Followed by the major solution, some alternative suggestions such as vendor-managed inventory (VMI) and supply contracts are briefly introduced for further considerations by the decision-makers. By aggregating the data pertaining to the overall inventory and end user boarding gates, the safety inventory level can be considerably decreased without affecting the cycle service level. Hence, the total operating and inventory cost will also be minimized.

2.2.1 Background of AAHK

AAHK is a statutory body wholly owned by the HKSAR government and responsible for the sustainable development and daily operation of Hong Kong International Airport (HKIA). AAHK aims to give excellent customer service and an exotic airport experience to passengers (Hong Kong International Airport, 2017). In practice, airport operations are complicated as they need close collaboration between various parties. In addition, airports need to maintain their business at all times in the principle of 24/7. Responsive and flexible replenishment of the essential consumables are critical for smooth airport operation.

2.2.2 Overview of Paper Consumables Used in HKIA

Paper consumables are one of the key consumables for airport operations, and they are heavily employed at the boarding gates for both flight arrival and departure. They are required to be distributed to boarding gates as well as other places at the airport. The arrangement of the paper consumables replenishment and delivery is managed by Terminal 1 department at AAHK. Paper consumables often used at the boarding gate is "2Ply Carbonless Paper Roll" thermal paper. The thermal paper is fed

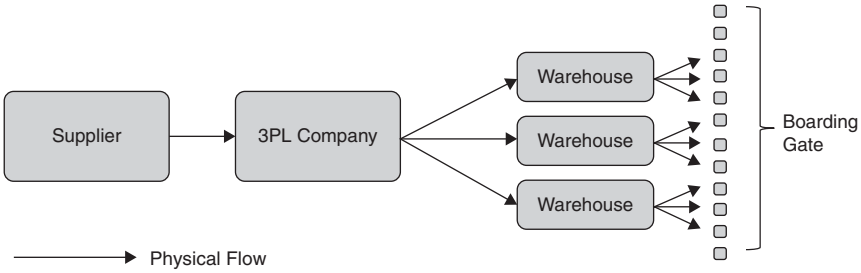

Figure 2.1 Paper consumables supply chain.

Source: Authors.

into the thermal paper printer for printing necessary information of flight departures/arrivals. It is important for Terminal 1 department at AAHK to provide sufficient paper consumables in a timely manner for use at the boarding gates. Customer satisfaction is proportional to the cycle service level of the paper supply. Accordingly, it is important that the department ensure adequate stocks are available for consumption to keep up the high cycle service level.

2.2.3 Current Operations of Paper Supply Chain

Thermal paper is required at all 89 boarding gates, including those at the main building (i.e., Gates 1–80), outerbay area (i.e., Gates 511–513 and 520–525), North Satellite Concourse (i.e., Gates 501–510) and Midfield Concourse (i.e., Gates 201–230). There are three warehouses for storing the 2Ply Carbonless Roll, which are located near Gate 42 of Terminal 1, Midfield Concourse and North Satellite Concourse for supplying the paper consumables in the area.

Figure 2.1 shows the supply chain of the paper consumables at AAHK. The supplier gives the products to the 3PL Company. The 3PL Company then transports the products to the three warehouses in the restricted area of the HKIA. The staff of each of the warehouses then transports the paper consumables to the boarding gates.

In the current paper consumables replenishment and delivery operation, there are a total of five steps involved. Since the paper consumables are required to be delivered to the warehouses in the restricted area, a series of predelivery tasks needs to be completed by AAHK and 3PL Company. This includes applying permit, informing related parties and preparing escort and so forth. AAHK and 3PL Company need close collaboration and timely communication for this predelivery work. The details are shown in Figure 2.2.

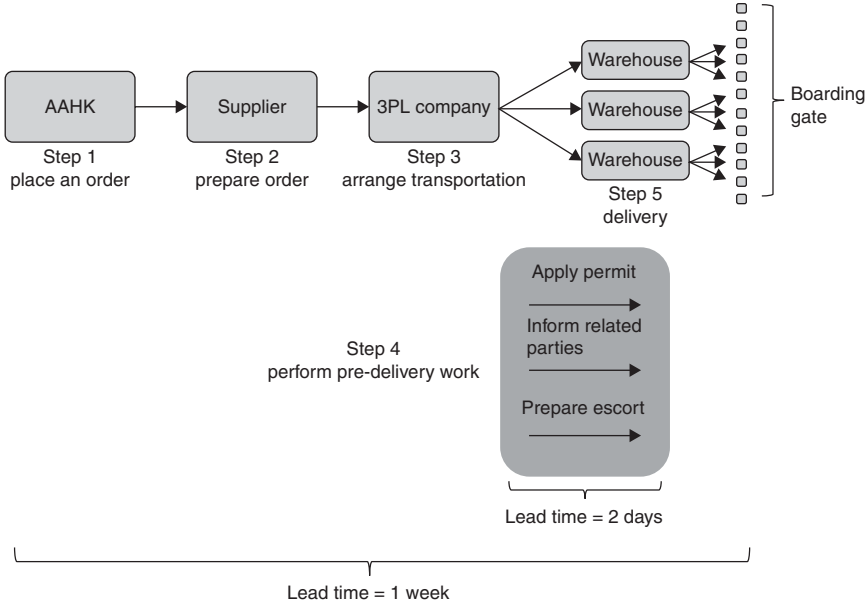

Figure 2.2 Replenishment and delivery operation of the paper consumables.

Source: Authors.

2.2.4 Potential Issues in AAHK Paper Consumables Supply Chain

Although it is known that the decentralized warehouse can reduce the response time, as the warehouse can be closer to the boarding gates, such strategy may cause several potential issues.

No Accurate Inventory Records of the Paper Consumables: Since the size of the three warehouses is relatively small, AAHK does not have an inventory management system for the paper consumables. The records are mainly based on human cycle count only. A lack of real-time inventory records and the scope of human error increase the uncertainty of the paper consumables.

Complex Predelivery Work: AAHK and 3PL Company are required to have close collaboration and timely communication for predelivery work. Without such cooperation, the delivery may be delayed. Delays in replenishment of paper consumables because of incomplete predelivery work have happened in the past. It significantly affected the inventory replenishment and service levels. The potential issues may also specifically affect the efficiency of the paper consumables in both physical flow and information flow.

Supply Chain Uncertainty: Due to the uncertainty of paper consumables, more safety stock may need to be allocated to the three warehouses. Thus it increases the inventory holding cost of AAHK. Because of inaccurate inventory records and the uncertainty, the demand information from the point-of-use to the upstream of the supply chain may lead to increasing variance in ordered quantity along the supply chain, which is called bullwhip effect.

2.2.5 Proposed Plan—Centralized Management

For improving the efficiency of the paper consumables replenishment and delivery, the centralized management strategy will be used.

Proposal for a Centralized Warehouse: A centralized warehouse aims to reduce the uncertainty and the amount of safety stock, and therefore it is suggested that one centralized warehouse for storing the paper consumables will be used. AAHK can thus reduce the number of safety stock required in the warehouse due to the risk-pooling effect. Furthermore, the inventory cost can be reduced by adopting a centralized warehouse while maintaining the same service level. Other than the managerial approach, electronic data interchange (EDI) can also be considered as improving the information flow between the parties in the supply chain. This method can minimize the information lead time owing to the bullwhip effect across the stakeholders (Abrahamsson, 1993).

Logistics Network Configuration: Decision support system (DSS) is a computer-based system that manages different information about organizations and predicts effect of possible decisions (Murty et al., 2005). In the case of AAHK, we will focus on using DSS in the logistics network configuration within AAHK. As centralized warehouse strategy is used, some of the boarding gates may be farther away from the warehouse than others. Thus, it is necessary for optimized delivery routing and quantity to transport the paper consumables from the warehouse to the boarding gates, with minimized transportation cost and delivery time. DSS can aid AAHK in maintaining an optimal flow of paper consumables through the network and minimizing the total transportation cost. Since the DSS system is set up in the centralized warehouse for managing all paper consumables inventory rather than in the three warehouses, the economies of scale can be achieved.

In our case, the raw data include transport rate, supplier capacities and the demand for paper consumables at each of the boarding gates. As the airport has 89 boarding gates, we need to use a data aggregation technique to simplify the data into seven clusters in the DSS system for better forecasting. We will use a closer proximity algorithm to aggregate the boarding gates. In other words, all the boarding gates will be grouped nearly together to create a new cluster or a cell. In doing so, the first cluster would be the boarding gates that are located in Terminal 1, which consists of Gates 1–3, 15–19, 511–513

and 520–525. Then, the second cluster consists of Gates 20–36 because they are located relatively closer. Furthermore, the third cluster includes the boarding gates located in the North Satellite Concourse (Gates 501–510). The fourth cluster will be Gates 60–71, and the fifth cluster will be Gates 40–50. Last but not least, the Midfield Concourse will be divided into two clusters, which are Gates 201–210 and 228–230 in cluster six and Gates 211–219 in cluster 7.

2.2.6 Optional Approaches

Supply Contracts

Incentive in Buy-Back Contract: Supplier is assumed to be willing to buy back excessive goods from AAHK for some agreed-upon price. The Airport Authority has the incentive to order more.

Incentive Quantity-Flexibility Contract: Supplier provides full refund for certain quantity of returned (unsold) items.

Under supply contracts, it can reduce the chance of paper stock out and trade-off the supplier for the higher risk. However, the supplier is required to have an effective reverse logistics system for the recollection of papers. Moreover, the backward transportation of paper stocks may increase the total logistics costs. The supplier is probably unwilling to sign these contracts with AAHK if there are no obvious incentives for the supplier.

Vendor-Managed Inventory: In order to tackle the issue of the sudden change of paper consumption (i.e., demand fluctuation), introducing the VMI model can be viewed as an option. VMI is a model wherein the information of the product will be provided to the supplier by the buyer and they will make an agreement that certain amount of the goods from AAHK will be kept reasonably by the supplier at the warehouse of the buyer (Dong and Xu, 2002). Meanwhile, the data should be shared through EDI. Therefore, within few hours, the paper suppliers will receive the corresponding information, including demand and inventory level about paper. By the application of enterprise resource planning (ERP) system, the data can be transited in real time and hence delay can be avoided.

Using VMI, the demand can be matched and material requirement controlled through connection with a number of departments and boarding gates, thereby avoiding a large amount of safety stock, minimizing the handling cost and optimizing the whole SCM (Disney and Towill, 2003). In the current situation, AAHK manages the order and demand data, including how many paper materials are to be used and when the reorder point of the inventory is reached. If VMI is deployed, this information has to be handed

over to the supplier by the end users. Trust issues need to take consideration between two parties. Additionally, the supplier also needs to investigate the actual demand of the paper consumables directly to generate an accurate forecast (Holmstrom, 1998).

2.3 The Role of Distribution in SCM

SCM is a dynamic business. Coyle et al. (2013) explained the structural changes in supply chains by concentrating on the division of inbound and outbound logistics. On the one hand, inbound logistics mainly handles the management of physical supplies including receiving, storing and disseminating incoming materials or components for production. On the other hand, outbound logistics mainly provides physical distribution pertaining to storing, transporting and distributing goods to final customers. Physical distribution commonly appeared in the scholarship on outbound logistics after the 1950s. The earlier focus on outbound logistics or physical distribution was logical because finished goods generally held higher value. In the 1980s, the deregulation of transport and emerging industries (e.g., automotive, high-tech companies and consumer package/grocery products) led to a significant effect on transport choices and the design of strategic distribution systems (Eskigun et al., 2005). By 2050, seven-eighths of the world's population is expected to live in emerging or developing countries. According to the current rate of population growth, one billion people are expected to live in the developed world while eight billion are expected to live in emerging countries. In this context, an expanded distribution system becomes a "must" to maintain pace with the growing demand for goods and services (Kiessling et al., 2014). As a result, physical distribution evolved from an operational mode to a strategic decision-making mode (Hiremath et al., 2013). The National Council of Physical Distribution Management (NCPDM) was created to enhance education, leadership and research related to physical distribution (Coyle et al., 2013). To lower the likelihood of the inefficient allocation of distribution tasks and redundancy of work by participants, it is necessary that a distribution channel becomes managed as an integrated interfirm system under the leadership of one participant (Mehta et al., 2010).

Physical distribution describes the rigorous steps undertaken to store and move a product from a supplier to a customer along the supply chain. Such distribution includes a systematic management of a set of interrelated activities pertaining to distribution, transport, finished goods, warehousing, packaging, inventory levels and materials handling. The physical distribution process starts when a supplier obtains an order from a customer (Kwateng et al., 2014). Distribution takes place between each pair of steps in the supply

chain. On the one side, raw materials and components are shifted from suppliers to manufacturers. On the other side, finished products are shifted from manufacturers to final customers. Distribution is a key determining factor for improving the overall profitability of a firm because it directly affects the customer experience and supply chain costs (Chopra and Meindl, 2007; Hiremath et al., 2013). The role of distribution operations motivates firms to confront challenges and sustain different supply chain processes (Cooper et al., 1991; Kwateng et al., 2014). Hence, the majority of firms are keen on designing, restructuring and operating a customized distribution service that delivers quality services across all supply chain operations. The critical success factors for creating physical distribution stem from responsiveness, flexibility and cost-efficiency (Kwateng et al., 2014). Coyle et al. (2013) described the main roles of distribution operations in SCM.

- Distribution facilities can stockpile inventory to buffer uncertain demand and supply.
- Distribution facilities can maintain inventory for protection against supply disruptions, demand spikes and forecasting errors.
- Distribution facilities can maintain additional inventory if the firms buy larger quantities to enjoy quantity discounts. Thus, the firms reduce their cost per unit.
- Distribution facilities can support long-term production requirements, including for perishable outputs such as cheese, fruit and wine.
- Distribution facilities can be used to obtain and maintain larger deliveries of inventory for economical transport.

Researchers of supply chains have addressed the design and management of physical distribution networks for a time frame typically spanning more than 10 years. Establishing an international distribution network requires significant investment of capital and time, and such networks also entail considerable risk (Mehta et al., 2010). Regarding physical distribution systems, firms concentrate on the following five interrelated decisions (Hiremath et al., 2013):

- Determining the suitable number of distribution centres and plants.
- Determining the location of individual distribution centres and plants.
- Determining the product allocation to each distribution centre and plant.
- Determining the customer allocation to each distribution centre and plant and
- Determining the storage capacity and throughput of each distribution centre and plant.

2.4 Transport Management

Transport management is critically important for enhancing overall supply chain performance and facilitating socioeconomic development (Susniene and Jurkauskas, 2008). The two main objectives are to (1) improve commercial performance and (2) provide sustainable distribution solutions. Transport plays a vital role in closely integrated, customized, time-sensitive and vulnerable supply chains and networks. The improvement in the use of time is a major issue in the literature on SCM (Ptak and Noel, 1998; Svensson, 2002; Mason and Lalwani, 2006). Morash and Clinton (1997, p. 5) explained that "to minimize total costs and maximize customer value, transport integration is essential within the supply chain." Also, the 14th World Conference on Transport Research (WCTR) reinforced the observation that sound transport infrastructure with different transport modalities creates comprehensive distribution channels (Woxenius et al., 2017). Since the early 1990s, the field of transport management has applied the concept of technological advancement. Circumstantial evidence has suggested that technological development encourages transport integration and maintains a smooth physical distribution through reasonable scheduling over time (Geerlings et al., 2009; Liu et al., 2014). The concepts of "nodes" and "links" become especially important for transport management. Critical seaport and airport operations are briefly discussed in the following section.

2.4.1 Container Port

Containerized shipping was first launched in the United States in the 1960s. Container port operations require storage facilities, multiple depots, specialized cranes and rail-heads. In the maritime industry, over 90 percent of international cargo is continuously delivered through seaports. Hence, container ports are described as pivotal nodes in worldwide shipping networks. Also, 80 percent of seaborne cargo is shipped in containers. Containerized shipping offers cost savings by allowing cargo to be packed in one location and moved over long distances through different transport modes (Cho, 2014). Murphy and Daley (1994) elaborated that a critical factor in choosing container ports is cost, including the costs of loading and unloading and freight handling. Such costs are closely correlated with container port efficiency. Apart from cost, other factors may pertain to container port effectiveness: the frequency of calling vessels, navigation distance, distribution, port schedules, hinterland nearness, port accessibility, port facilities, port availability, port traffic and the variety of shipping routes (Willingale, 1981). In contemporary global freight

Table 2.1 Top 20 container terminals in 2015 and 2016

Country	Port	2015 (throughput)	2016 (throughput)	2016 (rank)	2015–16 (% change)
China	Shanghai	36,537,000	37,135,000	1	1.6
Singapore	Singapore	30,962,000	30,930,000	2	–0.1
China	Shenzhen	24,204,000	23,980,000	3	–0.9
China	Ningbo	20,593,000	21,565,000	4	4.7
Hong Kong (China)	Hong Kong	20,114,000	19,580,000	5	–2.7
South Korea	Busan	19,296,000	19,378,000	6	0.4
China	Guangzhou	17,457,000	18,859,000	7	8.0
China	Qingdao	17,465,000	18,050,000	8	3.3
United Arab Emirates	Dubai	15,592,000	14,772,000	9	–5.3
China	Tianjin	14,109,000	14,523,000	10	2.9
Malaysia	Port Kelang	11,891,000	13,167,000	11	10.7
Netherlands	Rotterdam	12,235,000	12,385,000	12	1.2
Taiwan	Kaohsiung	10,264,000	10,460,000	13	1.8
Belgium	Antwerp	9,650,000	10,037,000	14	4.0
China	Xiamen	9,179,000	9,614,000	15	4.7
China	Dalian	9,449,000	9,584,000	16	1.4
Germany	Hamburg	8,825,000	8,900,000	17	0.8
United States	Los Angeles	8,160,000	8,857,000	18	8.5
Malaysia	Tanjung Pelepas	8,799,000	8,029,000	19	–8.8
Vietnam	Cat Lai	6,863,000	7,547,000	20	10.0

Source: UNCTAD (2017).

networks, container ports not only play a role as a hub for the exchange of containers between various maritime shipping lines but also become an interface to landside transport systems. Comprehensive logistics control systems and efficient information technologies are required to fulfil expected performance measures (Chew et al., 2010).

Before the 1980s, the container shipping industry was largely concentrated on developed countries and along their maritime routes. By the 1990s, the rise of China as the world manufacturing center drove the dramatic growth of container ports in East Asia. It is no surprise that much of the world's container traffic is found in Asian countries such as Singapore, Hong Kong, China, Taiwan, Japan, Thailand, Vietnam and South Korea (Cho, 2014). In general, the number of containers shows tremendous rates of growth from 1990 to 2010 (Andziulis et al., 2012). Currently, 7 of the top 10 container ports are in China. In 2016, almost half of the volume handled by the top 40 ranking of container terminals was assigned to container ports in China. Furthermore, 55 percent of container ports are now found in Asia (UNCTAD, 2017). The top 20 container terminals are shown in Table 2.1.

Figure 2.3 Yantian International Container Yard.

Source: Yantian International Container Terminals (2017).

The Yantian International Container Terminals (YICT) has been transformed into one of the largest and most advanced container terminals in the world. Today, YICT is a preferred port of call for mega-vessels and has strengthened the regional economy. The annual throughput increased significantly from 13,000 TEUs in 1994 to 11,696,000 TEUs in 2016 (Yantian International Container Terminals, 2017). Figures 2.3–2.5 explain the container port layout, operations and management.

The YICT operation evolved from the traditional manual handling of general cargoes to using sophisticated mechanical equipment for handling, moving and transferring containers. The YICT installed comprehensive ship-to-shore interchange equipment in its container yard systems. The container yard systems are compared in Table 2.2.

2.4.2 Midstream Operation

Before the introduction of containerization in the 1960s, mid-stream operation (MSO) provided most cargo handling services for oceangoing vessels. Starting in the twenty-first century, the development of advanced ports for sea-freight

Figure 2.4 Yantian International Terminal operations.

Source: Yantian International Container Terminals (2017).

Figure 2.5 The transport network of Yantian International Container Terminal.

Source: Yantian International Container Terminals (2017).

Table 2.2 Comparison of container yard systems

	Land utilization (single tier)	**Terminal development costs**	**Equipment costs**	**Equipment maintenance costs**	**Manning levels two crane operation**	**Operating factors**
Tractor Chassis System	Very poor, 185 teu/hectare	Very low	High	Low	High	Good accessibility Simple terminal organization
Straddle Carrier	Good, 385 teu/hectare	Medium	Moderate	High	Low	High flexibility Two/three stacking capability
Yard Gantry Crane System	Very good, 750 teu/hectare	High	High	Low	High	Good land use Scope for automation
Front-end Loader (FLT)	Poor, 275 teu/hectare	High	Moderate	Medium	Medium	Versatile

Source: Institute of Chartered Shipbrokers (2015).

Figure 2.6 Traditional mid-stream operation in Hong Kong.

Source: Authors.

transport and container services in southern China, along with the relocation of manufacturing industries to Hong Kong, created an unfavorable situation for MSO. MSO included the loading and unloading of cargo-vessel containers while on the high seas, with dumb steel lighters or barges distributing and transferring containers to nearby piers. In this system, ocean-going vessels no longer require berthing alongside docks for the loading and discharging of cargo. In other words, vessels can easily drop anchor at mooring buoys and discharge their cargoes with the aid of single-derrick cranes placed on board local dumb steel lighters. The unique MSO operation is currently practiced in Hong Kong (Lau and Ng, 2017). The traditional MSO is described in Figure 2.6.

Although MSO is now diminishing, there are still 28 shipping lines considered as MSO. MSO operates at 11 different locations (e.g., Chai Wan, Yau Ma Tei, Stonecutters Island, Rambler Channel, Lamma Island, Western District, Lamma Island, to name but a few) occupying a total water frontage of 4,936 meters and a total land area of 24 hectares. Tai Wah Sea/Land Heavy Transportation Ltd, Transward Ltd and Fat Kee Stevedores Ltd are the three main MSO operators in Hong Kong. Presently, the berth width of Stonecutters Island of Public Cargo Working Area (PCWA) is 50 meters, while it is 40 meters for Chai Wan PCWA and between 20 and 30 meters for Rambler Channel PCWA (Marine Department, 2017).

In the future, MSO faces different challenges, including (1) strong competition from container terminals in the Pearl River Delta, (2) a lack of waterfront,

(3) a shortage of skilled labor, (4) an activity that is capital intensive, (5) direct international sailing from Pearl River Delta ports, which led to a gradual decline in sources of cargo for MSO, (6) a longer distance between the waterfront and anchorage areas and (7) the use of open tender to allocate PCWA berths, which significantly increased operating costs for both PCWA and MSO operators (Lau and Ng, 2017).

2.4.3 Dry Bulk Cargo Terminal

The term "dry bulk cargo" refers to homogeneous unpacked cargo (Institute of Chartered Shipbrokers, 2015). The five major dry bulks are iron ore, coal, grain, bauxite/alumina and phosphate rock (UNCTAD, 2017). In terms of volume, dry bulk cargoes contribute to the largest group of cargoes, accounting for over 50 percent of all loaded cargo. Bulkers delivering around 100,000 tons of such cargoes are completely usual in maritime transport (Grote et al., 2016). Because of the technological advancement and speedy expansion of dry bulk shipping, dry bulk vessels have been further upgraded in terms of ship design, ship types and operations. Dry bulk cargo terminals also require improving their operational efficiency (Chen et al., 2010). In dry bulk cargo terminals, the typical equipment includes ship-loaders, ship-unloaders, bulk terminal stackers and reclaimers (Institute of Chartered Shipbrokers, 2015). Such terminals are now located like Japan, South Korea, South Africa, West Africa, Russia, China, Latvia, Rotterdam, Bakar and Brazil.

Dry bulk cargo terminals are responsible for two key environmental issues: dust during each stage of the operation and noise during loading and discharging (Institute of Chartered Shipbrokers, 2015). Worse, it is common practice for ship owners to push overboard any cargo residue left on the bulkers after unloading, which harms the marine environment. Accordingly, the International Maritime Organization (IMO) highlighted this critical issue in the Marine Environment Protection Committee (MEPC). The discharge of cargo residues was forbidden in 2015 (Grote et al., 2016). A dry bulk cargo ship is shown in Figure 2.7, and a dry bulk terminal is shown in Figure 2.8.

2.4.4 Liquid Bulk Cargo Terminal

The term "liquid bulk cargo" refers to an unpacked homogeneous liquid cargo. Examples of liquid bulk cargoes include palm oil, crude oil and liquefied natural gas (Institute of Chartered Shipbrokers, 2015). Liquid bulk cargoes are one of the key segments in the maritime shipping industry. In terms of volume, liquid bulk cargoes represent 30 percent of all loaded cargoes (Grote et al., 2016). In a liquid bulk cargo operation, the terminal's equipment

Figure 2.7 Dry bulk ship.

Source: Huayang (Hong Kong) Shipping Limited (2017).

Figure 2.8 Dry bulk cargo terminal.

Source: Huayang (Hong Kong) Shipping Limited (2017).

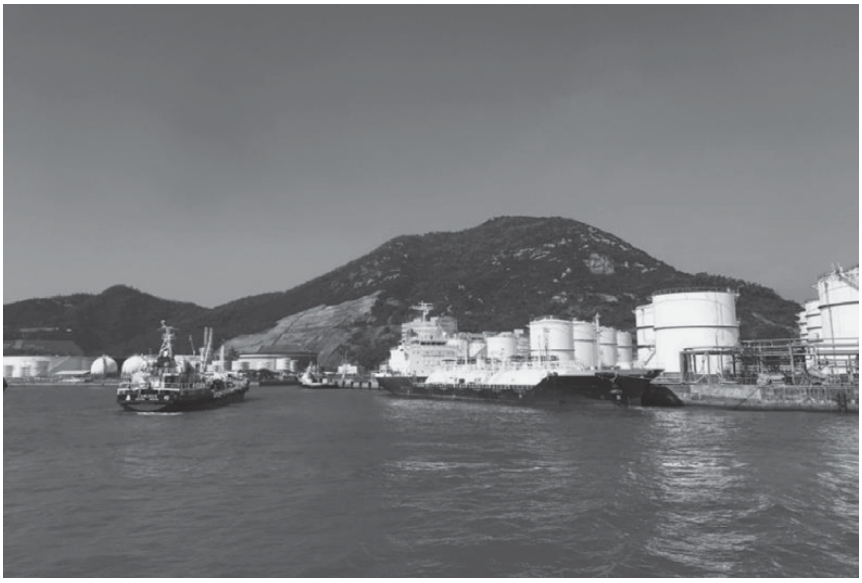

Figure 2.9 Liquid bulk ship.

Source: Helmsman Supply Limited (2017).

includes terminal pipeline systems and pumping equipment (Institute of Chartered Shipbrokers, 2015). A liquid bulk ship is shown in Figure 2.9, and a liquid bulk cargo terminal is shown in Figure 2.10. Typical liquid bulk cargo terminals are now located like Rotterdam, Japan, China, South East Asia and Scotland.

Liquid bulk cargo has several unique characteristics: toxicity, flammability, corrosiveness and vapor pressure, all of which may pose a threat to human health. Also, the failure and leakage of the tank structure, emissions and run-off are common sources of marine pollution. Hence, maintaining a safe and clean environment is of critical importance for a liquid bulk cargo terminal manager (Institute of Chartered Shipbrokers, 2015).

2.4.5 Roll-On/Roll-Off Terminal

Roll-on/roll-off (RORO) ships are vehicles designed to deliver wheeled cargo, such as trucks, cars, trailers, motorcycles, semitrailer truckers and railroad cars, which must be driven on and off a ship on their own wheels or transferred with the use of a platform vehicle (i.e., self-propelled modular transporter). The determining factors include driver preference, schedules and the duration of

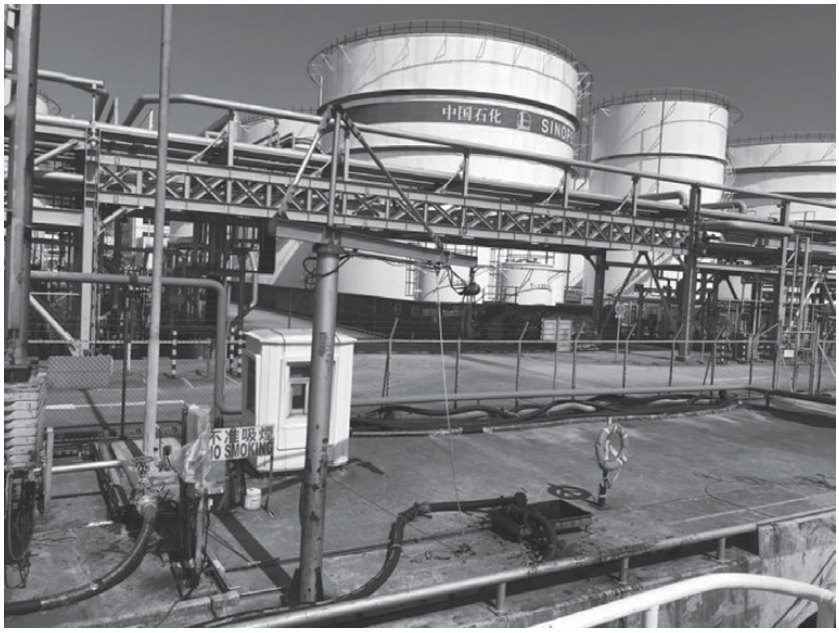

Figure 2.10 Liquid bulk cargo terminal in Hong Kong.

Source: Helmsman Supply Limited (2017).

sea journey (Institute of Chartered Shipbrokers, 2015). In general, a RORO terminal includes a land area, a water area and a berth and apron, and it offers services such as boarding, disembarkation and security checks (Tang et al., 2015). A RORO terminal's operational efficiency is largely determined by bridging the physical interface between shore and ship through the use of shore-based ramps. Other cargo handling equipment, such as reach stackers, top-lifters and forklift trucks, are also used in RORO terminals (Institute of Chartered Shipbrokers, 2015). Currently, RORO terminals are found in Canada, East Africa, Israel, the Mediterranean and Australia, among other places. A RORO terminal operation is shown in Figure 2.11.

2.4.6 Inland Port

An inland port intends to ease seaport congestion and enlarge cargo handling capacity. It is integrated with, or linked to, seaports, thus providing shippers in a commercial/industrial region with different logistical services and supplementary services such as customs clearance and maintenance. An inland port is an extension of a seaport that connects by rail to the docks. A well-established

Figure 2.11 Roll-on/roll-off terminal operation in Malta.

Source: Authors.

inland port is able to reduce transport costs, improve the ecological environment by switching the transport mode from road to rail, increase cargo handling capacity, generate benefits to seaports through securing hinterland markets, enlarge berth throughputs and provide superior service to transport operators and shippers. Accordingly, inland ports are commonly adopted worldwide, such as by Virginia in the United States, the CentrePort in Canada, Xi'an in China and Eskilstuna in Sweden (Qju et al., 2015).

CentrePort, an example of an inland port, is strategically located in the center of North America, in Winnipeg, Manitoba. It is the largest and first trimodal inland port and foreign trade zone with direct access to both national and international truck, rail and air cargo operations in Canada. CentrePort provides prime industrial land for development pertaining to warehousing and distribution, manufacturing and assembly, food processing and packaging, agribusiness and transport-related logistics (CentrePort, 2017). The CentrePort operation is illustrated in Figures 2.12 and 2.13.

2.4.7 Airfreight Industry

Hong Kong has ranked as one of the world's leading international airports since 1996, and by 2016 it handled about 4.52 million tons of cargo. Here, air cargo was recorded at around 1.3 percent of Hong Kong's total cargo throughput, but air cargo contributed HK$3.02 million to Hong Kong's total

Figure 2.12 CentrePort operation (1).

Source: Authors.

value of external trade in 2015. Additionally, in a report commissioned by the AAHK, the volume of air cargo handled at HKIA is expected to surge by 2.7 percent annually in the coming years (Hong Kong International Airport, 2017). Table 2.3 illustrates the air cargo throughput at HKIA.

Because of globalization, the Hong Kong airfreight industry faces stiff competition and rising customer expectations. Accordingly, the airfreight industry not only provides port-to-port transport but also offers customized and differentiated customer services with customer requirements including priority lift, courier lift, secure lift, live animal lift and fresh lift. Air cargo handling equipment is shown in Figure 2.14. The Hong Kong airfreight industry requires changing from manual operations to automatic operations to deliver products and services and at the right time, to the right place, in the right condition and for the right people. Recently, Cathay Pacific (CX) took action to become Asia's largest carrier. CX also used HK$8.22 billion to take over Dragon Airlines by stock acquisition (Cathay Pacific Airways Limited, 2006). This acquisition turned CX into Asia's largest airline, allowing it to develop its mainland routes. After the CX takeover of Dragon Airlines, CX's increased access to the mainland market resulted in

Figure 2.13 CentrePort operation (2).

Source: Authors.

more cargo capacity. This had implications for Hong Kong's Super Terminal 1. Because of profitable routes into the mainland's fast-growing airfreight market, and as the leading air cargo terminal operator in Hong Kong, Super Terminal 1 became unable to provide effective cargo handling services to CX. In 2007, Super Terminal 1's annual throughput of air cargo was around 2.63 million tons with a land area of 171,322 square meters. The overall land use efficiency was approximately 15.4 tons per square meters (Hactl, 2007; Hactl Press Release, 2008). The terminal's efficiency is expected to decrease when cargo volumes increase in the coming years. A 10-year contact between CX and Hong Kong Air Cargo Terminals Limited (Hactl) expired in 2009. In light of this, the

Table 2.3 The air cargo throughput at Hong Kong International Airport

Year	Tonnage ('000 tons)
1998	1,629
1999	1,974
2000	2,241
2001	2,074
2002	2,479
2003	2,642
2004	3,090
2005	3,402
2006	3,579
2007	3,742
2008	3,627
2009	3,347
2010	4,128
2011	3,938
2012	4,025
2013	4,127
2014	4,376
2015	4,380
2016	4,521

Source: Hong Kong International Airport (2017).

Figure 2.14 Air cargo handling equipment.

Source: Authors.

development of an independent air cargo terminal by CX seems to be inevitable. CX invested approximately HK$4.8 billion to set up an independent cargo terminal in the second half of 2011 and was awarded the franchise for 20 years at HKIA (Cathay Pacific Cargo Press Release, 2008). These developments may

accommodate the airline's rapid growth in cargo volume and product enhancement, especially regarding mainland China. Cathay Pacific Airways plans to construct an independent new air cargo terminal at HKIA, and this will bring additional cargo handling capacity and attract more cargo flights to HKIA. This measure further consolidates Hong Kong as an international air cargo hub.

If CX's new terminal is recognized as a third cargo terminal operator (CTO), then Asia Airfreight Terminal (AAT) may find itself facing stiff competition because other airlines can also use CX's cargo terminal. Nevertheless, CX's new air cargo terminal creates competitive pressure for Hactl and AAT. However, CX intends to establish its own airfreight terminal via backward vertical integration (Slack and Fremont, 2005). This may be viewed as a value-added chain in a system of total integrated logistics and integrated conglomerates (Davis and Duhaime, 1992; Notteboom, 2002). Through backward vertical integration, a company can establish subsidiaries in such a way that the entire supply chain becomes self-managing (whereby some of the inputs produced in the chain are used in the production process, with the company's aim of producing its own products). In this case, CX hopes to provide air cargo handling services with its own subsidiary company for a return of benefits. At the commercial level, CX can enjoy the low-cost competitive advantage due to increased efficiency and input utilization (Fronmueller and Reed, 1996). Compared with Hactl's land use efficiency, the new air cargo terminal can meet a target of bringing in over 25 tons per square meter (Cathay Pacific Cargo Press Release, 2008). CX can also lead to diversification in this industry and offer one-stop shop services to customers. It can improve the customer service level accordingly (Notteboom, 2002; Slack and Fremont, 2005). At the strategic level, CX can enjoy lower operating costs and then pass those savings along to customers. In other words, it can attract other customers away from other air cargo terminals to use CX air cargo services and build up an extensive cargo network. On the negative side, backward vertical integration creates significant costs for CX, such as administrative costs and strategic costs (i.e., sunk costs and commitment escalation) because of the problem of complex coordination and communication within CX (Fronmueller and Reed, 1996).

The Hong Kong airfreight industry not only faces domestic rivalry but also encounters neighboring pressure in Asia. Because of open skies policies, deregulation of the airlines and industry alliances, there is competitive pressure in the airfreight industry (Francis et al., 2002; Park, 2003). Open skies policies, which stimulated the liberalization of the aviation industry, are expected to further remove the capacity controls and entry barriers for each route (Forsyth et al., 2006). In addition, open skies policies permit the airlines to set prices and quantities without restriction and free them to form the ownership arrangements and alliances without government intervention

(Adler and Hashai, 2005; Forsyth et al., 2006). Consequently, regional competitiveness means that the Hong Kong airfreight industry encounters a competitive market in the Asia region. Here, regional competitiveness (European Commission, 1996) is defined as "the ability to produce goods and services which meet the test of international markets, while at the same time maintaining high and sustainable levels of income, or more generally, the ability of regions to generate, while being exposed to external competitions, relatively high incomes and employment levels." Regional competitiveness stimulates the Hong Kong airfreight industry to achieve and sustain competitive advantage.

The government plays a vital role in enhancing Hong Kong's airfreight industry and securing Hong Kong as an international air cargo hub.

- *Providing subsidies to the airfreight industry in Hong Kong*. For land or surface connectivity, Hong Kong should continue developing appropriate physical infrastructure to streamline border crossings and ease infrastructural bottlenecks. For instance, the Hong Kong-Shenzhen Western Corridor provides direct access to the eastern Pearl River Delta area while Hong Kong-Zhuhai-Macau Bridge enhances the connections between HKIA and the western Pearl River Delta area. Thus, Hong Kong can integrate the hinterland within the Pearl River Delta area and bring more cargo sources from the Pearl River Delta area to Hong Kong (HKIA Master Plan 2025, 2007).
- *Establishing a free-trade city*. As most of the commodities entering Hong Kong are tariff-free, it can attract enterprises to invest in it and absorb cargo.
- *Preparing for fifth-freedom services to Hong Kong by the Civil Aviation Administration of China (CAAC)*. In 2015, the ASEAN Open Skies fulfilled expectations of a full liberalization of air services within the Asian region (Ionides, 2008). This implies that it is easier for Hong Kong to enter into the mainland market and increase the catchment area in mainland regions due to the lack of restrictions on carriers flying within the Asia region.
- *Developing creative and value-added logistics services for shippers*. The government should collaborate with air cargo operators to develop and streamline intermodal transport networks through customs clearance technologies such as a common e-platform. This can simplify custom clearance procedures and enhance the flexibility of cargo delivery (HKIA Master Plan 2025, 2007).

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Chapter 3

SUPPLIER SELECTION AND PROCUREMENT

Supplier selection is the upstream part of supply chain management (SCM). The critical role of supplier selection is to maintain the effectiveness of supply chain operations. In this chapter, we aim to achieve the following:

- explain the role of suppliers in the supply chain;
- identify supplier selection criteria; and
- understand the principles of globalization in procurement management.

3.1 The Role of Suppliers in the Supply Chain

The idea of the supply chain is gaining importance in the global business environment. The competitive advantage of a supply chain is largely dependent on the collaboration between supply chain members, who perform different supply chain activities interdependently. A supply chain involves several members and is responsible for ensuring the smooth flow of goods or services from suppliers to customers. The suppliers perform a particularly important role in the upstream supply chain, as their work can largely affect overall supply chain performance. We illustrate an overview of SCM in Figure 3.1. In a logistics firm, the roles of the purchasing manager and supplier are interrelated. In the past, the purchasing manager's job was mainly to (1) plan and carry out manufacturing requirements, (2) evaluate the quality of goods provided by the supplier, (3) buy supplies at the lowest delivered cost and (4) arrange for warehouse goods shipments. In the contemporary era, the purchasing manager is expected to (1) perform direct insertion into key suppliers' facility needs with interpersonal skills, (2) examine complementary strengths and weaknesses of suppliers, (3) interact with suppliers about new product designs and production and (4) use the information in a supply chain and the different financial positions of suppliers to optimize cash flow and financing for the whole of the supply chain. Thus, procurement management attempts to improve quality, reduce

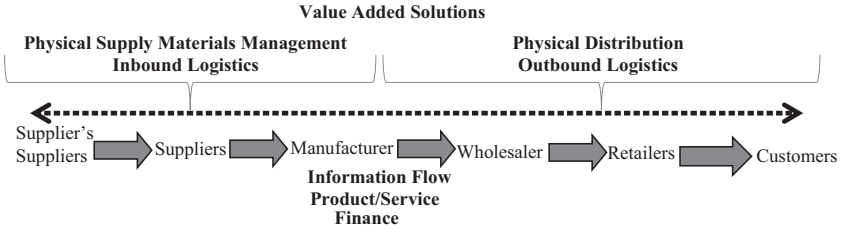

Figure 3.1 An overview of supply chain management.

Source: Author.

cost and improve the firm's entire competitive position through supplier commitment and competency (Gomm, 2010).

It is now accepted that supply chain decisions determine the firm's capital structure, cost structure, profitability, risk level and market value. In other words, SCM is evolving from a tactical, back-office function to a creation of shareholder value. Maskell (1991) posited that financial performance measurements are critical for external reporting and strategic decisions. In the past decades, the economic recession led to the collapse of the asset and dry up liquidity from the logistics industries. To this end, supply chain finance (SCF) is an appropriate approach to optimize working capital by integrating supply chain oriented and finance oriented functions. The main objective is to associate financial flows with information and product flows within the supply chain, fostering cash flow management from a supply chain point of view. SCF not only addresses financial solutions, but also highlights supply chain processes, inventories and fixed asset financing like pay-on-production schemes. As a matter of fact, the SCF encourages commitment, trust and profitability in the whole of the supply chain (Gelsomino et al., 2016).

Nowadays, supply chain managers are expected to know the "language of finance" to communicate the influence of supply chain performance on financial indicators (Keebler, 2000; Atkinson, 2008). As Gomm (2010) proposed, three methods can employ the financial positions of suppliers to improve financing for the supply chain as a whole; these are (1) financing inventories in a make-to-stock supply chain, (2) financing inventory in transit and (3) financing assets in a production supply chain. Also, first-tier suppliers that can rapidly transfer product to original equipment manufacturer (OEM) assembly lines and give effective solutions when problems happen will create sales volumes that should interpret directly into profits (Vickery et al., 2003).

Scholars have researched several roles played by suppliers. In this section, four major roles are discussed.

3.1.1 The supporting roles of the Supply Chain Operations Reference Model

The Supply Chain Operations Reference (SCOR) model is used for critical analysis in SCM research. It shows the basic and common processes of each supply chain: plan, source, make and delivery (Huan et al., 2004). Some researchers point out that the process of "return" should also be included. Suppliers are heavily involved in "source." The fundamental role of the suppliers is to provide different sources, such as raw materials, components, infrastructure and services, required by firms. For instance, the major materials purchased by beer companies from suppliers are barley malt, brewers' rice, yeast and hops (Nevabeer, 2014). Glass bottles, aluminum cans and kegs are also purchased for packaging (Chan, 2013; PacificCan, 2011). In the sourcing process, suppliers are responsible for negotiating with customers about the quality and requirements of sources, payment, delivery conditions and so on. Suppliers are required to inform the customers about their financial and production capacities, and the business plan (Li et al., 2011). Through this process, customers can develop a comprehensive evaluation of suppliers. They can anticipate the quality of production, products or services before the real collaboration with the suppliers. The information from suppliers not only benefits their customers but also the whole supply chain operation.

3.1.2 Early Supplier Involvement

Instead of simply providing sources, suppliers should establish strategic and long-term relationships with their customers to keep improving the business performance of both sides and try to guarantee that supply aligns with demand for the required products or services. Thus, suppliers expect to be involved in the customers' business operations early on, rather than being outsiders to the customers' firms. Both sides need to exchange up-to-date information for sustainable improvement on quality and responsiveness. Moreover, suppliers are heavily involved in developing new products. They prepare designs and production plans, give advice, provide materials and conduct inventory management and fast order processing (Lee et al., 2007; Singh and Power, 2009). This way, firms can have better control over the upstream supply chain. The level of firms' performance is positively associated with the level of supplier involvement (Singh and Power, 2009; Dries et al., 2014).

3.1.3 Supply Chain Integration

Supply chain integration focuses on a supply network rather than a single supply chain. In the process of supply chain integration, firms interact and

coordinate with all their customers and suppliers to form a cohesive supply network. For example, suppliers A, B and C cooperate in serving the same firm. With a high level of supply chain integration, all suppliers share their knowledge, such as market information and technologies, with each supplier to improve the overall effectiveness and efficiency of the supply chain. However, the execution of this concept is difficult because it involves multiple supply chain members. Poor supply chain integration creates diseconomies of scale and destroys the relationships among supply chain members (Huang et al., 2014). Suppliers are therefore responsible for establishing a sustainable relationship among all partners to prevent destructive competition and maintain long-term integration.

3.1.4 Human Resources Practices of Suppliers

Suppliers are the starting point of the supply chain. To ensure the best performance in the rest of the supply chain, supplier internal operations are critically important. Human resource management helps the suppliers complete several roles in the supply chain (Othman and Ghani, 2008). For instance, the training of special production techniques for workers helps the firms maintain competitive advantages in their products. Othman and Ghani (2008) find an example in which Galaxy's suppliers show a strong connection with human resource management. Galaxy audits the suppliers' training program and their workers' competence. It always maintains close coordination with suppliers and seeks advice from them to deal with technical problems.

3.2 Supplier Selection Criteria

Supplier selection is a complicated process. Firms need to determine comprehensive supplier selection criteria according to different critical factors, such as business objectives and the nature of the industry. Due to intense competition in the global market and a rapidly changing business environment, firms consider the supplier selection process a part of SCM strategy. However, in SCM strategy, the interests of different stakeholders within the supply chain must be reconciled because SCM strategy considers not only internal parts of a firm, but also a firm's external relationship with others. In addition, the accuracy and the quality of information are difficult to control. Hence, supplier selection becomes a strategic and challenging process within the supply chain. Firms should form long-term relationships with preferred suppliers which are willing to share information, technology and advice (Tseng et al., 2009). In general, the supplier selection process requires seven key steps, as follows. Step 1: recognize the need for supplier selection. Step 2: identify key

sourcing requirements. Step 3: determine sourcing strategies. Step 4: identify potential supply sources. Step 5: limit suppliers from the selection pool. Step 6: determine methods of supplier evaluation and selection. Step 7: select the supplier and reach an agreement (Monczka et al., 2005).

Supplier selection criteria are standards that are used by the firm to evaluate suppliers. They match the goals and objectives of the firm's business and show the firm's expectations from the suppliers. If firms can set clear criteria, both sides will have a better understanding of their roles and responsibilities. It is easy to expect good performance from suppliers. Firms can set their own supplier selection criteria according to their needs, but should still follow a direction. The criteria should be useful for evaluating the capacity of suppliers (Nair et al., 2015). There are common criteria used by most industries, such as lead time, customs duties, labor relations and cost reduction performance (Kar and Pani, 2014). These are as critical as the specific criteria. All criteria can be divided into quantitative criteria and qualitative criteria. Before the 1990s, firms preferred quantitative criteria (Kar and Pani, 2014) such as price and lot size availability. However, qualitative criteria, such as flexibility and reliability, are useful, as they can reflect high value in the suppliers (Thiruchelvam and Tookey, 2011). In addition, there is a separation of operational supplier selection criteria and strategic supplier selection criteria. The former focuses on the requirements of cost, delivery, flexibility and quality of sources. The latter relates to the technologies and product development brought by suppliers. They are highly related to the operational and strategic performance of the suppliers, respectively (Nair et al., 2015).

Finding the most important supplier selection criteria is essential in the supplier selection process. Nonetheless, it may be difficult if the firm has many business requirements. Some criteria cannot fit in well with all of the rules. It is not easy to determine the most important criteria manually when so much data must be processed (Thiruchelvam and Tookey, 2011). Some models presented by academic researchers can be used to help firms choose the most suitable supplier selection criteria. For instance, the analytic Hierarchy process (AHP) can be used for weighting the criteria to select the most important ones, and the analytic network process (ANP) offers criteria interactions (Chang et al., 2011), in which the criteria are not analyzed separately. There is also a model, called the fuzzy decision-making trial and evaluation laboratory (DEMATEL) method, that shows the relationships between selection criteria and supply chain performance. It can determine the most important criteria based on which other criteria can be affected. Moreover, it can reduce the criteria for attempting the effectiveness of evaluation using a statistical process (Chang et al., 2011). Sometimes, there will be a conflict between different criteria.

The firm needs to trade some less important criteria for more important ones. Multiple Attribute Utility Theory (MAUT) can be used to manage these conflicts (Thiruchelvam and Tookey, 2011).

3.3 Supplier Selection Criteria: A Case Study of the Beer Industry

After studying the concepts of supplier selection criteria, we now examine the consideration of these criteria in the beer industry.

Supplier selection criteria should be clearly set by beer companies. Advice from professionals in the industry should be used to establish the criteria. They should not be made impulsively, but after rigorous research. Because the beer supply chain belongs to the food supply chain, factors affecting food safety should be considered the most critical. These criteria will not be a focus in other industries such as automotive, furniture and so on. In other words, different industries must set specific supplier selection criteria so that the firms can choose the right suppliers effectively. This will benefit the overall performance of the specific supply chain. For example, in the beer industry, ISO certification (ISO 22000) can be a criterion. ISO certification is a professional and international standard proving the food safety management of a company (ISO, 2014). It can be used for selecting suppliers of ingredients, glass bottles, aluminum cans and kegs, as these elements may involve hygienic-related problems. In addition, quality assurance control is a key concern in supplier section. It directly affects the consistency of material quality. A training program for suppliers can maintain the efficiency and effectiveness of workers, which can improve production quality and productivity.

3.3.1 Single Sourcing vs. Multiple Sourcing

A beer firm can choose either single sourcing or multiple sourcing in its supplier selection process.

Single Sourcing: This strategy means that a firm chooses only the most suitable supplier from a group of suppliers for procurement (CIPS, 2007). Tables 3.1 and 3.2 show the advantages and disadvantages of this strategy.

Multiple Sourcing: This strategy means that the buyer purchases materials from multiple suppliers for production and prevents overdependence on a single supplier (Business Dictionary, 2016). Tables 3.3 and 3.4 show the advantages and disadvantages of this strategy.

Table 3.1 Advantages of single sourcing

1. Variability in product quality can be lower
2. Reduces training costs as workers of the supplier and buyer are familiar with the operation
3. Close collaboration occurs between the buyer and supplier
4. The supplier is more willing to invest in information technologies or facilities to share data and help the procurement operation
5. Purchasing cost can be lower as the supplier can offer quantity discounts for a big lot size
6. Upstream supply chain can be monitored early as the supplier joins the product development process
7. The buyer maintains a long-term relationship with the supplier
8. The buyer can manage the supplier easily as there is only one supplier

Sources: Lau and Yip (2010); Martin (2004).

Table 3.2 Disadvantages of single sourcing

1. The buyer cannot handle the relationship easily, as the buyer may be afraid of losing the supplier if the relationship becomes bad
2. The supplier may dominate the operation with greater power
3. The buyer has difficulties negotiating the price with the supplier
4. The supplier may not intend to improve the quality, as there is no competition
5. The risk of failure of products is potentially increased, as the buyer only relies on one supplier. If there are any problems with the raw material, the production line and final product will be significantly affected

Sources: Lau and Yip (2010); Martin (2004).

Table 3.3 Advantages of multiple sourcing

1. There is more competition among suppliers
2. Supplier competition leads to better service quality and lower cost
3. As the choices of suppliers increases, the need to depend on only one supplier decreases. The buyer's power to influence price and service level can be increased
4. The buyer can easily handle unpredictable demand

Sources: Lau and Yip (2010); Tdonovan (2012).

Table 3.4 Disadvantages of multiple sourcing

1. Increases difficulty in controlling the service quality of numerous suppliers
2. Difficulty establishing long-term commitment with suppliers

Sources: Lau and Yip (2010); Tdonovan (2012).

3.3.2 Item Procurement Importance Matrix

Buyers should use different strategies for different materials. In the Item Procurement Importance Matrix, the items procured from suppliers can be divided into four main types, distinctives, criticals, generics and commodities, according to risk and value (Deshmukh, 2013). The firm should distinguish among them before making supplier selection decisions and choose the supplier selection criteria accordingly. For distinctives and criticals, such as barley malt, aluminum can and special taste ingredients, buyers should select multiple sourcing to deal with the risk of demand and supply uncertainty. Distinctives and criticals are important for production and customer service. Beer quality can be increased and procurement cost can be reduced because of supplier competition over quality. Moreover, beer companies require a stable supply. They can quickly purchase raw material from different cooperating suppliers and react to changes in demand with multiple sourcing. If failure occurs in one supplier, the company can obtain resources from other suppliers. If single sourcing is used, beer firms will bear the risk of production shutdown or stock-out due to the limited capacity of a single supplier.

Single sourcing can be used for generics and commodities for reducing cost because these kinds of material are less important and the function is to support the logistics operation. Examples of generics and commodities are stationery and office chairs. The frequency of acquiring these two types of material may not be as high as distinctives and criticals. In addition, they do not directly affect the finished product and the inventory level. As the effects on customer service level and probability of stock-out are low, it is feasible to use a single source to build a relationship with the supplier and enjoy a possible discount. Incurring the cost of managing multiple suppliers is unnecessary.

3.4 Understanding Globalization in Procurement Management

Due to globalization, the number of trading blocs continues to increase. As a result, firms can obtain sources globally. These trading blocs aim to enhance the trading activities between countries through some commonly agreed-to policies. This globalization also greatly affects procurement management. One of the most renowned and influential economic blocs in the world is the North American Free Trade Agreement (NAFTA). Procurement management in the automobile industry under NAFTA is discussed in this part.

3.4.1 North American Free Trade Area

NAFTA is a free trade agreement formed by Canada, Mexico and the United States. It was validated on January 1, 1994. Among the member countries, goods and services can be freely traded without tariffs, taxes or quotas restricting trade. However, it only benefits originating products, and Certificates of Origin are tightly regulated (Bureau of Foreign Trade, 2004). In 2013, trade among the three member countries was US$1.1 trillion (The Economist Intelligence Unit N.A., Incorporated, 2015).

NAFTA eliminated nontariff trade barriers such as foreign exchange controls among member countries (Bureau of Foreign Trade, 2004; Lin, 2017). Thus, fair and open market competition can be maintained. The benefits of an open market can be shared by supply chain members because the overall transaction, procurement and transportation costs are reduced. As a result, it can bring advantages to customers because lower prices are more likely to be set when lower costs are achieved. The agreement mainly focuses on liberalizing trade in automobiles, agriculture and textile manufacturing (Council on Foreign Relations, 2017).

NAFTA contains 22 chapters which cover different fields and regulations about multinational trade among the United States, Mexico and Canada. The procurement activities of the automobile industry are affected by the instructions in chapter 10, which specifies that suppliers in NAFTA and domestic companies are equal when they compete for the same procurement opportunities (US Department of Commerce, 2017). It also specifies key requirements for the procurement processes of the automobile industry as follows: (1) whole procurement procedures need to be well-publicized and transparent to stakeholders, (2) supplier qualification should be fair and competitive, (3) trade partners need to decide adequate time limits for performing trade processes, (4) documentation and contracts are required to be manageable and confidential to prevent information leakage, (5) rule of origin is always consistent for determining the validity of trade, (6) evaluation of supply chain member performance must be based on technical specification, not other irrelevant criteria, such as brand name, popularity and so on and (7) unreasonable use of limited tendering and selective tendering should be avoided to maintain fairness and efficiency in the supplier selection process.

3.4.2 Procurement Management in the Automobile Industry

With NAFTA, automobile components can be freely transported among the three member countries without taxes and tariffs. Due to tax-free trade and

a sharp decrease in production costs, the trade of automobile components from the United States to the other two members comprises 75 percent of their local production. Trade from Mexico and Canada to the United States comprises 51 percent of the aggregate production volume of Mexico and Canada. Only 5 percent of US imports came from Mexico before NAFTA. It has since increased to 40 percent and is valued at US$74 billion as of 2015. The volume of imports in Mexico is recorded at US$47 billion from Canada and US$20 billion from the United States. US automobile factories were shifted to Canada and Mexico, and the output from those factories is exported to the United States. The rationale behind this is to take advantage of land, machine and labor cost savings. For example, compared to the United States, labor is paid a lower salary in Maquiladora, Mexico. In 2016, 19.3 million automobiles were produced, a 2 percent increase from the previous year. The target in 2023 is 22.5 million (Lee, 2017a). Specific policies for the procurement of commodities and services are set through NAFTA. The strictest policy is the requirement to adopt the same standards of quality assurance across the three countries. This can eliminate inconsistencies in technical inspection and ensure efficient customs clearance. In addition, an independent committee is set up to monitor labor and environmental regulations (Lin, 2017).

3.4.3 Advantages to the Automobile Industry Due to Global Sourcing under NAFTA

Four main advantages can be achieved under NAFTA. First, better control over manufacturing cost and procurement cost can reduce overall trading cost. Second, carrying out the entire manufacturing process in North America can reduce supply chain risks. Third, the competitiveness of Mexico is enhanced due to low production costs for automobile components (Lee, 2017a). Mexico is now the fifth largest country in terms of automobile-related production as of 2013. It is the largest exporting country in Latin America with an export volume of up to 34 percent of its GDP (Shi, 2014). Fourth, NAFTA brings competitive advantages to the United States, which can enjoy better control over an integrated supply chain with Canada and Mexico. Raw materials and semifinished products needed in automobile production can be transported tax-free to and from Canada and Mexico. Between 1993 and 2011, US imports from Mexico and Canada have increased 587 percent and 57 percent, respectively, and exports to Mexico and Canada increased 245 percent and 100 percent, respectively (Lee, 2017b). Hence, the United States can reduce procurement costs to increase competitiveness over other automobile manufacturers.

3.4.4 Problems

There are two problems related to NAFTA in the automobile industry. The first is the flat import tax imposed on automobiles produced in Mexico (Prasad, 2017). Automobile manufacturing requires over 10,000 components from multiple suppliers of different countries. It is difficult to recognize the origin of the production of the components, but, as mentioned before, only NAFTA-originated products can enjoy the tax benefits. Therefore, a flat import tax is imposed due to the complexity in determining the origin and tax calculations. This potentially increases procurement and production costs. The second problem is unnecessary increases in time and transportation costs among the member countries. Manufacturers want to maximize the benefits of the tax-free trade, so they send semifinished automobiles across country borders eight times (Lee, 2017a). These processes increase both the local and cross-border transportation and handling costs of the products, which are paid by suppliers and manufacturers. The production and procurement costs will rise as a result. This may also result in an increase in time spent in the tax-free production process.

3.4.5 Possible Political Problem

In 2016, Donald Trump, a protectionist, won the US presidential election and planned to put the interests of US citizens above relationships with other countries. He has criticized NAFTA for losing US jobs to Mexico (CCMag, 2017). The United States has high salaries and prices compared to Mexico (Liu, 2014), and US manufacturers prefer moving their production plants to Maquiladoras in Mexico and exporting the commodities back to United States to reduce salary expenses and total cost. US workers therefore lose bargaining power under NAFTA because manufacturers can select foreign labor to replace them. This result is reflected in the export value: exports from Mexico to the United States are US$340 billion, but exports from the United States to Mexico are only US$240 billion. To protect the interests of US labor, suppliers and manufacturers, Trump is now looking to "remake" NAFTA.

Breaking the agreement may have profound consequences. Many manufacturers relocated their factories to Maquiladoras, an economic zone at the US-Mexico border, for cost advantages such as salary and tax. Export and reexport among members has become the major trading pattern. In 2015, the procurement of vehicle components in Mexico and Canada, including motors, brakes and seats, accounted for US$67.3 billion (Read01, 2017). If the agreement is broken, the tax-free trade policy among the countries will be lost. The United States would immediately impose a 35 percent export tariff

on trade with Mexico and Canada. The consequences of breaking NAFTA are explained from the perspectives of US suppliers and buyers in turn.

For suppliers in the United States, export volume will decrease as the tariff creates an extra procurement cost for Mexico and Canada. Some foreign importers may decide to select other supply sources or produce domestically. US automobile suppliers will lose export opportunities and revenue. This is especially true for suppliers in Detroit, which are responsible for half of the automobile components exported to Mexico and Canada. Losing Maquiladoras also means losing business opportunities for Mexican suppliers and US manufacturers with plants in Mexico. This applies more to Mexican suppliers, who will have difficulty competing with US suppliers once the tariff increases to the 35 percent procurement cost to buyers.

Buyers in the United States will no longer be able to take advantage of the lower costs in Maquiladoras. When the industrial base moves back to the United States, manufacturers will incur higher salary expenses. Production costs will therefore increase. Suppliers and manufacturers will try to shift the burden to buyers, which will increase procurement costs. The estimated increase in production and procurement costs is US$6.4 billion (Read01, 2017). Assuming that most buyers are rational, they may decide to establish global sourcing strategies to reduce the procurement cost. As a result, a new process must be determined for selecting global suppliers. Old practices for sourcing are being replaced by new selection criteria, quotations, negotiations, pricing strategies, delivery methods and contracting. Selecting and beginning cooperation with global suppliers takes more time, and technology leakage will occur, as moving production to a separate geographic region makes it more difficult to control privacy.

3.4.6 Recommendations

To tackle the key problems mentioned above, three recommendations are suggested to enhance and protect the procurement management of NAFTA.

3.4.7 Integrate with the Belt and Road Initiative

Through the Belt and Road Initiative (BRI) project, 65 countries, including China, European countries and other Asian countries, will cooperate closely on trade (HKTDC, 2017). Most of these are developing countries seeking potential business opportunities. When integrated with NAFTA, there will be more economic integrations with other countries to protect against the possible effects of breaking or remaking NAFTA. In other words, member countries can export and import more commodities and services to other countries. Member countries can also share more information for better procurement

management, such as who the best supplier is. Moreover, when NAFTA is integrated with the Belt and Road Initiative, several advantages of multiple sourcing can be enjoyed. First, risk can be diversified. Currently, 50–70 percent of each US automobile's components are highly dependent on imports from Canada and Mexico (Lee, 2017a). If there are the problems with the components of these two members, such as inferior quality, production line breakdown, warehouse or transportation problems or limited supplier capacity, the sales of US automobiles will be hindered. This creates risk in SCM. Hence, this risk can be diversified with the BRI by increasing the sources of components from different suppliers. Second, components can be procured at lower prices. Currently, China and Southeast Asia provide cheap labor, but the export volume from these places to the United States is small (Lee, 2017a). Thus, employing labor from these places can lower operating costs. Third, due to intense competition, the quality of products may improve. However, factories are still better located in Canada, Mexico and the United States because of low transportation cost. As a result, sustainable sourcing and supply chain stability can be enhanced.

3.4.8 Upgrade the Level of Economic Integration

The status of NAFTA is only as a free trade agreement, which means that the level of economic integration among member countries is low. Although trade between members is not restricted by taxes and tariffs, each member has its own trading policies for nonmembers. This may cause trade conflicts between member countries or external traders. Thus, one suggestion is to change from a free trade agreement to a customs union, which is more integrated. In a customs union, not only are trade barriers eliminated, but a common external trade policy (i.e., taxes and tariffs) toward nonmembers is also maintained (Holden, 2003). This common taxation policy provides a standardized treatment for global suppliers. Under standardized external treatment, firms do not need to find the best route for freight movement among countries to minimize tax expenses. In addition, members within a supply chain can share more information to easily determine the origin of products and make better procurement decisions. Hence, a customs union can reduce the need to charge a flat import tax. In addition, the import tax calculation is simplified and clarified. Total procurement costs can thus be reduced. As a result, manufacturers do not need to transport semifinished goods across borders several times to minimize taxes.

3.4.9 Sign a New Agreement to Protect the Automobile Industry

A new agreement should be signed so that the development and operation of the automobile industry will not be affected by the modifications to

NAFTA. Benefits such as free trade and the elimination of trade barriers can be guaranteed. The three member countries can still procure components of automobiles at lower costs. The interests of all parties of the automobile supply chain, including upstream and downstream firms, can be protected, including job opportunities and bargaining power. Moreover, more investors will be attracted to invest in this industry. This may lead to improvements in product quality because of more capital inflow, and the automobile industry will therefore be less affected by the unstable political environment.

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Chapter 4

WAREHOUSE MANAGEMENT

Since the rise of globalization, the role of warehouses has fundamentally changed from operational to strategic. Warehouses are one of the key players in supply chain management. Hardware and software are critical elements for facilitating smooth warehouse operations in the twenty-first century. In this chapter, we will achieve the following objectives:

- explain the role of warehouses in the supply chain;
- discuss a variety of warehouse activities;
- give an overview of warehouse management;
- learn about a case study of the adoption of RFID technology at air cargo terminals;
- illustrate the examples of three Hong Kong air cargo terminals on warehouse management (HACTL, AAT and Cathay Pacific); and
- study a bonded warehouse at a container terminal.

4.1 The Role of Warehouses in the Supply Chain

For a supply chain to realize maximum strategic benefits from logistics, logistics management must be integrated. Integrated logistics management must include five functional areas of logistics work (see Figure 4.1). These functional areas are related to the capabilities for achieving logistics value from integrated logistics management.

The critical exigencies in the processes of logistics centers (LCs) can enhance the role of warehouse processes in outsourcing when customer behavior changes. The complexity and the opportunity to conduct additional logistics services beyond the range of warehousing and storage of goods have prompted the creation of buildings of different functionalities. It is therefore necessary to specify which buildings are warehouse buildings (WBs), warehousing centers (WCs) and LCs. Developers engaged in the development of storage space mistakenly define LCs; therefore, fundamental functional differences between the LC and other buildings should be filtered (Kolinska, 2016). Table 4.1 shows the evolution of the definition of the scope of the LC.

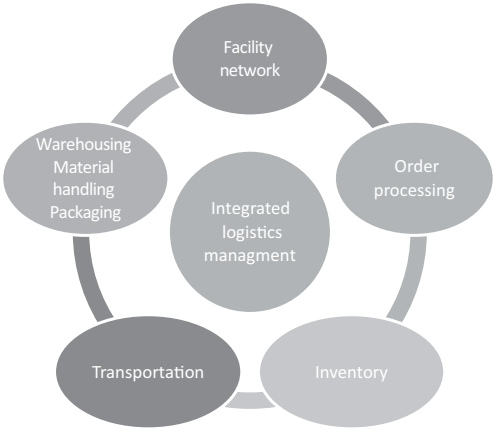

Figure 4.1 The elements of integrated logistics management.

Source: Donald et al. (2010).

The main characteristic of LCs is the intermodal terminal object, although this is not the only feature that identifies LCs, WCs and WBs. Table 4.2 shows a comparison of the individual functionality of logistics infrastructure objects (Kolinska, 2016).

As products and materials are procured, a value-added inventory flow is initiated that ultimately results in the ownership transfer of finished products to customers. However, with the emergence of globalization, reducing lead times requires the continuous improvement of material flow throughout the logistics supply chain. The availability of low-cost information has created time-based competition. Managers frequently share information to increase both the speed and accuracy of supply chain logistics. The role of the warehouse is less influential than before because of the selection of just-in-time or other new technologies being developed (Donald et al., 2010).

4.2 Warehouse Activities

A warehouse restructures and repackages the product. The product arrives packaged in a large size and leaves wrapped in a smaller size. In other words, an essential function of the warehouse is to break down huge amounts of the products and redistribute them in smaller portions. Even though warehouses can work on entirely different ends, most assign the same standard pattern of material flow. Mostly, they receive bulk shipments, frame them for quick retrieval and then, in response to customer requests, retrieve and sort SKUs

Table 4.1 Evolution of the definition of the scope of the logistics center

1960s–1970s	1980s–early 1990s	Mid-1990s–present
		Materials management Distribution services (national/global)
	Bonding	Import clearance
		Bonding
		Inbound transportation
Receiving	Receiving	Receiving
	Cross-docking	Cross-docking
Storage	Storage	Storage
		Inventory management and control
		Shipment scheduling
Order processing	Order processing	Order processing
Reporting	EDI reporting	EDI reporting
Picking	Picking	Picking
Order assembly	Order assembly	(Product) subassembly
(Re)packaging	(Re)packaging	Order assembly
	Stretch-shrink wrapping	(Re)packaging
		Stretch-shrink wrapping
Palletizing/unitizing	Palletizing/unitizing	Palletizing/unitizing
Label/mark/stencil	Label/mark/stencil	Label/mark/stencil
Shipping	Shipping	Shipping
Documentation	Documentation	Documentation
	Outbound	Outbound
	Transportation	Transportation
		Export documentation
		FTZ operation
		JIT/ECR/QR services
		Freight rate negotiation
		Carriers/route selection
		Freight claims handling
		Freight audit/payment
		Safety audits/reviews
		Regulatory compliance review
		Performance measurement
		Returns from customers
		Customer invoicing

Sources: Bolten (1997); Kolinska (2016).

ECR: efficient customer response; EDI: electronic data interchange; FTZ: free trade zone; JIT: just-in-time; QR: quick-response.

Table 4.2 Comparison of the individual functionality of logistics infrastructure objects

Performed functions	LC	WC	WB
Storage	X	X	X
Cross-docking	X	X	X
Sorting packages	X	X	X
Intermodal transshipment	X		
Shipping	X	X	X
Customs services	X	X	X
IT services	X	X	
Financial services	X		
Rent of transport packaging	X		
Cleaning and repair of transport packaging	X		
Refueling of vehicles	X		
Maintenance of vehicles	X		
Food and beverage	X		
Hotel services	X		

Sources: Fechner (2009); Kolinska (2016).

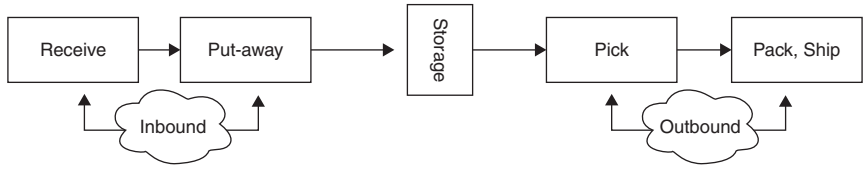

Figure 4.2 The physical processes of warehouse activities.

Source: Bartholdi and Hackman (2008).

and send them out to buyers (Bartholdi and Hackman, 2008). Order-picking is the most labor-intensive movement in most warehouses. Following Bartholdi and Hackman (2008), we describe the physical process of the warehouse activities, including inbound processes and outbound processes. The physical processes of warehouse activities are shown in Figure 4.2.

4.2.1 Receiving

Receiving may start with the advance announcement of the arrival of goods. Collecting from the beginning allows the warehouse to catalog receipts and unload to coordinate efficiently with other movements within the warehouse. It is not uncommon for warehouses to schedule trucks within 30-minute time windows. Once the product has arrived, it is unloaded and perhaps staged for

put-away. It is likely to be scanned to register its arrival so that ownership is found, payments transmitted and its availability to satisfy customers' demand is known. The product will also be inspected and any irregularities noted, such as damage, inaccurate counts, wrong classifications and so on. The product typically appears in larger units, such as pallets, from upstream, and so labor conditions are not usually exceptional. Overall, only about 10 percent of operating costs in a typical distribution center and RFID is expected to reduce this further.

4.2.2 Put-Away

Before the product can be put away, an appropriate storage location must be determined. The put-away decision is significant because where the product is stored restricts to a large extent how swiftly and at what cost it can later be recovered for a customer. This requires managing the secondary inventory, not of the product, but of storage locations. It must always be known what storage areas are accessible, how large they are, how much weight they can support and so on. When the product is put away, the storage location should be recorded. This information will be used afterward to construct adequate pick-lists to guide the order-pickers in recovering the product for customers. Put-away can require a fair amount of labor because products may need to be moved significant distances to their storage locations. Put-away typically accounts for about 15 percent of warehouse operating expenses.

4.2.3 Order-Picking

On receipt of a customer order, the warehouse must complete checks such as confirming that the inventory is ready to ship. Then, the warehouse must produce pick-lists to guide the order-picking. Finally, it must provide any necessary shipping documentation and schedule the order-picking and shipping. These activities are accomplished by a WMS, a software system that coordinates the activities of the warehouse to expedite the sending of the product to the customer.

The outbound processes of the warehouse begin with the receipt of a customer order, which is similar to a shopping list. Each entry on the list is referred to as an order-line and typically consists of the item and quantity requested.

4.2.4 Checking and Packing

Packing can be labor-intensive because each portion of a customer order must be examined. As each piece will be handled, this is a convenient time to check

that the client's order is complete and correct. Order accuracy is an essential step in customer service, but it is also the step with which most firms struggle.

4.2.5 Shipping

Shipping handles larger units than packing because packing has broken down the items into fewer packages (cases, pallets). Consequently, there is less labor required. There may still be some required if a product is staged before being loaded into freight carriers. The product is expected to be staged if it must be loaded in reverse order of delivery or if shipping a great distance, when one must work hard to fill each trailer correctly. Staging freight creates additional work because limelight delivery must be double-handled. The trailer is expected to be scanned at this point to register its departure from the warehouse. An inventory record update may also be sent to the customer.

4.3 Warehouse Management

The warehouse management system (WMS) is a mechanism that helps the warehouse standardize work processes and work procedures and support better usage. Using the WMS helps organize order selection. There are two basic methods for order selection: discrete selection and wave selection, also known as batch selection. In discrete selection, a distinct customer's order is selected and prepared for shipment as a particular work assignment. Discrete order selection is often used when order content and handling selection are significant. Wave selection can be designed and operationalized in a range of ways. A wave can be coordinated by an area of the warehouse at which all quantities of all products required to achieve all customer orders are selected at one time. Wave selection can encourage the employees to assign responsibility for a critical portion of the warehouse. Wave selection in the warehouse can additionally contribute to planning around a certain shipment destination or carrier (Donald et al., 2010).

Recently, security has become a key issue in warehouse management. In this part, we use the example of cigarettes to illustrate warehouse security management in Table 4.3.

4.4 The Adoption of RFID Technology at Air Cargo Terminals

RFID stands for radio frequency identification. Radio is the invocation of the wireless transmission and propagation of information or data. For the operation of RFID devices, frequency refers to the spectrum, whether it be low, high, ultrahigh or microwave, each of which has different characteristics.

Table 4.3 Cigarettes security warehouse management

CCTV cameras/video surveillance cameras with alarms systems	Cigarettes are expensive products because of the high tax rates. CCTV can monitor the spot and save the data to a computer for a period. Installing CCTV all over the warehouse can ensure that there is evidence against anyone who steals cigarettes.
Security guard	The security guard needs to check the warehouse every one or two hours. Any unlawful entry or intrusion into the warehouse needs to be documented.
Physical access	Using a digital lock is not sufficient to protect the warehouse. More must be done to protect the cigarettes. An 8-digit password for a digital lock, a key for opening, a fingerprint scanner review or even an eye lock can prevent any unapproved people from entering the warehouse.
Lighting	Using lighting can provide a clear view from all over the warehouse. Without light, it can be easy to steal even if a security guard is on duty. Many places in a warehouse are easy to hide in. A lighting system can provide additional security.
Security mirrors	Security mirrors can give clear visibility into closed areas and even around the corners in coordination with the lighting system.
Fire alarm system	Fire is one of the costliest causes of damage and loss of life in a facility. Fire alarm systems manage the facility for smoke, heat, fire sprinkler water flow and its PIV and the activation of a hand-operated pull station. It is a good way to protect the cigarettes from fire.
Folding security gates	Folding security gates can be moved out of the way easily when people or equipment need to pass but provide a lockable barrier when closed. These gates are excellent for positions at which compact, restricted access is a preference but perceptibility and air flow are also desired.
Equipment monitoring	When there are dangerous circumstances, there must be a guide to send and implement supervision in the warehouse for management. There must be LED displays to show the operation and even running log management or a record of equipment failure or historical fault inquiry.
Temperature and humidity controlled	In general, humidity is not as significant as a fixed temperature, optimally 35°F (2°C). Cigarettes should be stored in stacks on the ends of pallets that are large enough to limit overhang or on clean wooden dunnage at least 3 inches off the floor, right side up with all flaps on the same side of the case. Stacking should be three layers to a pallet, triple deck, provided that such stacking does not cause bulging or buckling of the bottom cases. Stacking in this manner facilitates the automatic reopening of the case flaps for tax stamping.

Source: WFLO Commodity Storage Manual: Tobacco and Tobacco Products Revised 2008 Storage Conditions (2008).

Classification relates to identifying the items with the aid of different codes present in a (memory-based) data carrier and prepared via radio frequency reading. RFID describes any device that can be sensed or detected from a distance with little difficulty. The etymology of the term lies in the origin of tags that reflect or retransmit a radio frequency signal. RFID uses radio frequencies to make transfers between the RFID tag and RFID reader. The RFID system can be broadly categorized according to the physical components of frequency and data. An RFID system is an integrated aggregate of versatile components that work together for the apprehension and classification of objects or persons. These are the components that are fundamentally responsible for working with any RFID system, whether basic or complex (Ahsan, 2011; Shodhganga, 2017). Although there can be additional components involved in RFID systems, such as sensors, the following are among the key elements of these systems (Ahsan, 2011; Shodhganga, 2017):

- RFID tag (attached to an object and possessing unique identification);
- antenna (tag detector which creates a magnetic field);
- RFID reader (manipulator and receiver of RFID tag information);
- application software (user, database or application and RFID reader interface); and
- communication infrastructure (enables the RFID system to work and transfer data across various components).

4.4.1 Case Study

Hong Kong's Asia Airfreight Terminal (AAT) has introduced RFID unit load device (ULD) tags for prepacked cargo. This new technology will speed up the cargo acceptance process by 45 seconds per shipment and will make AAT the first terminal operator to use this RFID technology for prepacked cargo at Hong Kong International Airport. Before RFID, the permission process required two levels of hand-operated data entry (for weight and contour) at the truck dock and classification point. Data were recorded into AAT's cargo management system and supervisory control system (The Cargo Letter [444], 2008; GmbH, 2016).

Applying RFID technology to the ULD tag means that the data entry process will take place only once, at the truck dock area. Once the tag has been tied to the prepacked shipment, data will be automatically retrieved when the load passes through the classification point. By utilizing RFID technology with the ULD tags, data accuracy for the cargo acceptance process is guaranteed, with human errors being minimized. The most frequent handling of ULD tags involves handwriting: the cargo acceptance operator records the shipment

information on the ULD tag, including the flight number, weight, contour and destination, at the truck dock area. With RFID technology, the computerized data entry process can guarantee data accuracy during the entire cargo acceptance process. For example, when drivers reach the terminal, the RFID antenna reads the tags on windshields. Drivers only need to pick answers to questions on whether they came for import or export items and the types of items on a computer screen. They will then be assigned a truck dock, with the dock number sent to their mobile phones and displayed on LED screens inside the AAT facility (The Cargo Letter [444], 2008; GmbH, 2016).

4.5 Warehouse Management at Hong Kong Air Cargo Terminals

Currently, Hong Kong owns and operates three air cargo terminals in the aviation industry. The three air cargo terminals include the Hong Kong Air Cargo Terminals (Hactl), Cathay Pacific Cargo Terminal (CPCT) and AAT. In this section, we discuss warehouse management in these air cargo terminals.

4.5.1 Hactl

Hactl is now operated by Hong Kong Air Cargo Terminals Ltd. Hactl air cargo terminal warehouses provide several value-added services to customers, airlines and freight forwarders to ship goods into Hong Kong to reduce issues in

- warehouse and processing;
- customs clearance;
- physical examination;
- document examination;
- crane lorry hire; and
- delivery.

Hactl also uses the Hex (Hacis E-logistics X) system, an e-logistics platform designed to facilitate cargo information flow along the supply chain. The Hex system includes a warehouse and order management system that can break down information into the airway bill level. It can provide cargo status in a real-time situation through connections to the COSAC. The warehouse can track and trace goods in real time. It can also display complete inventory records including discrepancies and damaged cargo and even information on products carried by concrete trucks. It lists the GPS summary for SuperLink China Direct and local consignments while in transit. The warehouse can obtain data on the real-time situation and prepare the location and labor to

handle the shipments once they arrive. E-commerce is another technology adopted by Hactl for improving warehouse operations and management (Hactl News & Media Press Release, 2015).

4.5.2 CPCT

CPCT is now operated by Cathay Pacific Services Limited. The advanced Materials Handling System and Warehouse Operating System used at the facility have worked seamlessly to ensure the efficient handling of cargo. The information analyst program provided by the CPCT can support the most advanced warehouse operating and material handling systems (Cathay Pacific Services Ltd, 2015). According to the *Sustainable Development Report* published by Cathay Pacific Services Ltd (2015), all of the labor working in the warehouse must have the following skills to enhance warehouse processes efficiently and effectively:

- operation knowledge and network;
- core application knowledge;
- technical IT skills;
- understanding of IT Services Support and Service Delivery Processes; and
- soft skills.

4.5.3 AAT

AAT is now operated by Asia Airfreight Terminal Co Ltd. Various cargo handling facilities are used in AAT, including the Pallet Container Handling System, Automated Storage and Retrieval System, Mini-shipment Centre, Truck Dock and others. In terms of information technology, Cargo Management System (CMS), Truck Control System (TCS), i-Pass and Self-Service Kiosk are the advanced technology developments of AAT (AAT Company, 2017). These developments can be summarized as follows:

- CMS—gives greater versatility, enhances glassiness and provides support using the most up-to-date data when making significant decisions and is thoroughly integrated with the government, airlines and other air cargo community systems.
- TCS—offers use of RFID technology to monitor, designate and control traffic flow within the terminal. Linked to Cargo Management System (CMS), TCS can select the truck docks nearest to cargo storage locations automatically and reduce waiting time to heighten effectiveness.

- i-Pass—the application of RFID technology requires that all vehicles entering the warehouse maintain an i-Pass and present it at the windscreen and maintain an RFID tag that carries information about the vehicle number, registered company, driver details and contact information. The i-Pass allows the system to recognize every truck and grant it access to restricted areas and to alert AAT of unauthorized entry, which increases the security control of the terminals.
- Self-service kiosk—truck drivers can see users' information on their i-Passes, change their contact number and incoming purpose and conveniently produce documentation for import acquisition.

4.6 Bonded Warehouses

In this section, we explore bonded warehouse development in a container terminal. Based on the study from Ndikom (2008), we consider Nigeria as a case study to illustrate the operations, management and problems encountered by bonded warehouses.

4.6.1 Case Study: Bonded Warehouse in Nigeria

Bonded warehouses are a strategic expansion of ordinary warehouses usually found in Nigeria's ports, intended for safe-keeping of cargoes for owners before the last takeover of such goods by consignees after the payment of legal fees covering warehouse rents and customs duties. A bonded warehouse is a mini-port or an extension of a port where corresponding port actions regularly take place. A custom bonded warehouse is a building or other secured area in which dutiable goods may be stored, managed or undergo manufacturing progress and customs inspections and examinations are carried out and corrected duties paid. The simultaneous entry of goods into the commissioned customs/Nigerian Ports Authority (NPA) bonded terminals, the importer and the warehouse results in liability under a bond. This liability is cancelled when the goods are

- exported or deemed for export;
- supplied to a vessel or aircraft international traffic;
- destroyed under customs supervisions; or
- kept at a bonded warehouse established by the state or by the private company, in which goods liable to integrity remain until the obligation upon them has been paid.

4.6.2 Structures Suitable for Bonded Warehouses

A supported distance of land is near the seaport and must have

- bulk storage for liquids;
- a fenced or walled enclosure with proper concerned land space; and
- any permanent, secure and separate building of brick, stone, solid metal/floor or other solid materials.

4.6.3 Prohibitions Relating to Bonded Warehouses

The following general prohibitions relate to all bonded warehouses:

- inflammable or dangerous goods or goods likely to cause damage to other goods shall not be in warehouses unless segregated from other goods to the satisfaction of the proper officer;
- naked lights shall not be allowed in a bonded warehouse except in emergency or with the permission of the officer;
- no public sales may be held in a bonded warehouse except with the authority and in the presence of an officer; this authority will seldom be given;
- stationery;
- spare parts fabrics/textiles;
- foodstuffs;
- toiletries;
- cosmetics; and
- goods that contract a duty rate of 10 percent or less.

4.6.4 Activities Permitted under the Bonded Warehouse Option

- reassembling goods that were disassembled for transport;
- displaying;
- inspecting;
- marking, labeling, tagging or ticketing;
- packing, unpacking, packaging or repackaging;
- sampling, testing, cleaning and diluting;
- usual maintenance and servicing;
- preserving;
- separating defective goods from those of prime quality;
- sorting or grading; and
- trimming, filing, slitting or cutting

4.6.5 The Benefits of a Bonded Terminal

- directly contributes to the port's decongestion;
- advances economics and trade connections with world shipping business;
- enhances government revenue;
- creates jobs;
- decentralizes port operational services;
- decreases vessel turnaround time;
- enables quick clearing and releasing of goods;
- provides efficient and dynamic port operational services;
- enables the extension of towns, cities and suburbs where the inland dry ports are established;
- promotes development in the fecundity/production of ports;
- makes the ports user/customer friendly; and
- allows a steady supply of raw materials to be secured in the manufacturing industry by importing in bulk, and payments can be made according to production demand.

4.6.6 Problems of Bonded Warehouses

After five years of operational functionality of these bonded warehouses, it cannot be said that the operations are without problems. The goal of these established bonded terminals has never been to resolve port congestion. Solutions are still unfinished, which has created problems, including:

- lack of operational equipment and infrastructural facilities;
- lack of functional space for cargo and vehicular movement and control;
- higher terminal handling charges;
- block-stacking problems;
- continued delay and delivery of containers;
- compound traffic problems;
- delivery and quick clearance of criminal and dangerous goods;
- higher cost of goods due to noticeable coercion from multiple agencies;
- alleged collusion by owners and government inspection agencies in the process of examination and review of orders;
- loss of revenue to the government due to alleged collusion by owners and governmental agencies;
- the cost of transfer of containers to owners from ports to bonded terminals;
- extra expenses spent on double handling because of agents;
- excessive billing on containers; and
- working hour loss leading to low productivity and operational performance.

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Chapter 5

CASE STUDIES IN FOOD SUPPLY CHAINS

In this chapter, we will be providing two specific case studies on food supply chains. Halal food and wine are the two main emerging issues in food supply chains. Recently, the market for halal food has received much attention worldwide. Therefore, the demand for halal food is increasing tremendously. Additionally, a cold chain involves the transportation of temperature-sensitive products along a supply chain through thermal and refrigerated packaging methods and the logistical planning to protect the integrity of these shipments. Wine is a typical example to illustrate such a chain. Thanks to globalization, wine has become one of the important commodities in the global trading activities of the twenty-first century. In this chapter, we will achieve the following objectives:

- provide an overview of halal food market and wine market in different parts of the world;
- explain halal food and wine supply chain management (SCM); and
- analyze how to strengthen the Hong Kong halal food and wine supply chain in the Asia-Pacific regions.

5.1 Principles of Halal Food

Halal is an Arabic word that in English is translated as allowed, permitted, legal or lawful. The opposite meaning is haram, which is described as forbidden, unlawful or illegal (Department of Islamic Development Malaysia, 2005). Under Islamic principle, halal is a part of Shariah (Islamic law) and is mentioned in the Holy Quran. Shariah law is the fundamental guidance in developing the halal standard (Tan et al., 2012a) and a code of conduct for all Muslims to follow and apply to every activity including eating. Every product and service must exclude the use of non-halal ingredients (i.e., carrion, blood, flesh of the swine etc.) (Ab Talib and Johan, 2012).

According to Islam and Shariah, all disputes and issues relevant to halal or haram should be based on Quran and Sunnah. Basically, halal is a series of

rules "*Halalan Thoyyiban*" (Sungkar and Hashim, 2009). Almighty Allah clearly states that

> He has forbidden you only the Maitah (dead animal), and blood and the flesh of swine, and that which is slaughtered as a sacrifice for others than Allah (or has been slaughtered for idols, on which Allah's Name has not been mentioned while slaughtering). But if one is forced by necessity without willful disobedience, nor transgressing due limits, then is no sin on him. Truly, Allah is Oft-forgiving Most Merciful. (Quran 2:173; Hilali and Khan, 1971, p. 34)

Religion is one of the factors that limits Muslim consumers in food consumption (Simoons, 1994). Halal foods must be specified by the Quran and Sunnah (Tieman et al., 2013). The demand for halal foods is rising globally, not just in Muslim countries but also non-Muslim countries because halal foods are perceived as much more hygienic, clean and tasty (Abdul et al., 2008).

5.2 Global Market for Halal Food

Halal food products account for about 16 percent of the current world food trade. The halal food market is calculated at more than US$632 billion annually and market size is over 1.8 billion people (Global Advisory & Research, 2015). The world Muslim population could reach 2.2 billion by 2030. The emergence of new markets of halal food includes Indonesia, Pakistan, India, Bangladesh and China.

The expenditure on halal food is expected to attain US$2.47 trillion by the year 2018. Hence, halal food could become one of the most influential and profitable market arenas in the world food business because of the following reasons: (1) Islam is the fastest growing religion in the world thus stimulating a future demand for halal food; (2) the increasing trend of consuming halal food products for safety and ethical reasons by non-Muslim consumers; and (3) the increasing halal consumer power due to rising disposable income (Nasdaq Omx Global Indexes and Edbiz Consulting, 2012).

There is an increasing awareness among Muslim consumers about their religious obligations, and using halal food products is vital for their afterlife and daily activities. Halal food supply chain has emerged in the twenty-first century because of the tremendous growth in halal markets in the world. Some countries have even started to establish halal hubs (Borzooei and Asgari, 2013).

Malaysian governments consider their halal industries as a pillar of economic development in the Second Industrial Master Plan (1996–2005) and Third Industrial Master Plan (2006–20). Some local logistics services providers,

Table 5.1 Global Halal food business hot spots

Country	Hot spot
Canada	Approximate CND3.4 billion value of Canadian food is exported to major Halal markets (e.g., Pakistan, Bangladesh, the UAE, Indonesia and Saudi Arabia)
United Kingdom	Halal food imports are worth around GBP18 billion per year. Among top EU exporters are Ireland, France, Netherlands, Spain and Germany
China	Become the net importer of food products by 2015
Brazil	The world's second top exporter of poultry and meat to Muslim-majority countries after the United States
New Zealand	The largest Halal exports are beef and lamb concentrated in Taiwan, China, Japan and Korea

Source: Malaysia International Islamic Finance Centre (MIFC) (2017).

such as MILS SdnBhd and Kontena Nasional SdnBhd, have started to offer halal logistics services (Jaafar et al., 2014). In order to enhance the halal food quality standard, the Malaysian food industry has also set up various agencies including Standards and Industrial Research Institute of Malaysia (SIRIM), Department of Islamic Development Malaysia (JAKIM) and Halal Industry Development Corporation (HDC). Brunei also strives to become a global halal hub by producing and certifying halal food, and catering to the world-wide market for premium-quality halal products (Borzooei and Asgari, 2013).

The global halal food business hot spots, according to Malaysia International Islamic Finance Centre (MIFC), is shown in Table 5.1.

Strictly observing Muslims must consume halal food as part of their diet. Nevertheless, it is interesting that almost all halal food products in the world come from non-Muslims countries, such as Argentina, Australia, Brazil, Canada, France and New Zealand. Halal food products involve a lot of handling and travel great distances before reaching end users. Consequently, the halal food supply chain poses some uncertainty whether the food products still maintain the authenticity and integrity of the halal status. The halal food supply chain provides a wide range of logistics services to reduce the doubts of Muslim halal food purchasers (Ngah et al., 2014).

5.3 Halal Food SCM

The halal food supply chain can be defined as the integration of business processes and activities from point of origin to point of consumption (i.e., from farm to table) according to the Islamic (Syariah) law (Ngah et al., 2014). The

materials and information flow throughout the supply chain must be managed in accordance with a halal standard. The materials flow refers to transport, storage and terminal operations. The information flow includes data management along the supply chain, for example, product information, demand data and halal logistics codes. In the context of halal food supply chain, traceability not only achieves customer satisfaction, but also ensures the food products comply with the principle of Shariah (Tan et al., 2012b; Zulfakar et al., 2014).

Ab Talib and Johan (2012) proposed that halal food is required to fulfill the following six conditions: (1) does not contain any non-halal parts or products of haram animals or products or animals that are not slaughtered in the name of Allah and using Shariah methods; (2) does not contain any ingredients that are considered najis (unclean); (3) is safe and not harmful; (4) is not prepared, processed or manufactured using tools or equipment that are contaminated or used together with non-halal or najis; (5) ingredients or by-products do not contain any human parts; and (6) during the process of manufacturing, preparation, packaging, storage or distribution, product must be physically separated between halal and haram products.

The halal food supply chain is based on a segregation system rather than detection (Halal News, 2014). Segregating halal and non-halal food for cross-contamination avoidance is the principal method of protecting the halal status. However, the halal food supply chain is highly vulnerable because of their credence quality attributes, essence of avoiding doubt in halal food, importance of maintaining halal integrity throughout the supply chain, lack of control of halal food norms and sensitivity of the Muslim consumer toward halal (Tieman et al., 2013).

Jaafar et al. (2014) suggest that halal food supply chain compliance is unattainable. The halal food supply chain is guaranteed only when food products are in the logistics firms' custody. The probability of a breach is higher when the food products are transferred to the other parties who are not practicing halal supply chain, notably small retailers. Hence, the food products in halal integrity are still questionable at the point of final consumption with the absence of halal services in between the factory and the end user (Ngah et al., 2014).

The Quran requirement for Muslim consumers to purchase halal food creates an important responsibility to guarantee the food products are halal (Tieman et al., 2013). Thus, halal customers demand higher halal standards for their food products. All food supply chain processes need to follow Shariah law, but not just the products' nature. Halal food logistics service providers are required to pay extra attention to prevent the risk of cross-contamination during any procedure. Sharing containers, inadequate inventory information on container contents, where the container is transited, allocated space

between halal and non-halal goods in the same containers, and so on increase the risk of halal integrity being compromised along the whole supply chain (Tan et al., 2012b). Thus, it poses a great challenge to maintain the halal performance, while handling non-halal food, too.

Shippers must ensure that the supply chain system is aligned with the perception and expectations of the various Muslim consumers, in order to protect the halal integrity along the whole supply chain (Halallogistics.info, 2014). When considering the materials flow, it is important to ensure halal food and non-halal food are physically segregated. This is to avoid cross-contamination and the possibility of making mistakes. During the transportation process, halal and non-halal food should not be mixed on the same trolley or pallet, and even not allowed to be placed in the same container and transportation vehicle (Tieman, 2014). For example, storing frozen pork meat in a reefer with halal food should be banned, even if there is empty space available. Pig meat is regarded as ritually unclean under Shariah law. In addition, tertiary packaging is needed to protect the halal food along the supply chain to avoid cross-contamination, and clear labeling to announce its halal nature is required.

Other than proper segregation, a well-established information system formed between different parties along the halal food supply chain is important. This information system is used for sharing codes of halal food, tracking the food locations and so on. This allows an easier and unified channel to pay extra attention to halal food, and is a better way to track their locations. In addition, this shared system can include the guidelines of special handling procedures for halal food, so it can maintain a high halal standard within different parties in the food supply chain, such as the suppliers, wholesalers and retailers.

Finally, the containers and transportation vehicles are another important concern for the halal transportation operations. The related containers and vehicles require thorough cleaning, because they may be used for carrying non-halal products, and cause cross-contamination despite having proper segregation. Furthermore, it is highly recommended to apply for a cleaning certification so as to reassure the halal standard to potential customers (Tieman, 2014).

5.4 Strengthening Hong Kong Halal Food Supply Chain in the Asia-Pacific Regions

Hong Kong has an estimated 300,000 Muslims. They include 40,000 Chinese, 150,000 Indonesians and 30,000 Pakistanis, and many others from India, Malaysia, the Middle East, Africa and elsewhere (The Census and Statistics Department, 2013). Until now, Hong Kong has five mosques of

which four are on Hong Kong Island (Shelly Street Mosque, Masjid Ammar, Chai Wan Mosque and Stanley Mosque) and one in Kowloon Peninsula (Kowloon Mosque). Despite the HKSAR government's adverse efforts on halal industries and the fact that a majority of Hongkongers have not yet access to a fully recognized halal market, a few private firms perform well in some food products and services to market themselves and impair other countries' competitor influence on halal industries. For instance, Ocean Park has an array of halal food and provides for Muslim tourists; and The Maxim firms have a halal Dutch kitchen in the Maxim's food production at Tai Po, and have received the Halal Certificate from the Incorporated Trustees of the Islamic Community Fund of Hong Kong. They provide halal food from the farm to the table-desk under food supply chain, as well as finance from the Islam bank, which complies with the Islamic dogma and receive the Halal Quality Marks.

Halal food supply chain is a growing opportunity in the business world. In order to compete with the increasing number of competitors, it is vital to put the maintenance of halal integrity on the first priority in the whole halal food supply chain. However, halal food supply chain is still at an introductory stage in Hong Kong. The Hong Kong halal food supply chain has faced challenges including (1) lack of global integrity in standards certification process; (2) interaction between halal food and Islamic finance industries have been limited; (3) advanced scientific techniques for verifying the halal status have not made an appearance; and (4) halal food markets are fragmented by different determinants such as income, ethnicity, location, awareness (1st International Food, Agricultural and Gastronomy Congress, 2012).

The government has devised an approach to strengthen Hong Kong as a regional halal food supply chain hub. The key recommendations are:

- Cooperating with the local Muslim organizations such as Islamic Cultural Association and International Islamic Society to invite the profession to hold up some talks or courses relevant to halal food supply chain in community center. Inviting expert and organizing some related talks could encourage the promotion of the halal food SCM in Hong Kong.
- Establishing halal logistics park in border area such as Sha Tau Kok to attract manufacturers to create their industry related to halal. Setting up the halal logistics park in the border area can easily connect with the manufacturers in Mainland China in order to promote the efficiency of production. In addition, the entire halal food supply chain activity could be planned and processed inside the park. The logistics companies enjoy the benefits from agglomeration economics like sharing resources and capabilities.

- Developing creative and value-added halal supply chain services to shippers. The government collaborates with cargo operators to develop and streamline intermodal transportation network through customs clearance technologies like a common e-platform. It can simplify the custom clearance procedure and enhance the flexibility of cargo delivery.
- Creating a trade-freedom city. As most of the halal food entering Hong Kong are tariff-free or enjoy a tax rebate, it can attract the enterprises to invest in Hong Kong and absorb cargo.
- Collaborating with different international organizations, notably, the World Bank, donor agencies (i.e., USAID, UNIDO), World Trade Organization, Codex Alimentarius Committee and Global Food Safety Imitative.

5.5 Characteristics of Wine

Wine is one of the most civilized and natural commodities which leads people to perceive it as a great perfection and necessary for the enjoyment in life (Hall and Mitchell, 2008; Simpson, 2011). It is purchased at both private and social occasions, and sometimes "on premises" at pubs, restaurants and other recreational arenas (Spawton, 1991). In general, the dynamic nature of wine is unique, complex and almost enigmatic because it is (1) a provider of sustenance and a luxury item; (2) associated with healthy living, while in excess it can create health problems, or even cause death; (3) a symbol of status and a "peasant" drink; (4) of immense religious and cultural significance and can be associated with hedonistic and debauched behavior; and (5) a fashion item, experience and commodity all in one (Hall and Mitchell, 2008). In this regard, wine becomes one of the most valuable commodities in international business.

5.6 Global Market for Wine

5.6.1 The Emergence of New Regions of Production and Consumption

Wine, a traditional industry, was traded between regional wine producing and consuming countries for centuries (Anderson, 2001). Traditionally, the wine production and consumption was relatively localized (Hussain et al., 2007). Until the turn of the century, there was only about 10 percent of global sales crossing national borders, and the majority was with proximate neighbors (Anderson, 2001). Wine producers in distant countries were isolated from each other, and most of the world's drinkers consumed either local wines or imports from neighboring producers (Hall and Mitchell, 2008; Mancino and

Presti, 2012; Dalmoro, 2013). Indeed, the minimal cross-border interaction stimulated the significant growth of the wine market within Europe (Hussain et al., 2007). More than 75 percent of the volume of world's wine production, consumption and trade took place within Europe (Anderson, 2001). The four largest European wine producers, France, Italy, Spain and Germany, belong to the so-called Old World, defined as those within Europe that have a long, uninterrupted history of wine production and consumption (Hussain et al., 2007; Flint and Golicic, 2009). As such, the Old World producers relied on their centuries of tradition and thus wine has been very much a "European product" for a long time now (Anderson, 2001; Flint and Golicic, 2009). France typically represented majority of the wine production pattern over a century.

5.6.2 The Drivers of Growth in Wine Trade

Thanks to globalization, the wider and stronger levels of competition in the wine industry are driven by three forces: (1) a worldwide oversupply of grapes and the incumbent pricing pressures—production surpluses have ranged between 15 and 20 percent over the 1990s (Anderson et al., 2001; Spawton, 1991; Hussain et al., 2007; Flint and Golicic, 2009); (2) increased consolidation in all tiers of the supply chain comprising the producer, distributors and retailing sectors making it difficult for the tens of thousands of wineries to get their product onto the shelves; (3) changing consumer behavior pattern of this product due to consumers becoming more knowledgeable about products and brands and discerning in their choice of products. For instance, the beverage wine consumers of the 1970s are now becoming the fine wine buyers of the 1990s (Spawton, 1991; Islam and Quaddus, 2005; Hussain et al., 2007; Flint and Golicic, 2009). Like other industries, the wine industry is confronted with both old and new challenges. The five major emerging producers, known as the "New World" (i.e., United States, Argentina, Australia, South Africa and Chile), are located outside Europe and have prepared for the rapid invasion of the global wine markets (Hussain et al., 2007). Besides, in 2001, a report commissioned by the French Ministry of Agriculture points out that "until recent years, wine was with us. We were the center, the unavoidable reference point. Today, the barbarians are at our gates: Australia, New Zealand, the USA, Chile, Argentina, South Africa" (Anderson, 2003, p. 47). As depicted in Table 5.2, the global wine production of the Old World has decreased by 8.3 percent while for the New World it has increased by 12.4 percent from 2002 to 2014. It is revealed that the top four Old World producers encounter the stiff competition from their New World competitors. Accordingly, they gradually, and continuously, lost market shares within the wine industry (Hussain et al., 2007).

Table 5.2 Evolution of wine production by country, 2002–14

	2002 Production		2014 Production	
	Billion liters	**% of world production**	**Billion liters**	**% of world production**
Old World Countries				
France	5.0	19	4.7	16.5
Italy	4.5	17	4.5	15.6
Spain	3.3	13	3.8	13.5
Germany	1.0	4	0.8	3.0
Total	*13.8*	*53*	*13.8*	*48.6*
New World Countries				
United States	2.5	10	3.0	10.7
Argentina	1.3	5	1.5	5.4
Australia	1.2	5	1.2	4.3
South Africa	0.7	3	1.1	4.0
Chile	0.6	2	1.1	3.7
Total	*6.3*	*25*	*7.9*	*28.1*
World total	***26***	***100***	***28.2***	***100***

Source: Wine Institute (2014).

5.6.3 The Development of a New, Huge Market for Wine in China

The increased global trade provides opportunities to wine business in the contemporary business environment for wine. On average, in the past two decades, a quarter of the wine produced around the world has been traded internationally (Hall and Mitchell, 2008). Decreasing tariffs, reducing logistics cost and the removing of certain trade barriers provide wine producers the opportunity to sell their products outside of their own regions and foster shifts in wine consumption patterns. In 2001, five "New World" countries, namely, Australia, Canada, Chile, New Zealand and the United States, joined forces to "diminish barriers by reducing regulatory burdens faced by winemakers" by signing the Mutual Acceptance Agreement on Oenological Practices. In order to enlarge their market share and encounter keen competition from the New World, the Old World countries expanded their new target markets to Asian countries, like China and India (Hussain et al., 2007). It followed that there had been a growing trend that the demand in Europe was declining and grew much more slowly in the United States. The wine consumption pattern is expected to shift in one distinct growth area—East Asia (Hong Kong Trade Development Council, 2010), with China being a significant emerging wine market. According to the *International Wine and Spirit Research*, Chinese alone

had consumed about 2.1 billion liters of wine. The total value of wine has accumulated to RMB 46.3 billion (Xinhua net, 2013). It is especially true in the first-tier cities, of which Guangzhou, Shenzhen, Beijing and Shanghai have gradually established regular wine consumption patterns in the past decade. Additionally, some festivals including Lunar New Year, Labor Day, National Day and Christmas have reached peak demands. By 2020, wine consumption in China is expected to increase by 40 percent and ranked the first in the world (China Daily.com, 2013), with wine-tasting increasingly becoming popular, especially among the middle class. In terms of value, wine can be classified into commercial/everyday wine (i.e., around RMB 100), the mid-range (i.e., ranged from RMB 200 to RMB 500) and fine wine (i.e., ranged from RMB 600 to over RMB 1,000). In this regards, the majority of Chinese are expected to purchase fine wine due to a high level of quality assurance (BUD Project 2013). Furthermore, East Asian importers encounter considerable logistics challenges in wine trade, especially between Europe and Asian countries. Such complexity could be an opportunity for differentiation for Hong Kong. Higher levels of complexity are mainly determined by (1) Asian importers needing to deal with different small operators (i.e., small producers in France); (2) ex-works practice due to producers in France not being involved in transportation, and thus organizing the transport and supply chains themselves; (3) Asian importers using freight forwarders and 3PL providers to provide specialized wine logistics service, and hence, wine logistics, including its process and logistics, often being difficult to be controlled effectively; and (4) most of the wine shipments between France and East Asia being conveyed in dry (rather than reefer) containers. By using dry containers to deliver the wine, importers confront the challenges in humidity and temperature variation, which in turn affect the product quality and value.

5.7 Wine SCM

5.7.1 Information System Management

Under the inevitable trend of globalization, firms encounter multiple pressures including market expansion, keen competition and increasing customer expectations in a dynamic business environment. This motivates firms to minimize total cost and maximize customer service level through upgrading their capabilities. Thus, firms develop IT strategies to overcome the complexities in global business (Chan et al., 2012). Wine logistics service providers illustrate IT or information systems to integrate wine logistics activities, such as collecting, processing, retrieving, reporting and storing of data, to achieve a competitive edge (Lun et al., 2006). In order to enhance its capacity of intercepting

suspected counterfeit wine and verifying wine authenticity, Hong Kong wine logistics industry has established a wide variety of advanced technological tools including cold chain management, EPC barcode or radio-frequency identification (RFID) (i.e., used for real-time inventory management and security in wine warehouse); and anti-counterfeiting technology (such as smartphone application security labels with bar code or QR code use).

5.7.2 Transportation Management

In transportation management, one needs to balance the key elements (i.e., transport time, wine safety and quality) so as to facilitate the effective transportation of wine. Most wine logistics service providers prefer to deliver the wine through sea and road transport due to the low transportation cost and a large number of bond warehouses being set up around ports. In designing wine delivery routing in China, wine logistics service providers consider the use of Hong Kong as a transshipment port. Mainland Chinese customs trust goods from Hong Kong and hence, it could enhance customs facilitation measures. Also, the Hong Kong wine industry entered into a Closer Economic Partnership Agreement (CEPA) with the Mainland Chinese government on January 1, 2006. Under CEPA, Hong Kong enjoys tariff-free treatment and establishes a cost-effective and convenient distribution hub to store their investment-grade wines for delivery to their markets on demand. Wine not made in Hong Kong is subject to tariff rates of up to 20 percent when entering the mainland (HKTDC, 2013). The suggested wine logistics route planning in China has been illustrated in Table 5.3. During transportation, wine logistics service providers consider either wrapping an air cushion inside the wine bottle or storing the wine bottle inside a wooden board for protection. Wine logistics service providers also add an insulation layer in the wine bottle to maintain tight temperature control.

5.7.3 Inventory Management

Inventory management includes coordinating, planning and controlling of wine along the logistics process. The level of stock and the speed of materials flow are the major constraints in the wine logistics process, and they are determined by the nature of demand and supply. On the one hand, the supply of wine comes from different geographical regions, and wine logistics service companies have to manage inventories with the objective of making available the right products, at the right time, in the right quantity and at a competitive cost. On the other hand, a wine logistics firm is indebted to the many customers they work with. The customer are from different channels across

Table 5.3 Suggested wine logistics route planning in China

Mode of transport	Route
Sea	Hong Kong → Nansha/Lianhuashan/Huangpuother → cities in Guangdong province
	Hong Kong → Yantian/Shekou/Chiwan → other cities in southern part of China
	Hong Kong → Humen → other cities in Pearl River Delta
	Overseas winery → Hong Kong → Pudong → other cities in northern part of China
	Overseas winery → Hong Kong → Tianjin → other cities in northern part of China
Road	Hong Kong → Man Kam To/Huanggang → Guangdong province
Rail	Hong Kong → Beijing
Air	Hong Kong → Guangzhou → other cities in Pearl River Delta Hong Kong → Shanghai → other cities in Yangtz River Hong Kong → Beijing → other cities in northern part of China

Source: BUD Project (2013).

the cities—hotels and restaurants, retail shops, supermarkets, wholesalers, individual consumers who are wine lovers and so on. Hence, a wine logistics service firm could establish an order management system to plan the order and control the delivery process on time. Common technologies such as electronic data interchange (EDI), materials requirement planning (MRPII), e-commerce, customer relationship management (CRM) and enterprise resource planning (ERP) can be used to manage wine inventories and integrate various links along the wine logistics operations.

5.7.4 Warehousing

Wine is a valuable commodity which needs special care in warehouse operations. Suitable temperature and the thermostat are vital to the preservation of wine quality. Wine logistics service providers require storing the wine in appropriate storage facilities during the wait for inspection or customs clearance. Nowadays, Hong Kong Quality Assurance Agency (HKQAA) requires wine logistics service provider to install Wine Storage Management

Table 5.4 Fine wine and commercial wine storage

Items	Fine wine	Commercial wine
Temperature range (°C)	11–17	17–22
Maximum temperature variation per day (°C)	3	5
Maximum temperature variation per year (°C)	5	10
Humidity (%)	55–80	>50

Source: HKQAA (2014).

Storage (WSMS). Wine logistics service providers need to fulfill HKQAA code practices and system requirements including temperature, humidity, LED lights, vibrations, maintenance, security, inventory management, fire systems, hygiene and insurance. Basically, fine wine and commercial wine have distinct storage requirement (Table 5.4). However, it should be noted that the main variations of temperature take place during travel.

Hong Kong wine logistics service providers are one of the key stakeholders in the Hong Kong wine industry. In order to strengthen the competitiveness of Hong Kong wine logistics service providers, the Customs and Excise Department (C&ED) of Hong Kong and the General Administration of Customs of the Chinese mainland signed the "Cooperation Arrangement on Customs Facilitation Measures for Wine Entering the Mainland through Hong Kong" on February 9, 2010. The agreement has been implemented in Shenzhen. The measures include prevaluation of wine duty and compression of clearance time at mainland ports. C&ED also implemented comprehensive measures to tackle counterfeit wine, for example, by establishing a dedicated investigation team; forming an alliance with the industry to strengthen cooperation in intelligence collection; setting up a specialist team under the alliance; and establishing a liaison network with overseas and Chinese mainland enforcement agencies to deal with suspected counterfeit wine and verify wine authenticity (HKTDC, 2013).

In the future, Hong Kong wine logistics service providers could help Hong Kong vintners to participate in the design and operations of the mainland wine warehouse and thus, wine warehouse performance could achieve relevant customer metrics. Since the mainland logistics service providers are familiar with customs clearance and inspection, extensive transportation networks, strong logistics facilities support and past experience, it would be a good strategy for the Hong Kong wine logistics service providers to form a strategic partnership with the mainland logistics service providers. The mainland logistics service providers could provide the "last mile" delivery service so as to facilitate wine domestic sales for the success of Hong Kong's wine logistics industry strategy.

Furthermore, Hong Kong wine logistics service providers have a high level of service (i.e., using reefer to deliver the wine from time to time) and lay emphasis on quality and integrity. These advantages could help Hong Kong vintners to jointly develop a wine market in second-tier mainland cities (i.e., Dalian, Chengdu).

5.8 Strengthening the Hong Kong Wine Supply Chain in the Asia-Pacific Regions

After the removal of alcoholic duties in June 2008, wine imports surged around 80 percent in the first year. Compared with 2007, the wine-related business has increased by over 30 percent and the number of employees engaged in wine-related business has increased by more than 5,000. In 2012, the imports of wine reached HK$8.1 billion, a fourfold increase compared to 2007 (HKTDC, 2013). It followed that the HKSAR government organized various activities and implemented policies to develop Hong Kong into a wine trade and distribution center.

- *Developing the first free wine port among major economies*. The HKSAR government announced that duties on wine, beer and alcoholic beverages (except spirits) were exempted in June 2008. Abolition of wine duty will facilitate Hong Kong's position as a premier wine destination of the world and encourage high-value wines to be traded and purchased in Hong Kong. To facilitate the city as the first "free wine port" of the Asia-Pacific region, the HKSAR government has signed cooperation agreements with 13 major wine-producing countries, such as France (including Bordeaux and Burgundy regions), Spain, Australia, Italy, Hungary, New Zealand, the United States (i.e., Washington and Oregon States), Portugal, Chile and Germany in 2013. Through agreements, Hong Kong could undertake a leading role in organizing wine business activities in the Asia-Pacific region pertaining to wine-related trade, investment and tourism and providing good business matching opportunities.
- *Establishing marketing efforts*. In order to promote Hong Kong as Asia's wine trading and distribution center, the Hong Kong Trade Development Council (TDC) organized the first Hong Kong International Wine Expo in August 2008. This provided an opportunity to create a one-stop platform for exhibitors and buyers to meet and explore business opportunities in the emerging markets of Asia and the Chinese mainland. Hence, it could create and retain Hong Kong as a cosmopolitan flair in the world. To enhance reputation and enlarge networks with different Chinese provinces, Hong Kong wine logistics providers have participated and collaborated

with Chinese wine exhibitors in different types of wine trade fairs and exhibitions each year. For instance, the China Food & Drinks Fair (CFDF); China International Wine and Spirits Exhibition; China (Guangzhou) International Wine Fair; Shanghai Wine Festival; International Exhibition of Food & Drink, Hotel, Restaurant & Food Service Equipment, Supplies & Services (HOFEX), to name but a few.

- *Strengthening wine education*. In recent years, Hong Kong has opened several wine centers, societies, clubs and schools to provide trade-qualified and accredited training. With a more formalized, professional educational system, a strong foundation and a sustainable base for a wine industry can be established. The number of wine-related professional courses grew from 21 in 2007 to 86 in 2009. The number of participants in these courses has reached over 8,500 in 2009, as well as over two times as compared to about 2,400 participants in 2007 (HKTDC, 2013). Furthermore, the Hong Kong wine industry creates innovation environment with over 2,000 knowledgeable wine liquor license holders as well as training several sommeliers, wine journalists, wine logistics specialists, viticulturists and other wine stakeholders. The high-skilled and well-trained labor could contribute to the sustainable development of wine industry.
- *Developing wine investment tools*. Hong Kong encourages the development of wine investment tools to offer competitive investment options including wine investment funds, wine futures and wine auctions for Hong Kong and Asian investors. As there is free flow of capital, it can attract enterprises to invest in the Hong Kong wine industry. In addition, Hong Kong can attract private banks and wine auctions to offer wine investment funds. It is forecasted that the demand for wine investment by Asian investors will amount to reach US$970 million by 2017.
- *Promoting wine fairs or wine exhibitions with low cost inventory buffers in Hong Kong*. Wine is a risky business. The quality of wine is determined by temperature, humidity, light and shock. Wine, especially fine wine, would face a high risk in wine fairs or exhibitions due to insufficient wine storage facilities, low demand and shrinkage costs. Thus, the wine trading firms could conduct comprehensive research in wine market demand before exhibition. To reduce the risk, we suggest that wine trading firms consider placing wine order either "less quantity with more assortment" or "large quantity with fewer assortments."
- *Creating express delivery services for wholesalers*. Hong Kong requires promoting the emergence of Hong Kong–based distributors for Asian market. Wine logistics service companies could provide express delivery services from Hong Kong to Asian regions within 24 hours. To facilitate the efficient wine delivery service, Hong Kong wine logistics service companies collaborate

with logistics parties in different regions so as to provide the "last mile" distribution service. Flexibility with quick response is the first mover advantage in the dynamic business environment.

- *Creating a trademark of Hong Kong traders using reefer containers*. Hong Kong traders use reefer containers to deliver the wine so as to achieve higher customer service level, take care of wine during transport and storage, as well as maintain integrity attitude. As a result, Hong Kong wine traders could build up a unique trademark to provide customer confidence and simplify wine customs inspection procedure.

5.9 Conclusion

The emergence of halal food and wine is a growing opportunity in the business world. In order to keep up with the increasing number of competitors, it is vital to put the maintenance of halal integrity on the first priority in the whole halal food supply chain. However, the halal food supply chain is still at an introductory stage in Hong Kong and has faced several challenges, including (1) lack of global integrity in standards certification process; (2) limited interaction between halal food and Islamic finance industries; (3) lack of advanced scientific techniques for verifying halal status; and (4) fragmentation of halal food markets by different determinants such as income, ethnicity, location, awareness (1st International Food, Agricultural and Gastronomy Congress, 2012). Also, we discuss the development of the wine industry and wine SCM. In the coming years, the development of a wine trading and distribution center will not only generate direct benefits to Hong Kong's economy, but also bring indirect benefits from higher demand of linked businesses including storage, trade shows, educational programs, tourism, advertising and promotion, management and consulting services (Hong Kong Trade Development Council, 2013). In this chapter, we have provided practical recommendations for the Hong Kong halal food and wine industry to encounter the competition and grasp the feasible opportunity in the external environment. These will help Hong Kong achieve the "first mover" advantage and gain sustainable competitive edge in the long run by the use of innovative products and services.

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Chapter 6

INLAND PORTS IN GLOBAL SUPPLY CHAINS

Due to capacity expansion, environmental considerations, community restrictions and complex supply chain management, an inland port has emerged as a notable actor to connect a hub port and hinterland area. Mexico has demonstrated illustrative examples of inland ports in global supply chains. In this chapter, we will achieve the following objectives:

- understand a movement from a traditional supply chain with a lot of middlemen to a cheaper supply chain that is reliable and agile, without middlemen, to achieve direct benefits for Mexican producers;
- explore different types of inland ports around the world;
- analyze investment that recognizes the affordability issue of the current fresh produce supply chain system, its markets and warehouse storage, and how it does not displace that system with unaffordable rental levels;
- create new value chains through the introduction of business processing and technical business support facilities; and
- underpin the development of free trade negotiations (consortium) by delivering safer, low cost and higher quality products and promote supply chain infrastructure and use of the Centre Port partners.

6.1 Introduction

A supply chain is a series of organizations that interact with one another in order to bring products (goods or services) to the final consumer. Typically a supply chain includes customer or consumer, retail or retail stages, merchants or distributors, manufacturers or manufacturers and suppliers, among others (Chan et al., 2012; Tang and Lau, 2013; Lau et al., 2018).

One of the main purposes of managing supply chains is the coordination and improvement of interorganizational processes. The world's best-recognized definitions come from the Council of Professional Supply Chain Management, formerly known as the Council of Logistics Management.

Before the 1990s, companies were oriented to managing their internal processes, but as the approach to supply chain management emerged, the

Figure 6.1 Traditional supply chain management.

emphasis shifted to managing interorganizational processes, which went beyond the boundaries of one's own institution.

In an integrated supply chain approach, organizations realize that they need to include not only their suppliers and customers, but also third-party service providers (intermediary and service providers) to identify and improve their critical processes, in such a way that can be gained collaboratively through synergies, in order to meet customer requirements at a lower cost, with greater quality and speed (Figure 6.1).

"Supply chain" is a term that emerged in the 1980s, but it was not until the early 1990s that organizations started considering it to increase their competitiveness and successfully manage their supply chains.

Even though the term is used globally, it is not well defined, since it is not really a chain, nor is it supply, although these words are still used. The word "chain" implies a series of linear organizations, but in practice, organizations are involved in a "network," so this term should be used instead of "chain."

However, the term "supply" implies the flow and relations in a single direction and sense, but companies actually have client-supplier flows and relations, that is, in both directions, so the term "customer-supplier relations" or "relationships among logistical members" should be used instead of "supply."

Likewise, there is confusion between the terms "supply chain" and "logistics"; the latter is a supply chain process that manages the different flows of organizations from their origins, including not only primary suppliers but also suppliers of suppliers, to their destination or consumption.

Nowadays, logistics no longer ends with consumption, since there are also flows that go backward, that is, "reverse logistics," which we will talk about later, as in the case of recycling, or the famous recall, which is to recover something that did not work well in the market, as usually done by the automotive companies.

6.2 Software or Hardware?

Effectively managing supply chains is vital for both organizations and countries, as it affects the basic competitiveness criteria, which are the cost, quality and delivery time of the product required by the customer.

Therefore, we must understand the integral concept of "supply chains" and identify the importance of "doing," that is, processes and actions that allow us to generate good supply chain management; another important aspect is "where to do," which should be recognized as the physical place where these processes and actions will be carried out.

Before the focus turned toward supply chains, it was said that an organization could satisfy two of the three basic criteria of competitiveness, that is, if the customer wants it fast and with quality, the cost is high; if the customer wants it at low cost and with quality, it takes a long time to elaborate; and if you want it fast and at low cost, quality is not guaranteed. The integration of the supply chain allows the fulfillment not only of these three basic criteria but also of others such as innovation, security, flexibility, precision, accessibility, visibility and reliability—the key factors of international competitiveness.

After the changes and latest events around the world, manufacturing and services companies have migrated to other countries and regions, mainly to lower production, logistics and distribution costs. The brief description is provided in Figure 6.2.

Nowadays the competition is not between organizations, but between supply chains, regardless of the size or power that each company may have. The supply chain is an essential part of being able to compete. In other words, any organization needs to have a good relationship with the different members of its chains in order to penetrate markets and expand internationally. There are essential business approaches or strategies that are part of these supply networks to facilitate their proper functioning; some of the most outstanding are:

- *Supplier Development*: It is a scheme in which a company supports and invests in its suppliers to form long-term alliances with the objective of obtaining a better product, resulting in a win-win relationship. In Mexico, there is a shortage of reliable suppliers. In some high-technology sectors, less than 10 percent of suppliers are nationals. It is necessary to develop national suppliers to ensure the permanence of international firms and the attraction of new ones; achieving this not only leads to the generation of jobs but also increases the country's competitiveness.
- *Outsourcing*: It represents one of the strategic business decisions for any firm, since it allows the company to focus its activities and efforts on the core business and subcontract those processes that are necessary for the operation, but which are not essential for business strategy, ensuring long-term sustainability.
- *Provider Managed Inventory*: Under this scheme, the inventory of a company is managed by the supplier who will be in charge of maintaining the necessary

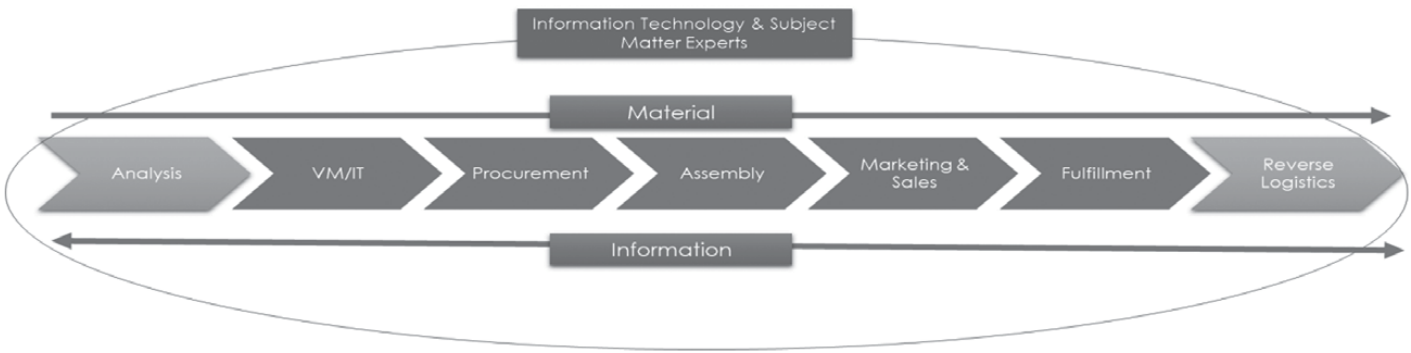

Figure 6.2 Contemporary supply chain management.

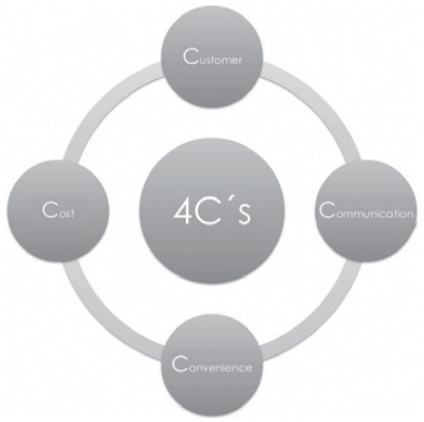

Figure 6.3 4C's model.

level, having it in order and assuming the responsibility of having sufficient supply. The supplier must have what is called an "open key," which means that he has access to his client's stores and information to maintain the optimal inventory level. This relationship is based on mutual trust, which is gained over time. Under this approach, inventory rotation improves drastically at the same time as the level of customer service, thus achieving a reduction in operating costs, and both customer and supplier benefit, improving the competitiveness of both organizations.

For the impact on supply chains, business strategies require a fundamental transformation that can be complemented by the 4C's model (Figure 6.3).

This model is made up of the concepts of trust, commitment, communication and collaboration. Trust must exist among the members of the chain and be earned through actions over time. There must be awareness of what it means to lose that trust and the impact it can have on the relationship. For example, in Latin American culture, sometimes it is not given the right value, as organizations change providers in search of lower costs, which generates detriment in long-term partnerships.

Commitment is generated when a supplier within a chain is responsible for meeting basic competitiveness factors such as delivering a product of a certain quality, at a given time and at a preestablished cost. It is imperative to fulfill the commitment or otherwise the productivity and competitiveness of the chain are adversely affected.

Communication is fundamental so that every link in the chain has knowledge of what is happening through it, thus avoiding the "whip effect." Since

Figure 6.4 Supply chain planning.

consumer demand is rarely stable, organizations must forecast demand to deploy properly inventories and other resources through the chain.

Due to chain communication failures, its members tend to overestimate inventories to avoid missing, causing the "whip effect" and reducing the overall competitiveness of the chain.

Collaboration is necessary to facilitate the communication process, increase trust and carry out the commitments of each of the actors in the supply chain (Figure 6.4). Collaboration facilitates the alignment of individual objectives to the overall objectives of the chain, as well as effective decision-making, reaching agreements and benefits for all members of the chain not only in monetary matters, but in terms of competitive position.

In addition to the 4C's model, basic elements such as administration, human capital, technology, as well as industrial, logistics and service infrastructure,

and interconnectedness to the urban network are required to achieve success in the integration of the chains, which allows a holistic, economic and social development.

6.3 The Hardware for Tending the Supply Chains: The Case of Success in Mexico—Guanajuato Puerto Interior

The need to design and serve more competitive and profitable supply chains has been growing, as the level of development of the countries increases, requiring an increase in the volume of transportation of goods to meet the demand of people and merchandise.

On the other hand, the global economic structure, with the decentralized production and consumption centers, brings with it an increase in freight flows and transport distances of merchandise, greatly complicating transportation. In addition, new trends in the transport sector to reduce stocks have led to smaller but more frequent shipments, further complicating operations due to the consequent need for synchronization and the most intense pressure on transport systems.

In these circumstances, maritime transport has become the most appropriate and cheapest way to meet the needs of merchandise mobility over great distances. In this way, seaports are configured as nodes with a capital importance within the logistics chains as a link between two transport systems, maritime and terrestrial.

As we have mentioned before, it is necessary to have a holistic infrastructure that allows the exchange of merchandise with different types of transport to be effected. However, and precisely because of the complexity of the transport sector and the increase in the volume of goods exchanged and transported, there has been a situation of increasing congestion of the routes, the scarcity of free spaces in the maritime installations (these two problems mean, in the end, an increase in costs and a brake on regional economic activity) and a significant environmental impact of seaports and even risks of inoperability.

A little more than 11 years ago, in Mexico, and specifically in the State of Guanajuato, the need to develop infrastructure that allowed connectivity with the main seaports and the borders of both the north and the south was raised, with the objective of promoting the economic and social development of the region, through the strengthening of supply chains, manufacturing and attracting new investment.

Guanajuato is one of the 31 states that, together with Mexico City, form the United Mexican States. Its capital is Guanajuato and its most populated city is León. It is located in the north center region of the country, bordering to the north with Zacatecas and San Luis Potosí, to the east with Querétaro, to the south with Michoacán and to the west with Jalisco.

Figure 6.5 Guanajuato location.

Dry ports, by allowing customs clearance within the territory, streamline the activities that take place in the maritime port, reducing the number of operations, thereby reducing the space requirements and the pressure that the port terminals execute on the coast (Ng et al., 2013; Lam and Notteboom, 2019).

Guanajuato Puerto Interior (GPI) (Figure 6.5), S.A. de C.V., was the first dry port in Latin America designed, built and operated under the holistic vision model Hvm, to boost the logistic, economic, social and industrial development of central Mexico.

An inland port is a dry intermodal terminal directly connected by road or rail to a seaport and operating as a center for the transshipment of sea cargo to inland destinations (Ng and Liu, 2014).

There are different types of inland ports, depending on the elements that comprise it, such as industrial park, customs, airport, railway, free zone, universities, among other things (Figure 6.6).

In addition to their role in cargo transshipment, dry ports may also include facilities for storage and consolidation of goods, maintenance for road or rail cargo carriers and customs clearance services. The location of these facilities

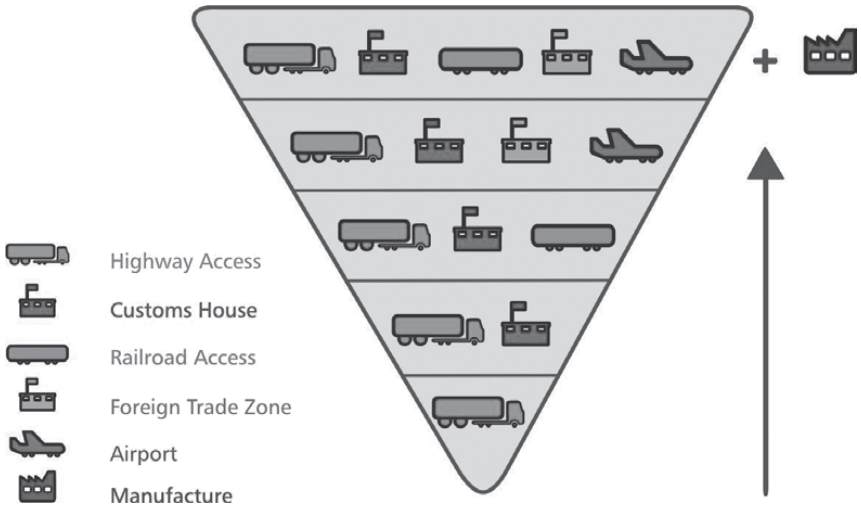

Figure 6.6 Types of inland ports.

at a dry port relieves competition for storage and customs space at the seaport itself.

A dry inland port can speed the flow of cargo between ships and major land transportation networks, creating a more central distribution point. Inland ports can improve the movement of imports and exports, moving the time-consuming sorting and processing of containers inland, away from congested seaports.

In an area over more than 1,450 hectares were installed a customs office, four industrial parks to receive logistics and manufacturing companies, a railway industrial park, a multimodal terminal, an area of large users, which were joined by an educational and training area, service area with daycare, a clinic, a fire station, shopping area and services to facilitate and serve the supply chain in its entirety.

The state of Guanajuato in Mexico is in the middle of the so-called golden triangle between Monterrey, Guadalajara and the Federal District, where 70 percent of the population and 60 percent of the country's internal commerce are concentrated.

Its history began during the first half of the 1990s, when under a new state administration determined to intensively promote the economy of the State of Guanajuato, projects such as the establishment of a light truck assembly plant called General Motors in Silao, Gto (1994), were begun.

In addition, it was considered that Guanajuato, despite having a strong internal economy, had lagged behind industrial neighbors Jalisco,

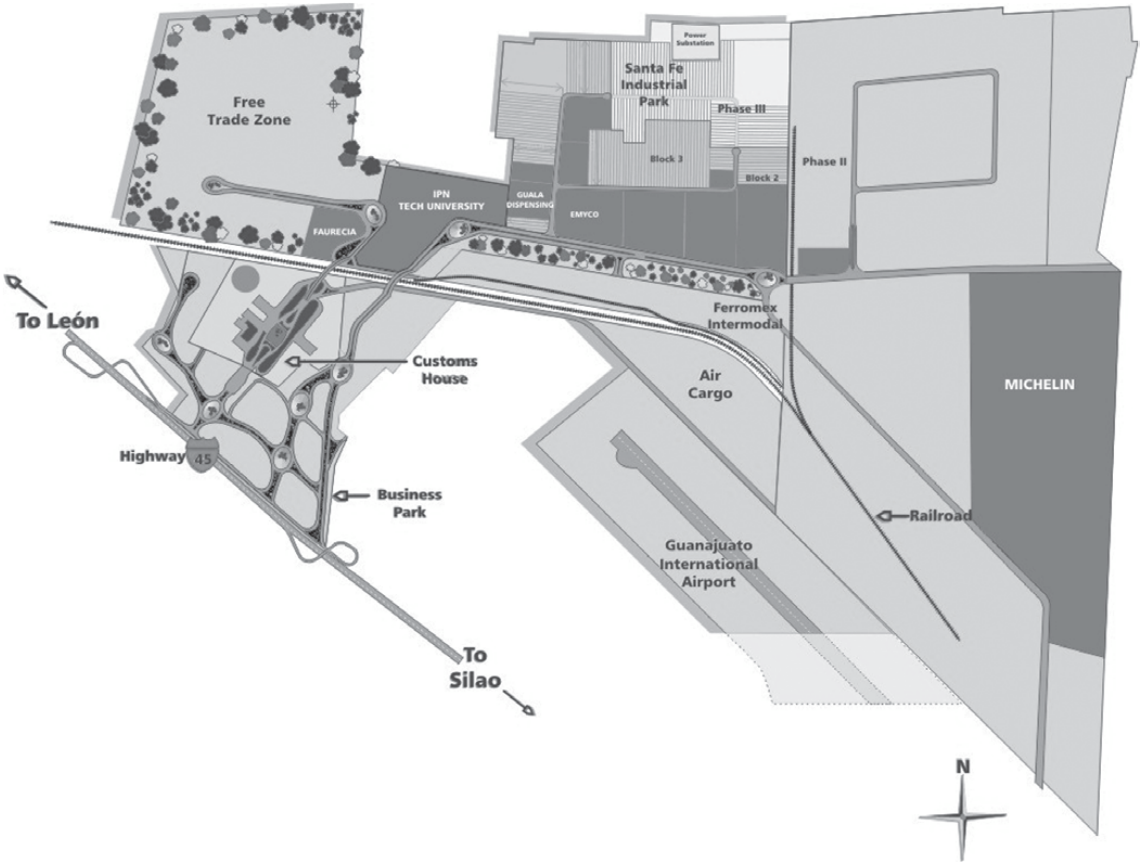

Figure 6.7 Outlook of Guanajuato.

Aguascalientes, Querétaro and, to a lower degree, San Luis Potosí. Within the framework of this new promoter impulse, the state government conceived projects as COFOCE, the interurban train and the interior customs.

The idea of having interior customs—as the project was initially called—grew stronger in the mid-1990s, when Guanajuato had a new international airport that had been located between the cities of Silao and Leon. In addition, the Mexico–Ciudad Juárez railroad line coincided in this same site along with the extended Federal Highway 45 (Pan-American). That is to say, in the same place came three media—air, road and rail (Figure 6.7).

However, the concept of the interior port, unknown in Mexico during the first years of development of the model, was very often confused with the model of an "interior customs." The confusion of concepts prevailed until approximately 2004, when the terms were clarified and the definition of what constitutes an "interior port" was achieved.

The main factors for the establishment of the complex were:

- *Road Infrastructure*: The extraordinary infrastructure flows as the state allows the road to reach 60 percent of the country's population in about four hours, that is, almost 60 million people. For example, Highway 45, where they pass around 55,000 vehicles daily.
- *Railroad Network*: It is crossed by the rail network that arrives at Cd. Juárez, since it is composed of approximately 8,000 kilometers of main road and serves five borders to the United States with daily exchanges with the two main railroads in the United States, that is, Union Pacific and the BNCF.
- *International Airport*: It has the international airport with unbeatable possibilities of growth.

After its antecedents, GPI, S.A. de C.V., was thought out and carefully planned to establish a mixture of uses and complementary vocations that optimize and expedite daily activities—a tidy, practical and convenient business environment, consolidating GPI as an important logistics platform in the country.

As a result, a public limited company with variable capital is created with majority state participation, for a greater citizen collaboration, where the government is the facilitator and the companies contribute the expertise, already with the media developed and complementing it with

- Mexico's largest and most modern customs in terms of internally connected infrastructure;
- a free trade zone;
- a community center with first world services;
- a nursery with the best practices and the highest experience;

- a fire station with academy; and
- an educational institution.

6.4 Infrastructure Development

The main basis for the development of the complex is the infrastructure of primary and first level services, from which they began to offer benefits to future clients. With this infrastructure based on a successful formula, robust and planned with a long-term vision, the operating complex integrated talents, as well as public and private capabilities.

The uses and services that it provides are conformed in the following zones of opportunity:

- industrial parks zone;
- customs;
- free zone (strategic fiscal area);
- specialized rail freight terminal;
- Guanajuato International Airport;
- business park;
- educational and training zone; and
- community services center

The objective clients of GPI are the companies that are directed to the heading of the manufacture and closely linked with the international market.

The competitive advantages of international trade offered by GPI are Customs, the Strategic Enclosure with authorization from the Ministry of Finance and Public Credit and the Intermodal Rail Terminal, which together make the project attractive for customers who want to reduce costs within the partition of the production chain.

This allows the public sector to rely on the private sector to provide value-added services that, in terms of cost-benefit, generate benefits for all parties involved (government, private companies and users of services).

The State of Guanajuato, in its desire to attract more investors, both national and foreign, strengthens its idea of creating a center to constitute an industrial, logistics and educational park.

The operating structure of the Guanajuato Inland Port complex has allowed us to obtain successful experience in the development and consolidation of business for companies.

6.5 Conclusion

In the heart of Mexico, we made the most important logistical and business platform in Mexico and Latin America: the Guanajuato Inland Port. It is a space where businesses find the processes of transport and logistics are more efficient, thanks to the convergence in one spot of air, rail and highway services.

Over the past five years, Guanajuato has emerged as one of the primary recipients of foreign direct investment by the auto and aerospace manufacturing industry. This investment has spurred industrial development in the region to utilize its strategic location as the manufacturing center of Mexico with an ample, stable and skilled workforce in the surrounding region.

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Chapter 7

CLIMATE CHANGE IN A GLOBAL ENVIRONMENT

Ports are increasingly influenced by the impacts posed by climate change. As they are critical nodes for international trade and shipping, it has brought notable implications for human welfare and the global economy. Hence, the time has come for a paradigm shift on how ports plan for and perform new strategies. In this chapter, we will achieve the following objectives:

- understand the relationships between climate change and sustainability of supply chains;
- provide discussions on the theoretical framework of institutions and institutional systems;
- present the experiences of climate change adaptation planning for ports of San Diego (United States) and Vancouver (Canada);
- learn about institutional theory and initiate new thought in planning and decision-making.

7.1 Introduction

Climate change is at the forefront due to the potential catastrophic risks posed to human lives and activities (Keohane and Victor, 2010; UNECE, 2010; Intergovernmental Panel on Climate Change, 2012). Schaeffer et al. (2012) warn that by 2100, sea levels may be up to 80 centimeters than what they are today. It is too late to avoid all the deleterious effects of climate change, in no small part due to uncertainties on how the problem should be addressed (Applegate, 2010). Thus, adaptation is not a choice but a necessity. In this case, supply chains are especially vulnerable to such risks. Despite strong evidence suggesting that institutional systems influence climate change adaptation due to ambiguity and competing political interests (Wheeler et al., 2009; Keohane and Victor, 2010; Preston et al., 2011; Osthorst and Manz, 2012), most attention focuses on physical and technical details of capital-intensive engineering projects, for example, elevation, levee, dykes and so on (National Research Council of the USA (NRC), 2010a). Adaptation is still not

adequately investigated, especially in terms of the reduction of uncertainty in decision-making, public policy, and institutional practice. Indeed, the sustainability of supply chains depends on the extent to which supply chain facilities and infrastructures can adapt and remain resilient to climate change impacts.

Understanding such, this chapter dissects the dilemmas of climate adaptation planning. It investigates whether climate change adaptation has catalyzed a transformation of the nature and practice of planning. Two port cases, namely, San Diego (United States) and Vancouver (Canada), are used in our discussions. Ports are appropriate targets for illustrative purpose as they play important roles in affecting the efficiency of supply chains (Ng and Liu, 2014). Also, located along coastlines, port facilities are especially vulnerable to climate change impacts (Becker et al., 2012). In addition, the chapter enriches institutional theory and initiates new thought in planning and decision-making, both in climate change and other public policy choices. It is a reminder to policymakers and industrial stakeholders that effective adaptation does not limit to physical technicalities, but also an ideological question that needs a fundamental reevaluation of the existing political, economic, and social paradigms.

The rest of the chapter is structured as follows. Section 7.2 provides a brief account of the theoretical framework of institutions and institutional systems. Sections 7.3 and 7.4 discuss the case studies of the ports of San Diego and Vancouver, respectively. The discussions and conclusion can be found in Section 7.5.

7.2 Theoretical Framework

An institutional system consists of the standard practices that structure relationships between agents. It imposes preceding constraints on policy choices and strategic directions (March and Olsen, 1989; Hall and Taylor, 1998). It countervails dramatic change, restricts alternatives and diminishes the rationalities of decision-making to predictable paths according to norms and practices based on culture and hegemonic values (Fuchs and Scharmanski, 2009; Glassman, 2004) even when they may have become obsolete (North, 1990; Hodgson, 1993). Institutional systems solidify generally accepted values into predictable practices so as to deter undesirable social outcomes due to individual actions. Having said so, it can "stretch" (Strambach, 2010; Notteboom et al., 2013) so as to deal with changing circumstances. The stretching usually involves two components, namely, the institutional environment and the institutional arrangement. The former refers to informal conventions and norms which organizations, being parts of a given community, should conform to so as to gain legitimacy and general support, and sometimes made compulsory

through legally binding rules and regulations (Martin, 2000). Moreover, it includes the mindsets of individuals and political elites. The institutional environment forms the basis for compromise (Gutmann and Thompson, 2012), operational characteristics and receptiveness to new knowledge (Boxer, 1991). The institutional arrangement refers to agreements and organizational structures between agents to strive for certain objectives governed by the institutional environment, like firms, bureaucracy, policies and cooperative networks.

The influence of institutions on port planning has been widely studied (for instance, Buitelaar et al., 2007; Ng and Pallis, 2010; Notteboom et al., 2013). However, previous research often followed a neo-institutional approach that investigated how established institutional environments structured cognition and guide decision-making, and how and why the institutional system matter has remained largely untouched. Facing new circumstances, such as climate change, institutional agents may take spontaneous initiatives to restructure the institutional arrangements, as exemplified by the neoliberal institutional reforms among ports around the world in the 1990s and early 2000s. However, decision-making gets more complicated within an uncertain institutional environment consisting of individual mindsets, ambivalent interests and diversified localities with individualistic and pluralistic traditions (Fishman, 2000). Climate adaptation planning possesses such an uncertain environment due to scarce legal standards, direct precedents, and readily transferrable scientific knowledge. This causes inadequate understanding, thus inadequate input, from stakeholders and the general public. With no direct paths, the institutional environment is a vacuum yet to be filled. Planning should provide clear guidance and practical actions to lead the direction of development, especially in the generation of first plans with many (untried) alternatives to choose from (cf. Wheeler, 2008; Preston et al., 2011; Sager, 2011). Further problems arise when the new circumstance has yet to reach a critical juncture (Buitelaar et al., 2007) and all parties do not yet deem significant transformation necessary or immediate.

7.3 Case Study: Port of San Diego

This section focuses on the Climate Mitigation and Adaptation Plan (CMAP) of the Port of San Diego (PSD) publicized in 2013 (but indefinitely suspended in 2014) which largely reflects its efforts in climate adaptation planning. In addition to document review, semi-structured, in-depth interviews with 12 relevant personnel (hereinafter called "interviewees") were conducted between 2012 and 2014. Interviewees include policymakers, planners, environmental interest groups and institutional agents within the County of San Diego

(hereinafter called "the County"). Interviews queried the overall impression of the planning process; the uniqueness of climate adaptation planning; the public outreach and accountability components of the process; the nature, organization and stakeholders involved; the existing conditions; PSD's vulnerabilities to sea level rise (SLR); risk analysis, goals and the prioritization for actions; and the establishment of adaptation strategies.

The CMAP was the first climate plan among US ports which addressed both adaptation and mitigation. It consisted of two main components. The first one dealt with mitigation driven by the California Environmental Quality Act (CEQA) (California State Government, or CSG, 2012) and Executive Order S-3-05 (CSG, 2005) focusing on analyzing, and achieving, GHG reduction from 2020 to 2050. The second part focused on adaptation, mainly looking at the impacts posed by SLR, driven by Executive Order S-13-08 (CSG, 2008) and AB-2598 (Tidelands and Submerged Lands: Sea Level Action Plan), complemented by the SLR Interim Guidance Document developed by the SLR Task Force of the Coastal and Ocean Working Group of the California Action Team (CO-CAT), supported by the Ocean Protection Council (OPC), the California Ocean Science Trust of CSG (OPC, 2010) and OPC's resolutions on climate change and SLR (OPC, 2007 and 2011). The following served as the fundamental principles guiding the development of the CMAP: study SLR scenarios, identify vulnerabilities and establish adaptation strategies to tackle the potential risks. The planning process consisted of four stages, namely, development (expert study and feedback from the public); drafting; finalization; and CEQA compliance review and public hearing. In adaptation, the major developmental process could be divided into four substages, namely, the study of existing conditions; identification of PSD's vulnerabilities to SLR; risk (likelihood and consequences) analysis and the prioritization for actions; and the establishment of strategies.

There were clear distinctions between adaptation and mitigation components. First, CEQA is a legally binding document governing GHG emissions and efficient energy infrastructure. Thus, the mitigation components, including measures and implementation, would be subject to a compliance review. However, the contents of CEQA are largely unrelated to adaptation. The SLR Interim Guidance Document was only a guiding reference to assist institutional agents when they developed strategies to incorporate SLR into planning decisions. The document stated that agencies were expected to interpret and use its contents in a flexible manner (OPC, 2010). Hence, there were no legal standards governing the development of the adaptation strategies. Although it indicated that agents should take its guidelines and suggestions into account when considering risk tolerance, timeframes, economic considerations, capacity of adaptation, legal requirements and other factors related to

the establishment of plans, including ports (OPC, 2010), its detailed contents illustrated that it was mainly guidance for studying and forecasting SLR and impacts. While acknowledging the risks that SLR could cause to the economic, ecological, physical and social environments, there were few suggestions, or recommendations, on the identification of port's vulnerabilities, risk analysis and its prioritization for actions, nor the establishment of adaptation strategies. This was exemplified by its recommendations that focused on the methodologies in estimating SLR. This left the federal level's National Environmental Protection Act (NEPA) as the only legal document, and thus any direct check-and-balances on the adaptation strategies were weak.

Being the leading public agency, PSD's Port Advisory Committee formed an ad hoc work group dedicated for the CMAP's development—the Climate and Energy Work Group (CEWG), with active members that included the San Diego Port Tenants Association, City of Chula Vista, City of San Diego, San Diego Gas and Electric, San Diego Foundation (SDF), Industrial Environmental Association and Environmental Health Coalition and the Energy Policy Initiatives Center of the University of San Diego. Work began in September 2010 (PSD, 2013), and members provided input to the appointed consultants. Simultaneously, the CEWG organized public outreach activities so as to introduce the plan to the broader community, and encouraged public feedback, notably two public meetings (PSD, 2013). However, this indicated that climate adaptation planning firmly remained within the County. Although state and federal public institutional and interest groups attended some CEWG meetings, especially during the early stage, like California Center for Sustainable Energy, Sierra Club, US Fish and Wildlife Service and the US Navy, interviewees generally agreed that their roles were largely peripheral—not surprising since federal legislation and policy on adaptation was vague or nonexistent (Verchick, 2010). Despite the call from academic and professional experts for extensive collaboration between policymakers, stakeholders and scientists (UNCTAD, 2012), such a call was sometimes overlooked thanks in part to the suspicion of state intervention from federal and state levels and a general skepticism of scientific knowledge not generated by stakeholders within the county. Considerable citizens within the County felt that knowledge not generated by local scholars and stakeholders would be of limited value for local application, and certain interviewees highlighted this point. Quoting SDF's communication to the County's leaders: "Choose a spokesperson that has expertise in the area about which s/he is speaking […] People have more confidence in the information presented when it is provided by experts and industries affected […] Generally, health experts and scientists, who can speak in real-world terms, serve as effective spokespersons" (SDF, 2010).This was not helped by segregated leadership with planners, policymakers, port stakeholders

and environmental interest groups having a diversified understanding of what was meant by adaptation. Quoting an interviewee, during the CMAP's development of adaptation strategies, substantial time and efforts were wasted just to narrow the gap of understanding between them. Despite the skepticism of nonlocal state intervention, stakeholders highlighted the segregated nature of climate adaptation planning in PSD and looked for a "champion" to provide a unified policy direction. However, few had any concrete ideas on how to achieve such.

Despite some difference, mitigation and adaptation concepts were co-used during the CMAP's development. In some cases, planners tried to knit them together when developing adaptation strategies. In the CMAP, nearly 50 adaptation strategies were adopted (PSD, 2013), compared to 16 mitigation measures (among them 12 targeted CO_2 reduction), but at least 7 of them were directly related to mitigation goals and measures (e.g., the promotion of energy conservation, increasing public education on climate change and its effects, installation of shades and green roofs to reduce cooling loads, incorporating climate change impact predictions into mitigation planning, establishing water recycling and conservation programs and policies). According to interviewees, this might make the CMAP more appealing to its audience. As highlighted in the SDF's communication, citizens of the County would like to see climate policies that could benefit daily lives, for example, more local jobs, basic services, lower energy and gas bills and so on (SDF, 2010). Indeed, many such demands were closely linked to mitigation goals and measures. This reflected the occasional existence of politics of expedience during the CMAP's development to cohere to the perception of climate adaptation by policymakers, major stakeholders and interest groups. Also, this facilitated planners to incorporate adaptation feedback from the public.

When developing adaptation strategies, planners drew up possible strategies with reference to various climate plans around the United States and other countries. They shortlisted and adopted certain plans and categorized them under six areas in accordance to PSD's mission to be a "working,""safe,""green" and "public" port (PSD, 2013). Many interviewees indicated that the shortlist was based on various considerations. First, strategies should comply with particular mandates of federal and state agencies like NEPA and AB-2598. Second, input and feedback from major stakeholders (notably port tenants) and environmental interest groups was considered. Third, selected strategies should be realistically implementable by the PSD within a short time period, usually in coherence with PSD's Master Plan (2012–17). Fourth, strategies should be under PSD's jurisdiction and financially feasible for the PSD. Ironically, the CMAP focused on how SLR could impact the PSD within a timespan (50 and 100 years) (ENVIRON, 2011) that was much longer than the PSD's planning

cycle (5–10 years). This suggested that some norms and practices not directly related to climate adaptation needed to be "mapped" into the adaptation process. A scarcity of legal guidelines and precedents, together with little public feedback, created a vacuum consisting of many uncertainties within the institutional environment for climate adaptation planning. Planners addressed this by searching for an alternative institutional environment (like co-using mitigation and adaptation and referencing non-port related climate plans). Quoting an interviewee from PSD, relying on something was important as it helped the CMAP to "defend on every front."

However, such a reliance was inadequate to address the ambiguous but ambivalent nature of the CMAP's adaptation components. During its development, the main argument between port stakeholders and interest groups surrounded mitigation and its measures (notably GHG emissions) due to legal obligations and the tangible nature of opportunity costs. On the contrary, similar conflicts on adaptation strategies were found wanting, with a wait-and-see attitude from port stakeholders on when the adopted adaptation strategies would be implemented, and how they would be affected. Hence, the adaptation strategies in the CMAP were not based on active public participation which more typically characterizes the planning tradition of the United States (Fishman, 2000). This offered a favorable condition to persist with the neoliberal ideology that embraced individualism and minimal public intervention (Harvey, 2005; Driesen, 2010). Adaptation strategies did not have any clear objectives; many suggestions just called for clarification of uncertainties, say, furthering research or developing more goals, strategies and plans (PSD, 2013). In fact, the adaptation component of the CMAP looked more like a pre-plan that that gave visionary guidance.

In terms of implementation, most interviewees had no concrete ideas about how the adaptation strategies would (or should) be implemented, or how the quality of implementation would (or should) be tracked and monitored. Apart from measures aimed at public parks which would certainly be the PSD's responsibilities, most implementation would be left to stakeholders (notably port tenants) who paid leases to the PSD which served as the latter's major income. In general, tenants maintained a wait-and-see attitude and were mainly concerned with the financial costs of adaptation. Expecting to share the cost of adaptation, these private stakeholders exerted pressure on the PSD to empower them to decide how to define and implement adaptation strategies. In turn, planners hesitated to assign more direct responsibilities. Indeed, the adoption of so many adaptation strategies was illustrative of a lack of willingness to commit to specific goals (PSD, 2013). Quoting an interviewee, the broad list of options allowed maximum flexibility for stakeholders to carry out such strategies, while simultaneously ensuring that the adopted adaptation

strategies could be, as mentioned, "defended on every front." This made effective enforcement especially difficult.

For evaluation, interviewees generally agreed that adaptation was difficult to implement and monitor without tangible and quantifiable measurement tools. While concrete emission reduction targets for 2020 were laid down in the CMAP, adaptation strategies had no such goals (PSD, 2013). In the CMAP's chapter on implementation, adaptation was not even mentioned. A comparison of the mitigation and adaptation implementation timelines suggested a lack of clear objectives for the latter (PSD, 2013). Also, while substantial uncertainties exist, nearly all interviewees agreed that, in the foreseeable future, climate adaptation planning should be regarded as successful if the mindsets of policymakers and stakeholders evolve and start to incorporate climate adaptation into decision-making. Thus, while recognizing the need for a paradigm shift within the planning process, there was little confidence that the CMAP could really transform the *status quo* due to constraints imposed by a rigid institutional system, even among planners. In this case, some even doubted whether any of the adopted adaptation strategies would ever be implemented. Facing so many difficulties and challenges, it was not a surprise that the adaptation component of the CMAP was suspended indefinitely in 2014—less than a year after it has been publicized (Messner et al., 2016).

7.4 Case Study: Port of Vancouver

The Port of Vancouver (POV) is the largest port in Canada in terms of tonnages (Port of Vancouver website, last accessed in July 2017). Located along the Pacific coastline, its operation poses substantial impacts on the city of Vancouver of the Province of British Columbia (BC), and Canada as a whole (Zhang and Ng, 2016). While climate change impacts vary, PMV and its facilities face considerable threats of flooding from the Fraser River, and a serious flood event may cause the city of Vancouver billions of dollars in terms of economic damage (Fraser Basin Council, 2016).

POV recognizes such impacts on the increasing water flows during spring and has undertaken adaptation planning since the early 2010s. However, POV is still "feeling its way out" due to the lack of relevant experience, while the complexity of climate change impacts and limited resources do not help its cause. While the Engineering and Maintenance Team takes up the physical aspects of adaptation, the port has yet to adopt an adaptation plan. Indeed, it has yet defined or established an appropriate approach and, so far, much was done only through regional collaborative efforts, notably through the Fraser Basin Council (FBC). POV gets actively involved in two projects initiated by the city of Vancouver and the FBC, namely, the Coastal Flood Risk Assessment

(through the Climate Change Adaptation Strategy adopted by the city of Vancouver in 2012) and the Lower Mainland Flood Management Strategy (initiated and coordinated by the FBC in 2014). Both attempt to understand the current and future scenarios for the sake of more effective adaptation planning.

However, in both, the involved stakeholders find it difficult to proceed to the "implementation stage." The first challenge is that they have yet to gain consensus on the funding issue. No regional stakeholders are taking the lead and propose any serious action plans. The question of jurisdiction obviously poses a barrier for further progress, while the existence of "landlord" port governance system (cf. Ng and Pallis, 2010) does not help its cause. However, if the Canadian Federal government takes the lead, its common funding standard may not apply to all stakeholders, not to mention to the sensitive issue of fairness to different provinces. Unsurprisingly, the result is "wait and see." The second challenge is the persistence on physical works with (comparative) negligence on costs. As mentioned, much of the work is still undertaken by the Engineering and Maintenance Team and other port stakeholders still overwhelmingly favor "protect" when tackling flood risks. Although BC Provincial Government (BCPG) dedicates some funds to the municipalities for this purpose, they require the latter to share up to 33 percent of the costs in capital works. This discourages many municipal authorities from participating (Ministry of Forests, Lands and Natural Resource Operations of the Province of British Columbia (MFLNRO), 2012). This raises the third challenge—the institutional problem of adaptation. BCPG follows its typical approach in infrastructure funding: the high hierarchy devolves responsibility to the lower levels, but only when the local authorities agree to undertake responsibilities (in terms of ownership, operation and maintenance) that a project would actually proceed. This suggests that the emphasis on the physical approach to adaptation may make the financial and institutional constraints even more explicit. A paradigm shift in adaptation planning is clearly required.

7.5 Discussions and Conclusion

In both the ports of San Diego and Vancouver, there are far-reaching attempts to address climate change adaptation so as to achieve sustainability. They trigger some restructuring within both ports' institutional arrangements and demonstrated planners' awareness that a paradigm shift from previous planning norms and practices is necessary. However, uncertainty in the institutional environment and the speculative attitude of major participants seem to strengthen the perception that political controversies would hinder future implementation. In PSD, this explains why the CMAP became more of a

visionary guidance tool rather than a real action plan. Planners "muddled through" the planning process by undertaking a highly evolutionary approach. Perhaps this should not be surprising, as the objective of the institutional system is to deter undesired shocks to societies due to individual actions (Weber, 1922). Except sporadic attempts, institutional agents are sometimes too bureaucratized to move out of respective turfs and integrate with other levels throughout the planning process.

Under the uncertain institutional environment, neoliberalism, which emphasizes minimal public intervention, explainsthe situation very well. Hence, the evolutionary approach in climate adaptation planning, as preferred by planners, is not necessarily a voluntary choice. It is imposed by an antipodal hegemony from the commons: apart from fulfilling some federal and state regulations (which were rather scarce in the first place), there is a (perceived) prerequisite to gain legitimacy from local stakeholders who were clearly their main audience.

To conclude, this chapter looks at climate adaptation planning from the institutional perspective. It confirms the proposition that an institutional system would affect the planning process, and institutional deficiency has hindered the effective tackling of climate adaptation. Ports highlight various important structural principles of climate adaptation planning and existing loopholes that require paradigm shift solutions. The impacts posed by climate change to the world will likely become even more explicit in the foreseeable future, and continuous research dedicated to reducing uncertainty in decision-making dedicated to climate adaptation is necessary, and thus sustainability in global supply chains.

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Chapter 8

SUSTAINABILITY IN INFRASTRUCTURE-BASED SUPPLY CHAINS

To maintain sustainable competitive advantage, logistics organizations design and implement sustainable infrastructure-based supply chains. The competitiveness of logistics is reflected in its ability to optimize the supply chain process in a cost-effective manner. In this chapter, we will achieve the following objectives:

- explain the concept of sustainable infrastructure-based supply chains;
- learn about the Holistic Vision Model® and Holistic Infrastructure Model in the management of global supply chains; and
- identify role and cost of infrastructure in the supply chain.

8.1 Introduction

Infrastructure by itself does not generate value. Logistics platforms, industrial zones and industrial parks were, and still are, one of the main instruments, in terms of cost and effectiveness, to promote the development of industry in growing economies, as well as to promote the economic development of rural and peripheral regions. However, the results depend on a set of internal and external factors that determine the growth of these developments, so it is expected that when some of these are not available in the necessary conditions, the achievements will be minimal compared to the high levels of investment, and even poor results may imply higher costs, mainly for businesses and governments.

In this context, when industrial and logistics infrastructure is developed that do not qualify the minimum requirements nor has the urban industrial equipment, it is possible that it cannot significantly influence the level of industrialization of a country, slowing down industrial production, even when the economies of agglomeration benefit the gradual establishment of new companies and investments. Thus, industrial infrastructure, logistics

and associated services must meet certain localization factors, economic and extra-economic, capable not only of attracting companies, but retaining them and promoting their full development. Indeed, much of the world's poverty is due to inadequate access to opportunities, development, hopes and dreams, due to limited access to infrastructure and a highly vulnerable environment.

The global economy is experiencing a dynamism and volatility that puts investment at risk for the growth, strengthening and development of necessary infrastructure, which guarantees the demands for basic services, competitive supply chains and the sustainability of the environment. Each time, governments have fewer economic resources. Infrastructure is a key factor to increase the competitiveness of the economy in nations and the well-being of its population, due to its impacts on determining the costs of access to markets and the quality of life of its habitants. Globalization, population growth and urban development are putting a lot of pressure in relation to infrastructure throughout the world. More advanced industrial economies, such as the United States and Western Europe, are dedicated to improving or replacing older infrastructures. However, developing countries face a more difficult task: to create new transport, communication, water and energy networks so as to promote economic growth, improve public health systems and reduce poverty.

Understanding such, it is necessary to develop a model that can achieve these objectives. In this regard, this chapter focuses on the development, strengthening and implementation of the "Holistic Vision Model" (Hvm) developed by the JA Group, a Mexican-based company that strives to innovate the development of holistic infrastructures (JA Group website, 2017).

For Hvm, visualizing, articulating and designing strategies that allow a sustainable environment is the most important. Infrastructure plays a preponderant role to empower human beings, strengthen and make supply chains more efficient, as well as achieve the economic and social growth of countries, regions and communities.

The environment is constituted by physical, social, economic and cultural conditions. An environment can be the house, neighborhood, parks, schools, companies and industrial zones. It is a place where people live, work, study and go for recreation; in each one of them, security, protection, privacy contribute to the welfare of each one of the people who live there must be promoted. In this case, it is important to think and act in a "holistic" way.

- The physical condition refers to the geographical space where people live, the living space that they share with the family, but also the places of study, work and recreation.

- The cultural condition refers to hygiene, order, care products and values, which are projected on themselves, their belongings and the natural environment.
- The social condition, on the other hand, refers to the relationships established with others, with the environment and the institutions.
- The economic condition refers to the forms of production and sustenance.

Does the environment, where industrial or business activities develop or intend to develop, have physical conditions and competitiveness relevant to economic processes that lead to the improvement of investment attraction and potentialization of the productive sectors?

The development of infrastructure improves the productivity of a country, so the consequence of this is that companies are more competitive, and the economy of a region is stimulated. The articulated and holistically designed infrastructure does not only improve the efficiency of production, transport and communications, but also helps to create economic incentives in both public and private sectors. The accessibility and quality of the infrastructure in a region will help investment decisions of national companies to materialize and determine how attractive that region is to foreign investors, thereby generating better and more competitive tools to strengthen and reduce cost in supply chains. Hence nowadays without doubt, the regions in which it is decided to develop logistic platforms is a matter for all that is necessary to achieve development, competitiveness and economic and social sustainability, for a greater growth and attraction of investments.

Start from the early 1990s, the United Nations proposed the idea of "sustainable development" in the development and environment conference. Since then, all the stakeholders investigated the infrastructure sustainable development issues. Basically, infrastructure is a complicated system. It is closely associated with government and socioeconomic policy, as well as having a direct influence on the resources and ecological environment. The notion of infrastructure sustainability consists of three key points of view: (1) an economic view pertaining to efficiency of the utilization of the infrastructure area, returns on investment (ROI) and allocation of facilities for firms to maximize their performance; (2) a social area like the direct involvement in activities and employment in infrastructure firms linking with the infrastructure (i.e., the association and interaction between city and land-based infrastructure, indirect employment, the participation in education and knowledge management and the livability of the area surrounding the logistics park); and (3) environmental management and performance pertaining to air quality, noise pollution, dredging disposal and dredging operations (Wang et al., 2017). Clearly, the role of infrastructure has undergone transformational change and

Figure 8.1 Holistic Vision Model.

performed a prime role in synergistic development to encourage regional competitiveness and generate an ecological environment in the twenty-first century (He et al., 2017). From the socioeconomic perspectives, different types of firms are now continuously analyzing and monitoring their environmental impacts in order to reduce the problem of infrastructure repairs and damage and provide a quality service (Dragomir and Lau, 2018; Ng et al., 2018).

8.2 Holistic Vision Model

Hvm (Figure 8.1) is an evolutionary, functional and dynamic model that potentiates vanguard and intelligent actions, providing systemic deliverables that drive integral sustainable development.

Holistic Vision Model operates as articulator of business sector initiatives with the vision and plans of the different levels of government, prompting one strategy for integral sustainable development of the region or country through infrastructure projects (Figure 8.2), such as: logistic platforms, industrial parks, port areas, extra-port areas, airport areas, extra-airport areas and free trade zone

Hvm is founded on four key pillars to achieve integral sustainable development (Figure 8.3):

1. *Social:* Promote the development of human capital in society. The future is Welfare.
2. *Infrastructure:* Develop and improve infrastructure as an essential means for human, social and economic development.
3. *Political:* Understanding the political environment to encourage and promote collective action.
4. *Economic:* Promote the welfare of human beings through the creation of economic value.

Hvm works as a system that maximizes and articulates initiatives aligned to the vision, where tractor and strategic projects together with the public and the private sectors are key elements in it (Figure 8.4).

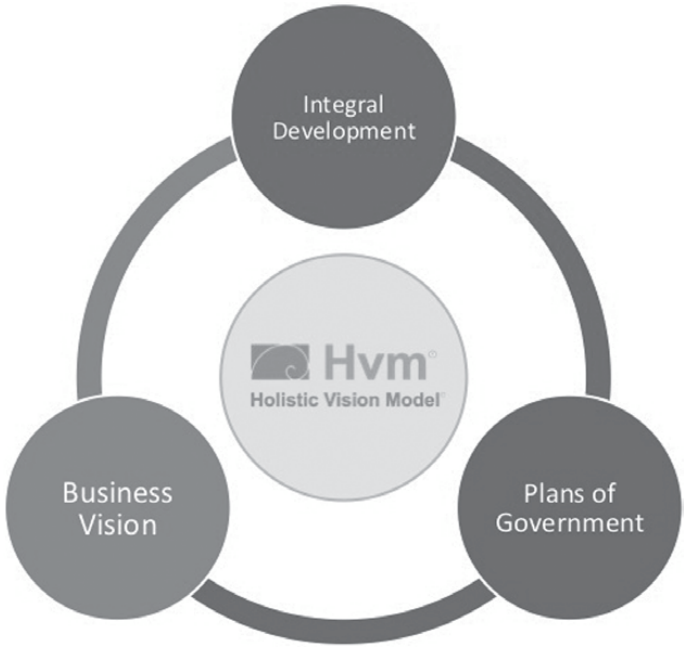

Figure 8.2 Hvm as a business articulator.

Social	*Infrastructure*	*Political*	*Economic*
Promote the development of human capital in a society. The future is welfare.	Develop and improve infrastructure as an essential means for human, social and economic development	Understanding the political environment to encourage and promote collective action.	Promote the welfare of human beings through the creation of economic value.

Figure 8.3 Four key pillars of Hvm.

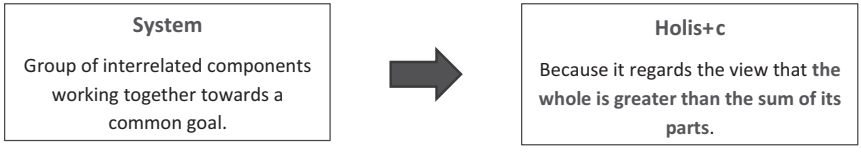

Figure 8.4 System and holistic.

Only logistics, which responds to interests for the movement of cargoes, when designing infrastructure in a holistic way, one can achieve much more ambitious objectives, such as:

- promoting integral sustainable development, mainly with social and economic impact;
- being a fundamental tool for attracting investment;
- promoting development with multiplier effect: strategic alliances, experts add;
- making the state, region or organization an attractive business destination;
- designing industrial and logistics infrastructure with a regional vision to increase the competitiveness of the local economy;
- generating resources in the short term to be self-sustaining in its operation; and
- involving citizens in productive activities that keep them in their country or state.

It is very important to understand that for the Hvm to work efficiently, it requires political will, participation of the private initiative as investors, an important involvement of society and a joint vision which articulates each and every one of the projects tractors, strategic and or special.

The Hvm defines and classifies the "Projects" using an analogy with the gear system of a speed bike, where, as shown in Figure 8.5, the tractor projects are the ones that have a greater impact by generating the necessary traction to drive the entire system and achieve greater displacement with less effort. Due to their importance and magnitude, the tractor projects drive strategic projects, whose impact is less, but important, in contributing to the integral result of the plan. Finally, special projects are added, which are executed on a smaller scale in response to situations or specific needs that must be addressed.

Hvm takes advantage of the synergy of the system to optimize time, resources and costs, and improve the effectiveness in achieving the objectives and goals. As mentioned, it works as an articulating agent of the strategies and initiatives of the different actors of the public and private sectors. That articulating capacity of the Hvm® is represented by the chain of the speed system of a bicycle, through which the efforts of the different levels of government are channeled and focused, together with the thrust of the private initiative and society. These actors are represented by the pedals of the bicycle, which are the generators of the impulse; besides that, the movement must be executed in a coordinated way and maintaining the same rhythm in both pedals so that the system moves in a balanced way and with the desired inertia thereby

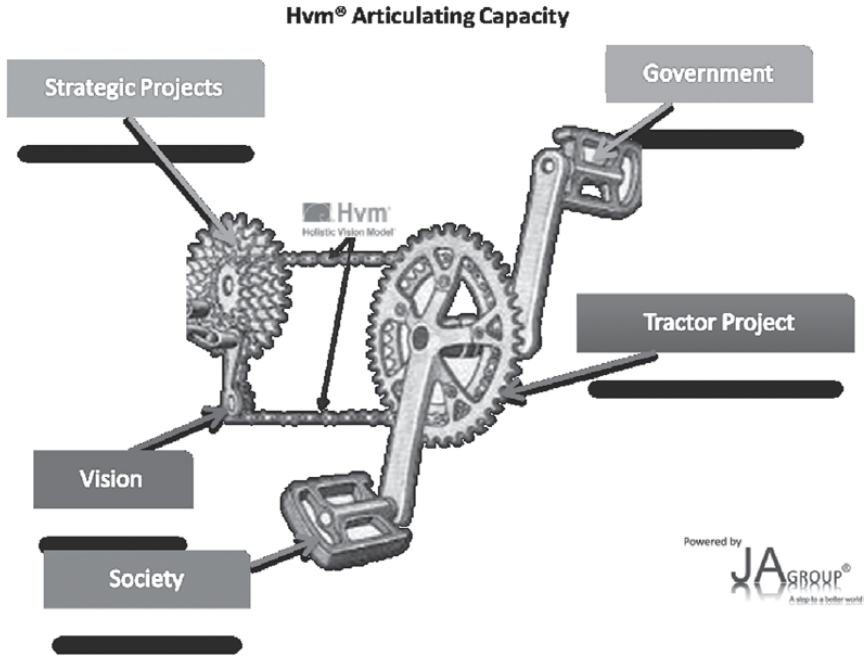

Figure 8.5 Hvm articulating capacity.

achieving the tractive, strategic and special projects that are put in place and generate the planned impact.

The momentum of the model explains the "amount of movement" generated by the projects derived from their global impact on the guiding axes defined in the planning. In this sense, it is necessary to define and identify as tractor projects those that have greater area of influence and capacity as development generators, so that when they are executed, it is possible to "travel greater distance in less time," that is to say that results are obtained with greater impact and transcendence in less time and by optimizing resources.

8.2.1 Tractor Projects

This is a set of initiatives whose main purpose is to expand the productive capacity of a specific economic and social sector, and which, in the context of the national priorities defined in planning, contributes in a particularly significant way to the achievement of the objectives and goals of the corresponding program, within the framework of its own strategy. The function of these tractor projects is to provide a navigation letter to answer

the question: Where do we want to be with a long-term vision? These types of projects are defined within the methodological analysis Hvm. In this case, tractor projects promote and guarantee state growth and development according to the needs of each region, strengthening logistics activities and supply chains, so the strategies that are aligned and articulated within them must impact in various sectors, where its execution requires a close linkage and management, seeking mainly to power the economic development that benefits the population in general.

8.2.2 Strategic Projects

The strategic projects in Hvm are defined as the set of articulated initiatives whose main purpose is to expand the productive capacity of a specific economic and social sector, which coexists within the PT and must be executed on time and within the budget, thereby optimizing the necessary resources to organize, manage and guide the process of object, process and system execution that give solution to requirements, problems or human needs, in the economic and social field. These are created when the competent actors involved determine the way in which they will achieve a strategic objective. It is the process that supports the articulation work of the design and execution activities, allowing the materialization of an object, technological process or systems for the resolution of a problem.

8.3 An Example of Sustainability under the Hvm: Nuevo Laredo, Tamaulipas, Mexico

8.3.1 Creating a Holistic Strategy to Attract Investment

Jorge Acevedo Alarid, president and CEO of the JA Group and a coauthor of this book, was invited to Nuevo Laredo, Tamaulipas, Mexico, to evaluate and design a holistic strategy that would allow the attraction of investments, efficiency of supply chain, economic promotion and social development in an articulated and global manner.

8.3.2 Stages and Processes That Are Developed

In the first instance, it is important to understand the context in which it is being lived in Mexico because it is an uncertain future in a globalized and changing world where the main trading partner wants to change the rules of the game and modify the ways of doing business. On the other hand, new opportunities are opening up, and Nuevo Laredo is no stranger to this. The municipality an interesting point for the development of foreign trade

logistics—both import and export—as it is well known, more than 40 percent of Mexico's international trade operations and Mexico cross precisely by this border crossing of the Mexican Republic; historically has been interesting logistics that occurs in this city.

8.3.3 The New Business Destination—Nuevo Laredo

Using the model, JA Group attempts to empower and transform the municipality of Nuevo Laredo into a business destination. Traditionally, Nuevo Laredo has been considered a crossing municipality—a municipality of passage that does not generate value and there is no value added—which means that there is a great movement of logistic cargo, transport, but there is no other service added to the goods that cross here. It is for this reason that the JA Group suggests the possibility of attracting investments that will generate new jobs and add value for each of these products, and it will no longer be considered a passing municipality.

8.4 Methodology "Hvm"

Hvm is also a methodology that allows articulating the assets and the preponderant activities of the municipality so that they can attract investments.

8.4.1 How Does It Work?

To begin with, it is important to understand the term "holistic," which means that *the whole is greater than the sum of its parts*. This allows to articulate, to integrate all the activities and projects in a single vision. Hvm allows users to create a navigation chart which defines where they are standing, where they want to go and what they are doing. In the case of the municipality of Nuevo Laredo, it seeks to promote all assets that are idle in the municipality.

8.4.2 Natural Attractor of Investments—Nuevo Laredo

Nuevo Laredo has great value and a very interesting productive sector, such as customs agents, freight companies and logistics companies. But what is being sought is for the municipality to become a natural attractor of investments.

8.4.3 How to Get It?

Generating infrastructure that allows rooting, to anchor companies that come from outside and want to make a value addition, Hvm looks forward to integrating the municipality in this first step into four quadrants:

1. *Area of Municipal Reserves*: It is an area where the social fabric has traditionally been broken; today there is a great vulnerability in the social issue, and what is sought is to reposition, empower the citizen and recover public spaces that allows generating security, greater mobility and a healthy environment of potential employees that companies seek. It is necessary to generate an environment of education, health, recreation, homes that are dignified and roads that are developed so as to be comparable to those (in general) in the developed world. Once the social fabric is articulated, it will be possible to have a skilled workforce and move from manufacturing to "mind-bending" and being able to offer a better quality of work. About 35,000 people live in this zone.
2. *Quadrant Oradel*: In here is located one of the industrial parks that already exists and what is sought is to develop and trigger the industrial environment around this park. In these two quadrants there will be an installation of universities, high schools, primary schools, kindergartens and other similar facilities.
3. *Quadrant Airport*: Having the Nuevo Laredo International Airport as its location, it sought to strengthen this area, where investors will arrive easily and which will be the first place they see in the city; Hvm strives to generate complete street in a holistic way to integrate air transport, with the carter and the railroad.
4. *Quadrant Reform*: Being the first square in the city where the main road is located, "AvenidaReforma," which is where it comes from Highways 57 and 45 that connect to the border.

8.4.4 Offering a Business Destination

Today, this administration is creating a navigation chart that allows integrating the social fabric with the economic fabric and together offers a business destination. It is important that in the recovery of streets and public spaces, people feel rooted, linked, proud of being Nuevo Laredo citizens, of being from Tamaulipas, of being Mexican, and together the model seems to successfully offer a dignified society and quality infrastructures for foreign investments. All the information that civil society, businessmen and governments have, both from past administrations and from the present, is integrated and a first dimension is generated.

The second dimension is to articulate all the assets and new projects, including the "Inland Port north in Nuevo Laredo" and the "Inland Port south of Nuevo Laredo," which allows to articulate and have land supply, products and services for national, regional and international companies that could arrive. The time of anticipation is necessary to develop this project, since they

are currently in the final stage of the navigation chart; for September 2017 must have completed the document that allows having the tractor projects that are going to drive and pull the development of the municipality with the strategic projects are those lighter projects where the productive sector and the local business sector to develop the economy.

It is noted that governments should become facilitators for economic development and social impulse with entrepreneurs, productive sectors and, in general, empowering citizens. Nuevo Laredo is a geographically strategic point that depends, contributes and receives many intrinsic factors from the international environment.

8.4.5 Nuevo Laredo "State Showroom"

The objective of Hvm's application is to transform Nuevo Laredo to become the "Showroom" of Tamaulipas, and a case of binational success that allows us to demonstrate that with adequate planning, a holistic strategic vision that empowers the human being to provide opportunities for business development, to be an example for all the cases of all the municipalities that are along the Mexican border with the United States and on the southern border of Mexico is worth pushing. In this case, economic development must be strengthened along four axes:

- social issue;
- economic issue;
- robust infrastructure theme; and
- political theme.

8.4.6 Think Like a Mexican

What the holistic vision is about is planning and building the future; anticipating the facts, creating attention to future and not past needs.

8.5 Methodology "Hvm"

Hvm, defining the *how to do it*, must contain human resources and capital and also anticipate exit clauses; this methodology lands and helps to execute the work and make reality what the Hvm does in the planning. The execution of the plan in Nuevo Laredo began in October 2017 and the putting into operation of the four quadrants mentioned above is anticipated, to which there has been a magnificent reception by the government of Tamaulipas, which wishes

to use Nuevo Laredo as a "Showroom" with the possibility of replicating this model in other municipalities of the state.

8.5.1 Mexico Needs to Regain Confidence and Empower the Streets

Citizens gradually need to be involved in development; they have to participate actively in each of these processes. Although they will begin to do works of restoration of public spaces and complete streets (e.g., sidewalks, streams, cycle paths, street lighting, signage), there must be citizen participation and disciplined pedestrians and drivers; and all this will have to be accompanied by quality road usage education, a culture of keeping the roads clean and to participate (Figure 8.6).

Mexican has to regain confidence and empower the streets, having confidence there will be less delicacy, in an illuminated street it is more likely that united families and their children go out to play.

8.5.2 Nuevo Laredo—a Good Place to Live

Through the process of Hvm, citizens will be able to see the recovery of public spaces, articulation and involvement of entrepreneurs to promote Nuevo Laredo as a tourist destination, with industries and services, and a good place to live. This project engages society and government, entrepreneurs and visitors, to make Nuevo Laredo a national benchmark.

8.6 Conclusion

As infrastructure alone does not generate additional value, it is important to consider sustainability as a generator of economic and social opportunities, helping with the optimization of supply chains, design of logistics platforms and industrial parks. Today the prospect of implementing Hvm in a municipality like Nuevo Laredo will give it the opportunity to be a sustainability and logistics development case study capable of improving competitiveness in supply chains binationally.

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Figure 8.6 Restoration of public spaces and complete street.

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Chapter 9

REVERSE LOGISTICS

Reverse logistics is the process of moving goods from their typical final destination for the purpose of capturing value, or proper disposal. Remanufacturing and refurbishing activities may also be included in the definition of reverse logistics. In this chapter, we will achieve the following objectives:

- provide an overview of key issues of reverse logistics;
- discuss reverse logistics management;
- describe reverse logistics management activities; and
- illustrate typical examples in reverse logistics management.

9.1 Introduction

Only a few decades ago, the world spoke about "quality" as a concept to add value in products and services; then the "just in time" concept appeared some years after. At that time, engineers, administrators and logistics strategists focused on designing intelligent and reliable strategies that would boost the concept of "supply chain" and guarantee greater efficiency in the delivery of products and services on time. It was essential to do what was necessary to achieve such, the production lines did not stop for any reason and added to the previous concept of quality and the consumers satisfied their need, taste or desire as soon as possible.

Quality refers to the ability of an object to meet implicit or explicit needs according to a parameter, a fulfillment of quality requirements (Figure 9.1). It is a subjective concept related to the perceptions of each individual to compare the thing with any other of the same species, and various factors such as culture, product or service, needs and expectations directly influence this definition.

The term quality of Latin is "qualitative." A current view of the concept of quality in marketing indicates that quality is not delivering to the customer what they want, but delivering what they had never imagined they were looking for and that once they get it, realize it is what they have always wanted.

There is also quality control, quality assurance and quality management concepts that are related to quality in industries and services. They are used in

Figure 9.1 Quality refers to the ability.

various areas through quality indicators such as standards and quality standards (Figure 9.2), for example, ISO 9000, ISO 9001, ISO 9002, ISO 9003, ISO 9004, ISO 14000 and others defined by the International Organization for Standardization (ISO) since 1947, the international organization responsible for forming and promoting a system that allows the international standardization of a large number of products and also covers several areas. ISO was established in 1946, when several representatives from different countries, around 25 in number, met because of the globalization that was already occurring during that time, and in response to the need to adopt measures that regulated the standardization of several characteristics of products, such as safety, environment, health and so on, which arose due to the commercial exchange that already existed.

9.2 Just in Time

The concept of "just in time" (JIT) began shortly after the Second World War II as part of the Toyota Production System. Until the late 1970s,

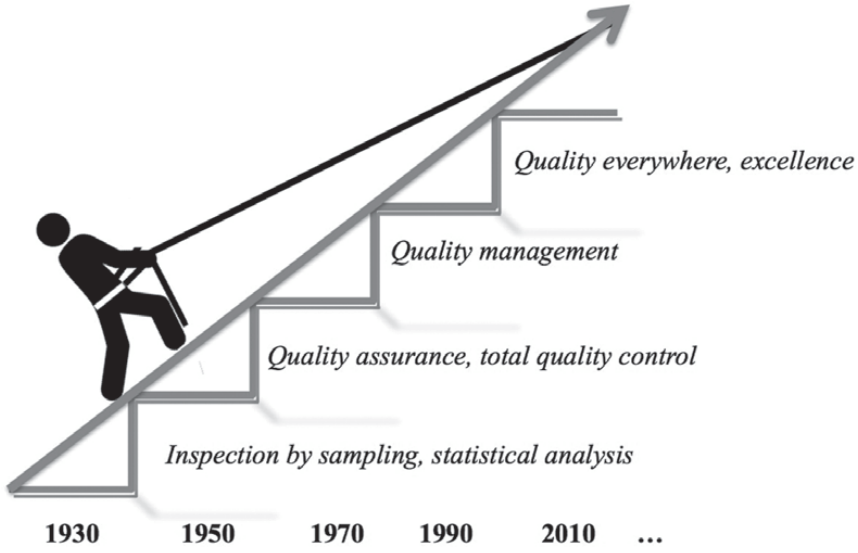

Figure 9.2 Quality evolution.

the system was restricted to Toyota and its family of key suppliers. In the following years it spread all over Japan, and by the 1980s it reached the West, with the automotive industry as a catalyst. Thus, JIT manufacturing means producing the minimum number of units in the smallest possible quantities and at the least possible moment, eliminating the need for inventories.

It is a philosophy that defines the way in which the production system should be managed. It is an industrial philosophy of eliminating everything that involves waste or waste in the production process from purchase to distribution. Waste, in this context, refers to anything that does not add value to the product. It is a method to achieve excellence in a manufacturing company, based on the continuous elimination of wastes, say, inspections, transport between machines, storage or preparations. Precisely, the denomination of this productive method indicates to us its philosophy of work, raw materials and products arrive just in time, either for manufacturing or for customer service.

The JIT production system is a production to demand adaptation system that allows diversification of products by increasing the number of models and their units. One of its main objectives is to reduce stocks, keeping strictly the necessary ones (zero stock-based methods), which implies a change in the mentality of the productive process, of the distribution and the

commercialization of the products, seeking to achieve synergistic benefits in the production–consumption chain.

The JIT system includes three subsystems: the manufacturing JIT, the information processing JIT and JIT transport. Definitely, the integration in the logistics chains of the exchange of goods, of the subsystems corresponding to industry, commerce and transport is considered.

JIT systems have had an unprecedented boom in recent decades. Thus, after the success of Japanese firms in the years following the crisis of the 1970s, many researchers and companies around the world focused on a form of production that was linked to both the cultural and social aspects of Japan and, therefore, very difficult to implement outside the country. However, it was later demonstrated that, although the implementation of the principles and techniques that supported JIT production systems required a profound change in the production philosophy, they did not have a specific form of society as a requirement as was initially expected.

After being formally adopted by many Japanese plants in the 1970s, the JIT system began to be implemented in the United States in the 1980s. In the case of Mexico and several other Latin American countries, some of the initial experiences of implementing techniques of JIT production showed the viability of these approaches in that country in the early 1990s.

Properly executed, the "just in time" philosophy reduces or eliminates much of the waste in purchasing, manufacturing, distribution and manufacturing support activities (office activities) in a manufacturing business. This is achieved using the three basic components: flow, quality and employee intervention.

9.3 Climate Change

All those who were or have been involved in logistics are motivated by making changes and revolutions that have made more efficient supply chains possible, at the interior of the manufacturing companies, services and retailers, having direct repercussions on consumer behavior.

Climate change (Figure 9.3), depletion of natural resources and increased awareness of the environmental deterioration generated by production, distribution and consumption processes have forced supply chains to become more responsible, reduce pollution and more competitive among all the links that form the chain.

According to UNCTAD (2017), about one billion tons of carbon dioxide are produced by maritime transport per year and is around 2.5 percent of global greenhouse gas emissions from fuel combustion. Because of energy

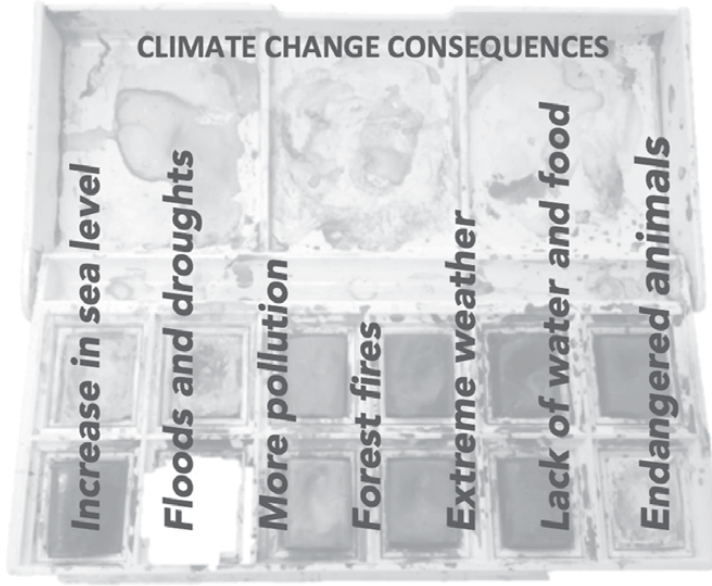

Figure 9.3 Climate change consequences.

developments and economic growth, maritime transport emissions will see a further increase of 50–250 percent. Developing carbon dioxide footprints will ease the climate change situation in the forthcoming years.

9.4 Green Logistics

As mentioned, the concept of "green logistics" is the integral transformation of the strategies of the logistics, structures, processes and systems for companies and corporate networks serving to create environmental friendly logistics processes, consents, and responsible and efficient use of resources. The "green" logistics target system is carried out through a balance between the economical, ecological and eco-efficient, creating sustainable value for stakeholders and investors (Figure 9.4). Considering, observing and evaluating for the first time the consequences and impacts that are generated in the medium and long terms.

Another way to contribute is to simulate the gas emissions of a fleet of vehicles in advance, something that can be done thanks to a model that roughly calculates the emissions. It also considers the type of vehicles used and the measures taken by the region where it works.

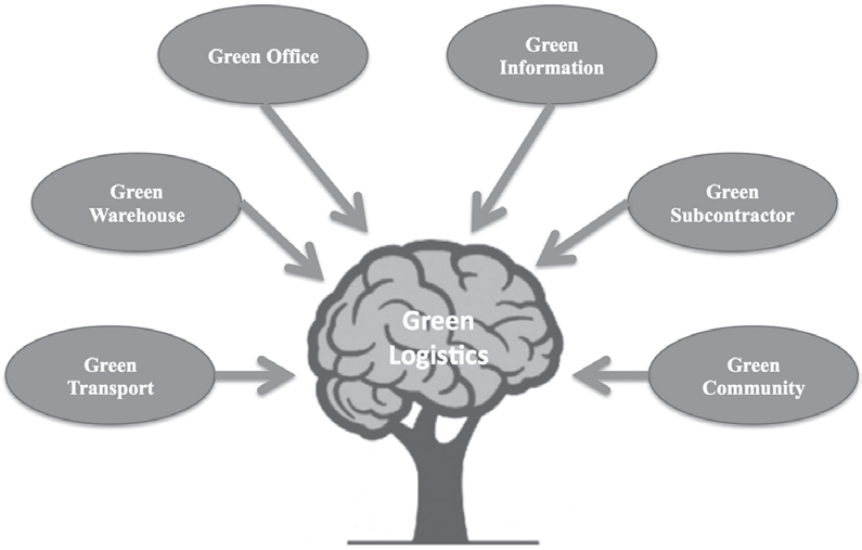

Figure 9.4 Green logistics.

9.5 Concept, Objectives, Advantages and Disadvantages of Reverse Logistics

It is well known that the world is facing increasing challenges from garbage (waste). Indeed, we are now at a point where pollution is doing serious damage to the Earth. Every time pollution increases, the number of endangered species close to extinction increases. In addition, climatic change that is presented by this effect affects all species of living things, and so it is necessary to create and implement tools to help us reduce waste generation.

For some organizations, reverse logistics is one of the most widely used ways for Access to the recognition for "Socially Responsible Companies" (Figure 9.5). Reverse logistics does not only apply to the distribution of products until they are sold, but also to the collection of waste, after its sales. In this case, the firm must be committed to collect the necessary components of waste that can be recycled and reused.

By implementing a good integrated strategy in the supply chain, the advantages of reverse logistics can be reaped, such as the generation of resources, the sustainability of productive sectors and the addition of value to what many consider a problem, or simply "trash."

Figure 9.5 Social responsibility.

9.5.1 Concept of Reverse Logistics

If logistics is an operational function that includes all the activities and processes necessary for the strategic management of the flow and storage of raw materials and components, inventories in process and finished products, as well as the necessary actions to ensure that they are in the right quantity, at the right place and at the right time, we must provide important value to the post-sales products, post-use, and all the elements that accompany it on its journey before reaching the last user or consumer. As seen in Aranda et al. (2004, p. 23),

> Logistics and supply chain is a set of functional activities (transport, inventory control, etc.) that are repeated many times along the flow channel, whereby the raw material is converted into finished products and added value for the consumer [see Figure 9.6]. Since raw material sources, factories and outlets are not normally located at the same places and the flow channel represents a sequence of manufacturing steps, logistics activities are repeated many times before a product arrives to its market place.

Reverse logistics is thus a booming concept, especially due to the advances made in recent years in the field of information and communication technologies.

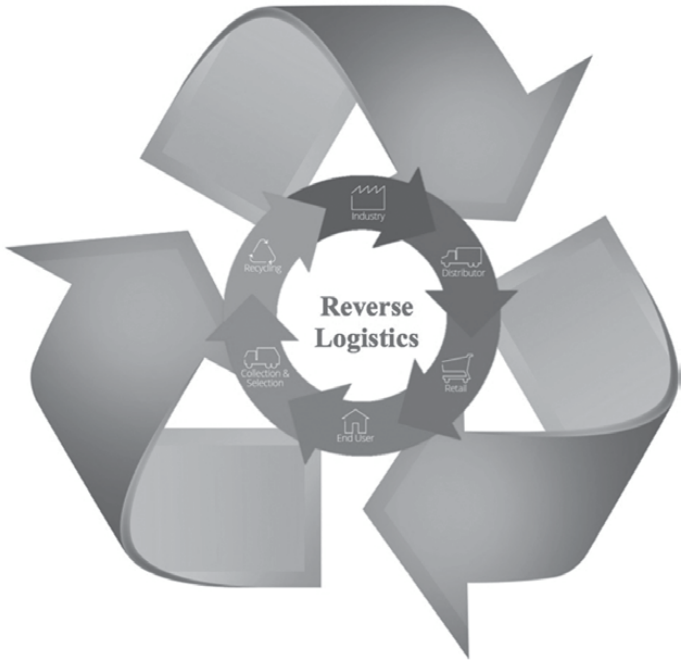

Figure 9.6 Reverse logistics.

The development of social networks and the internet has ensured that along with the new and almost unlimited business opportunities offered by e-commerce have emerged very specific logistics needs, which companies within the sector face with maximum speed and efficiency. Challenges, in most cases, are directly related to reverse logistics, an aspect that has become a fundamental key for commercial activities supported by new technologies, and which aims to improve the level of customer satisfaction along with a positive increase in their reputation in the market.

> Reverse logistics is the process of efficiently planning, implementing and controlling, at an appropriate cost, the flows of raw materials, inventory in process, finished goods and related information from the point of consumption to the point of origin for the purpose of recovering its value or been able to get them in an proper way. (Gaytán Iniestra, 2008, p. 11)
>
> By reverse logistics it is known as the process of planning, implementing and controlling the flow of products from the point of consumption to

> the point of origin in an efficient way, with the purpose of recovering its value or that of the return itself. (Bastos Boubeta, 2007, p. 12)
>
> Reverse logistics is the process of designing, implementing and controlling a flow of raw material, inventory in process, finished products in related information from the point of consumption to the point of origin in an efficient and economical possible way, for the purpose of recovering its value or its proper return. It is in charge of the recovery and recycling dangerous packaging and waste, as well as the processes of excess inventory return and seasonal inventories. Even it speeds n the end of life of the product, in order to give it outlet in markets with greater rotation. (Rosas Lezama et al., 2009, p. 43)
>
> Reverse distribution is the process of continuous recovery of the products or their packaging to prevent their accumulation in the landfills or the energy consumption derived from their incineration. It extends the responsibilities of the members of the distribution channel, because they are responsible for the products after their sales and after consumers have used them. (Stern et al., 1999, p. 13)
>
> Reverse logistics is the process of planning, implementing and controlling the flow of raw materials, in-process inventory and finished goods, from a point of use, manufacturing or distribution to a point of recovery or adequate disposal. (Ramírez et al., 2012, p. 35)
>
> Reverse logistics, according to the Executive Board of Reverse Logistics, can be defined as: the process of planning, implementing and controlling the effective flow of costs and storage of materials, ongoing inventories and finished products, as well as related information, from the point of consumption to the point of origin, in order to recover value or ensure its correct disposal. (Aranda Usón et al., 2006, p. 87)

The development of the logistics function in the organization in recent times has been very significant, becoming a variable strategic to obtain competitive advantages. Currently, companies must also address reverse logistics by analyzing logistical processes related to the return of products from the consumer to the producer, recycling, reuse of materials and components, eliminating waste disposal and the reconditioning, repair and remanufacturing operations. Employers and managers of the company should pay special attention to the management of returned products, whose objective is to recover as much economic (and ecological) value as possible, thus reducing the final amounts of waste. Companies must develop an effective policy for the management of recovered products, without affecting in a significant way their cost structure.

Companies are moving that greater strategic weight of reverse logistics in the form of purchasing policies aimed at the use of reusable products, responding to customers' interest in environmentally friendly companies or recovering some of the value of returning materials to the organization, increasing its benefits.

Therefore, it is particularly interesting for companies to know what options are currently available to efficiently manage the reverse flow of products in a developed market and especially to know the activities and characteristics that reverse logistics presents at the moment, as well as the advantages that motivate these practices, especially the ones called excellence practices.

In Latin America (including Mexico), companies still do not take advantage of the benefits and experiences of large companies in developed countries in terms of recycling, reverse logistics to reduce costs, design new markets or even create new products. However, the arrival of new foreign companies to Mexico has caused companies to view this as a new opportunity to do business. We can simply have products returned from a consumer from a company, because maybe the product came in bad condition or simply the manufacturer decide that it is not the product that they are going to sell, and they change the decision of the purchase, then they return the product.

9.5.2 Objectives of Reverse Logistics

A great reason for the implementation of reverse logistics in organizations is the large number of returns that they face in recent years, which has negatively impacted their financial status. One solution to this problem is that retailers and organizations are promoting the efficient reinsertion of returns in the commercial chain, positively affecting costs by lowering them and recovering the value of the out-of-use product (OUP). This is considered a business strategy for the organization positioning in the market and has led organizations to innovate in the return policies area, which are more flexible, allowing them to obtain a competitive advantage and gain the trust of their customers and to be faithful to the organization in their next purchase, albeit the inconveniences or failure that the finished product or service could present.

The basic objectives of reverse logistics can be summarized as follows: purchasing management, waste management, merchandise withdrawal, products classification, product engineering, reuse or destruction, return, waste management; recycling and materials replacement. Basically, there are two modes of reverse logistics according to their purposes:

Figure 9.7 Waste logistics.

- return logistics, responsible for managing the returns from the distribution point (often the last customer, in e-commerce contexts) to the product's origin center;
- waste Logistics (Figure 9.7), including recovery, recycling or waste treatment.

There is no doubt that in e-commerce environments, B2C (company–client) commerce has proliferated enormously, with return logistics being a key element in supply chain planning.

Among the major challenges facing return logistics, as is to be expected, is the reduction of costs and times: consumers understand that returns should be free (with costs absorbed by the company). In addition, there is also an increasing demand when it comes to product changes.

Of course, not everything in reverse logistics focuses on returns; especially in the context of B2B (intercompany) relations, it is also encouraged by the development of new technologies, waste logistics and recovery, all of which play central roles. Waste is, in most cases, a necessary bad situation where companies must coexist. Reducing them, adjusting them as much as possible to the real needs of their production and finding new ways to manage, treat or recover them does not exempt (but increases) the need for proper planning in terms of reverse logistics.

9.5.3 Advantages of Reverse Logistics

Some of the potential advantages of implementing a reverse logistics program are listed below:

- decrease of "surprise" or uncertainty in the arrival of OUPs;
- reuse of some materials;
- possibility for companies to cover other markets;
- greater trust in the customer when making the purchase decision;
- significant improvement of company image to consumers; and
- obtaining feedback information about the product.

9.5.4 Disadvantages of Reverse Logistics

Previous studies are required for decision policies establishment on the subject.

- It is not just a simple manipulation of the product.
- All departments of the company are related to the activities that are intended to implement reverse logistics.
- Entries to a reverse logistics process are "unpredictable."
- Inspections should be performed on each product individually and meticulously.
- The new (reverse) chain includes a number of processes that do not exist in direct logistics.

9.6 Reverse Logistics Management Activities

It must be decided whether a company should carry out various activities with its own resources or whether, on the contrary, it requires the services from a specialized operator. Returns in small quantities tend to represent higher costs by integrating them into the system (Cure et al., 2006, p. 20). Causes that generate and implement reverse logistics need:

- merchandise in bad condition;
- return on exceeded stocking;
- customer returns;
- obsolete products;
- seasonal stocking; and
- reverse logistics processes.

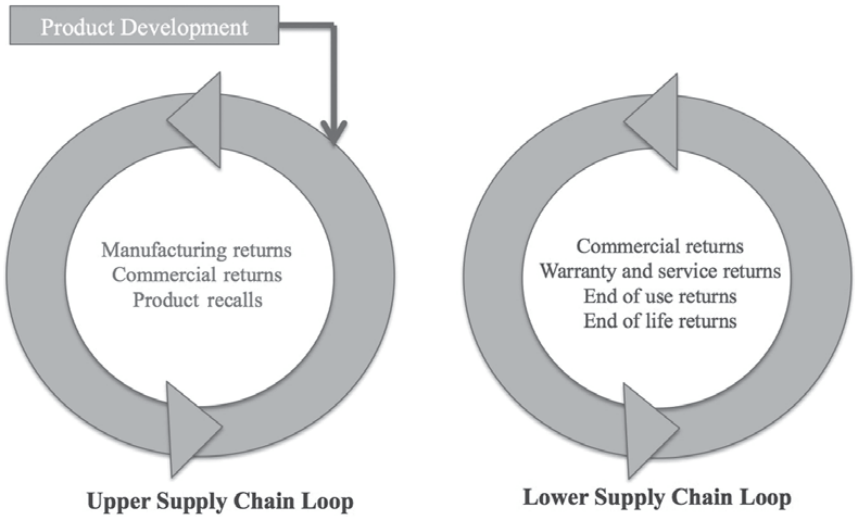

Figure 9.8 Supply chain.

Reverse logistics processes focus on five key objectives: (1) procurement and purchasing, (2) reduction of virgin supplies, (3) recycling, (4) replacement of materials and (5) waste management (Figure 9.8). In each of the processes of business logistics the five approaches can be identified:

1 *Procurement and purchasing*: It involves supplier development and procurement of raw materials, components, packaging materials and management units that are "environmentally friendly."
2 *Reduction of virgin supplies*: Product engineering activities and retraining of human resources with the purpose of evaluating activities of reuse of materials that are not in use anymore, preferring materials of recycled origin, choosing containers, packaging, handling units, reusable and recyclable packaging.
3 *Recycling*: It is necessary to develop policies of recycling with respect to the performance or standards of the product to use materials of recycled origin, explore technological innovations that make it possible to use recycled materials; and finance studies to reduce the use of virgin raw materials.
4 *Replacement of materials*: The increase in the rate of innovation in recycling processes should encourage the substitution of materials, in particular the heavier ones, with lighter ones with equal or higher performance (as is the case in the automotive industry where plastics are massively replacing parts of metal and glass in cars, as well as aluminum or "composed" materials in

the new chassis of the trucks decreasing the tare by facilitating an increase of the load unit for equal weight per axle).

5 *Waste management*: Materials procurement policies should evaluate the waste rate in the use of materials. Waste management is a non-negligible cost. It may also be necessary to have sample acceptance policies if the waste management requirements of the samples or simply their disposal by refusal is expensive.

Without doubt, reverse logistics is a management philosophy that any company should consider for its operation, considering all the factors as mentioned earlier. It is important to have a reverse logistics strategic plantation. When a company adopts its own systems of reverse logistics, it should design, manage and control the recovery and reuse of its products out of use. Its process and quality is usually characterized by the leaders in respective markets, in which the identification between company and product is very high, and they are manufacturers of complex and technologically advanced products, designed to recover some of the added value that incorporates "Design For Environment, DFE; Design For Disassembly, DFDA" (United States Environmental Protection Agency, 1995). The logistics network developed to recover these products is characterized by a complex network, being labor intensive with multiple links, generally decentralized and in which the recovered product is reintroduced into the original supply chain. Xerox, IBM, Electrolux or Bosch are examples of companies that have their own reverse logistics systems.

When the systems are not involved in reverse logistics, the company responsible for the product does not directly manage the recovery, but is performed by third parties outside the company. In this case, there are two possibilities.

9.6.1 Adhesion to an Integrated Management System

An integrated management system (IMS) (Figure 9.9) is an organization that promotes and manages the recovery of products out of use for its subsequent treatment or proper disposal. IMS are made up of members of the supply chain (suppliers, manufacturers and distributors) who finance the system according to their market share. In Spain, there is a different IMS, such as ECOEMBES (packaging), ECOPILAS (batteries and batteries for domestic use) or ECOVIDRIO (glass containers), SIGrauto (the Spanish Association for the environmental treatment of end-of-life vehicles) among others. Generally, the companies that have joined IMS share certain characteristics: they generally produce goods that are fairly homogeneous, are not technologically complex and have little unit value (glass) or complex and higher value (vehicle out

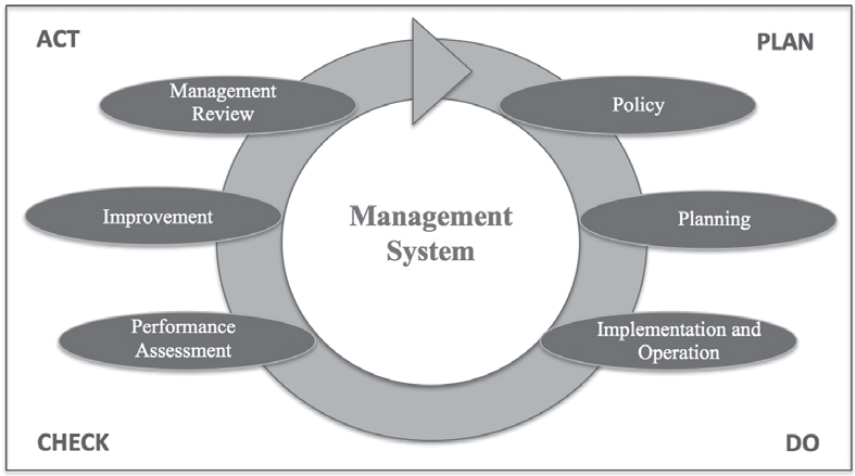

Figure 9.9 Management system.

of use), in which they usually recover the material or materials with which the product is made (networks for recycling).

Logistics networks are usually centralized, simple structures with few links and in which the recovered product is not necessarily destined to the original supply chain, so that the original and recovered products do not usually share the same final markets.

9.6.2 The Professionals or Logistics Operators

Companies can choose to hire specialized firms for the provision of reverse logistics services. Usually, this option is used by companies that design the reverse function from the end of the chain, either to comply with current legislation (hazardous or toxic waste) or operational requirements (return logistics). These types of networks are usually simple logistics systems, with few links, in which the transport function is very important and presents a decentralized structure.

9.7 Typical Example of Reverse Logistics

9.7.1 Recycled Plastic with Discarded Post-Use Products

Today there are many plastic products in the market used in all types of sectors (e.g., industry, agriculture, construction, automation, etc.). The increase in the use of these products in the past three decades has created more plastic waste.

In addition, due to its production from petroleum and its great resistance to degradation, it is very important to recycle plastics.

Plastics are polymers (substances formed by long chains of repeated molecules), mostly synthetics, that, due to their good properties, have a large number of applications and uses.

9.7.2 Recycling Methods

There are several types of plastic recycling, but for everyone, the first step is to carry out the proper logistical process, after identifying the products that will be the new raw material, based on products that are mostly used by consumers, or garbage or wastes generated in the processes of manufacturing companies. Once the plastic is collected, it is classified according to the color and type of material (PET, HDPE, Mixture) and after that it is sent for washing, compacting and storage. Once in the recycling plant, the plastic is classified according to its physical characteristics. In this case, there are two methods for plastic recycling

9.7.2.1 Mechanical Recycling

It is the method that is used in most countries. It consists of cutting the plastic pieces into small grains for later treatment. The mechanical recycling processes begin with the following stages: grinding, washing and pelleting (homogenization of the material and cutting into small pieces). Once this process is finished, the pellets are melted, and the plastic is given a new shape according to the method used, in the form of sheets, solidifying in a cold mold, in the form of hollow pieces by introducing air into the interior or using molds at pressure.

9.7.2.2 Chemical Recycling

It is based on degrading the plastic materials, by heat or with catalysts, getting to the point where the macromolecules are broken, and only simple molecules commonly called monomers remain. From these monomers, other types of plastics or fuels can be obtained according to the technique being used. This technique, despite being less used than mechanics, is the most promising, since the basic monomers can be remade into plastics of the same quality as the original.

Recycled plastics can be used to make:

- plastic wood: for the creation of urban furniture (benches, fences, etc.);
- textile fiber: for clothing, carpets, ropes, etc.;

- bottles: most bottles are recycled for more bottles; and
- construction: bricks, pipes, fences, etc.

As we can see, each of these processes requires a reliable and well-designed supply chain for maximum efficiency. The same could apply in the case of glass, paper, food and organic waste for production of compost, metals, minerals and so on. It is very important that consumers know different applications that are obtained from the recycling of plastics so that they become aware of the importance of recycling. Indeed, many companies have already joined the reverse logistics model so as to showcase their support to ecological themes.

Without a doubt, when we talk about reverse logistics examples of success, Amazon comes to mind. The multinational corporation has been mentioned on many occasions for its support of this method, and it has been spreading this message to the large number of companies that offer their products through the platform. So, in the field of reverse logistics, Amazon is one of the mirrors to look at since its return policy is one of the most envied at the online level.

9.8 Conclusions

Reverse logistics is a methodology of planning, implementation and efficient control of the effective flow of costs to establish a framework of logistics activities that are carried out from the point of consumption to the point of origin, where it is intended to collect, dismantle and process finished products that are used, damaged or no longer satisfies the needs of consumers, also known as out-of-use products, maximizing value utilization, sustainable use or in its case a correct disposal.

Figure 9.10 shows the route or process followed by reverse logistics, which consists of transporting the OUP from the user's hands to the producer, but reverse logistics is also responsible for the transformation of the returned products into newly usable products. This tool allows us to make companies aware that they should use environmentally friendly resources, because our planet (global village) firmly needs companies to be socially responsible, to help gather those components of their product that damage the ecosystem when the life cycle of a product ends.

Reverse logistics serves as a tool to support the competitiveness of organizations, especially private ones, by reinforcing the links between them and their clients, making it feels important for the supplier. A good service in every single way, with all the possibilities of contact with clients, makes them feel that their suppliers are striving their best to fulfil their requirements and, therefore, allows the organization to achieve and sustain a good position in an ever-competitive market.

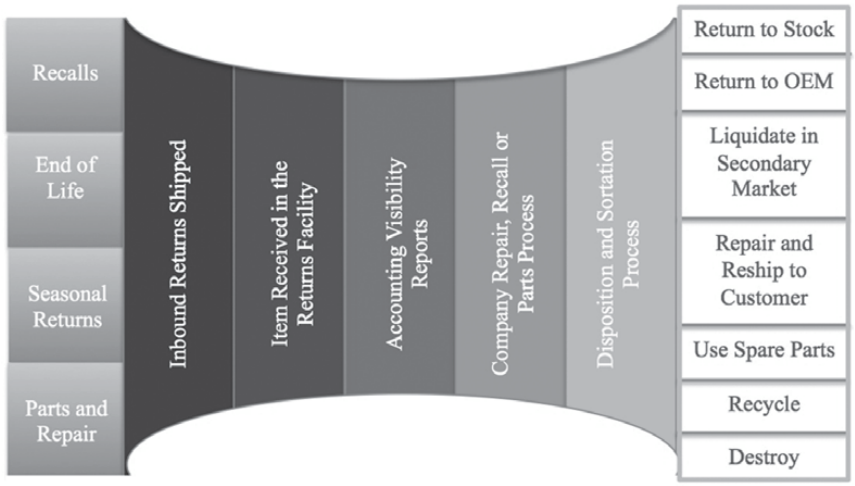

Figure 9.10 Reverse logistics pipeline.

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Chapter 10

LOGISTICS ASSOCIATIONS

The emergence of logistics associations generates the tremendous growth in the logistics industry. Logistics associations are one of the important platforms for logistics professionals to meet and generate business opportunities. In this chapter, we will achieve the following objectives:

- study different logistics associations in Asian and Canada regions and
- identify the roles of logistics association.

10.1 Introduction

Logistics associations have appeared in the world in the nineteenth century. The growth of these association has spread from the western to eastern regions. In order to align with the ever-changing logistics business practices and employer expectations, logistics associations organize various activities (i.e., seminars, site visits, conferences, social gatherings etc.) and collaborate with academic institutions to deliver different courses and practical examinations. Nowadays, logistics professionals tend to acquire both academic and professional qualifications. It makes good sense for them to obtain various professional qualifications from different logistics associations. In other words, the number of logistics associations is trending rapidly upward since the twenty-first century.

10.1.1 Why Join a Logistics Association?

Until now, various students and industry participators have been eager to strive to obtain various academic qualifications. The majority of them seriously overlook the significance of professional qualifications obtained from different logistics associations. In this section, we explore the rationale behind you joining a logistics association in the following reasons:

- logistics industry networking opportunities;
- logistics business and professional development;
- advocacy of government policies;

- enriching the logistics knowledge and obtaining updated logistics industry trends through different events such as seminars, site visits, workshops and conferences;
- gaining international recognition;
- accessing logistics education and training; and
- accessing membership directories.

10.1.2 What Are the Top Challenges for Today's Logistics Associations?

- Currently, more and more logistics associations have been established worldwide. In reality, logistics associations are not only encountering stiff competition from various logistics associations, but they are also facing trouble from external forces, including government policy, business environment and sociocultural and technological advancement. In this section, we investigate the top challenges for today's logistics associations.
- motivating young people to join a logistics association;
- keen competition between logistics associations;
- as logistics associations are nonprofit organizations, they strive to enlarge their financial support and human resources; and
- logistics associations are not recognized as having jurisdiction status. Hence, it is difficult to expand their membership database either by recruiting new members or inspiring current members to renew their membership status from time to time.

Currently, there are different well-known logistics associations serving logistics professionals in both Hong Kong and Canada. The key logistics associations are briefly discussed in the following sections.

10.1.3 The Chartered Institute of Logistics and Transport in Hong Kong

The Chartered Institute of Transport (CIT) was established in the United Kingdom in 1919 and then transformed into a Chartered Institute in 1926. In 1968, the Chartered Institute of Logistics and Transport (CILT) set up the Hong Kong branch. Subsequently, the Hong Kong branch was further upgraded to National Council status and renamed as the Chartered Institute of Logistics and Transport in Hong Kong (CILTHK) in October 1991. Since then, CILTHK has its own authority to manage all institute matters independently. For over 40 years, CILTHK has extended the networks with various academic institutions, government bodies and logistics firms. CILTHK

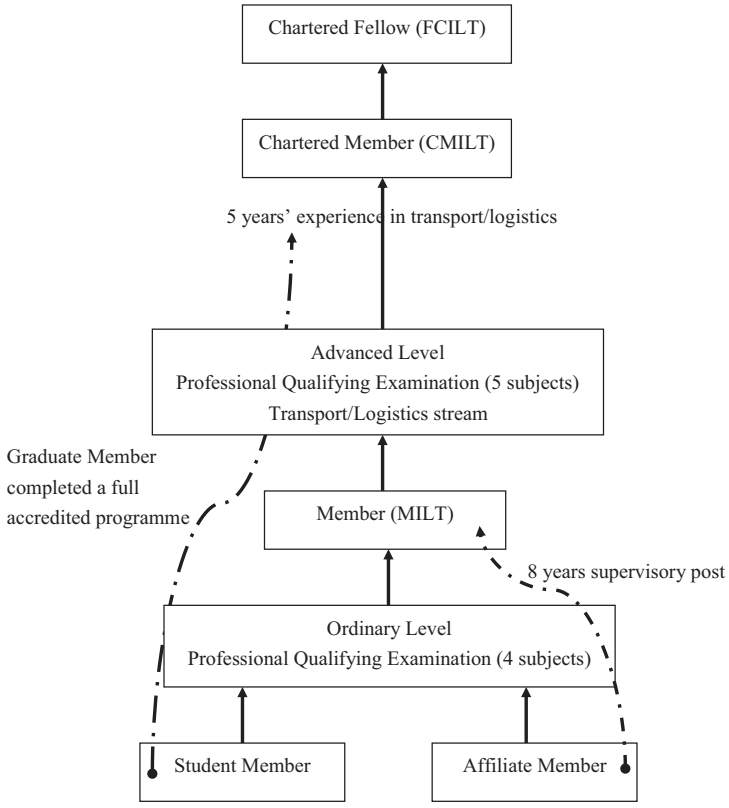

Figure 10.1 CILTHK membership structure.

currently has approximately 1,900 members widely ranging from junior staff to experienced senior manager in the industries of logistics, shipping, railway, road, airline, public transport, academic institutions, government and consultancy. Until now, CILT has established 31 branches across continents. CILTHK members are free to gain cultural exchange and engage in logistics knowledge transfer to different people from different parts of the world (CILTHK, 2017).

CILTHK set up 10 committees for members to join, namely, Education & Training, Gala Dinner Organising, Logistics Policy, Professional and Marketing Activities, Membership, Publication, Quality Assurance, Transport Policy, WiLAT and Young Professionals (CILTHK, 2017). Based on the candidate's academic qualification and relevant work experience, CILTHK provides five main individual membership classifications. CILTHK membership structure is illustrated in Figure 10.1.

10.1.4 Hong Kong Sea Transport and Logistics Association

The Hong Kong Sea Transport Association (HKSTA) was launched in 1994. Most of the members come from freight forwarding, shipping and logistics companies. In order to meet the significant changes of the logistics industry, HKSTA officially changed its name to Hong Kong Sea Transport and Logistics Association (HKSTLA) in May 2003. The Association has over 100 members. HKSTLA is taking a proactive role of setting industrial standards and offering educational courses so as to enrich the logistics service levels and practices in Hong Kong. It set up an Executive Committee and six subcommittees including Membership & Election, Promotion & Public Relations, Recreation & Sports, SME Development Steering, Trade Information & Technology, and Training (HKSTLA, 2017). Based on a candidate's academic qualification and relevant work experience, HKSTLA offers five main individual membership classifications. The HKSTLA membership structure is shown in Figure 10.2.

10.1.5 Institute of Seatransport

Two lecturers (Captain Ngai and Captain Chu) at the Department of Maritime Studies of Hong Kong Polytechnic University and a group of people in the shipping industry founded the Institute of Seatransport in February 1986. Members were drawn from different fields in the shipping industry, for instance, marine insurers, ship brokers, ship owners, maritime lawyers, maritime arbitrators, average adjusters, ship and cargo surveyors, harbor pilots, senior seagoing personnel, ship builders/repairers, ship masters and chief engineers. In order to enhance the exchange of professional knowledge within the Hong Kong maritime industry and identify the contribution to the sea transport community, the Institute organizes various seminars, site visits, conferences, workshops and practical training courses (Institute of Seatransport, 2017). Based on a candidate's academic qualification and relevant work experience, the Institute of Seatransport identifies four individual membership classifications. The Institute of Seatransport membership structure is shown in Figure 10.3.

10.1.6 Hong Kong Logistics Association

Hong Kong Logistics Association (HKLA) was founded in 1996. It mainly promotes the concept of modern logistics, which aims to help logistics firms lower the operating cost for value-added solution logistics services. Also,

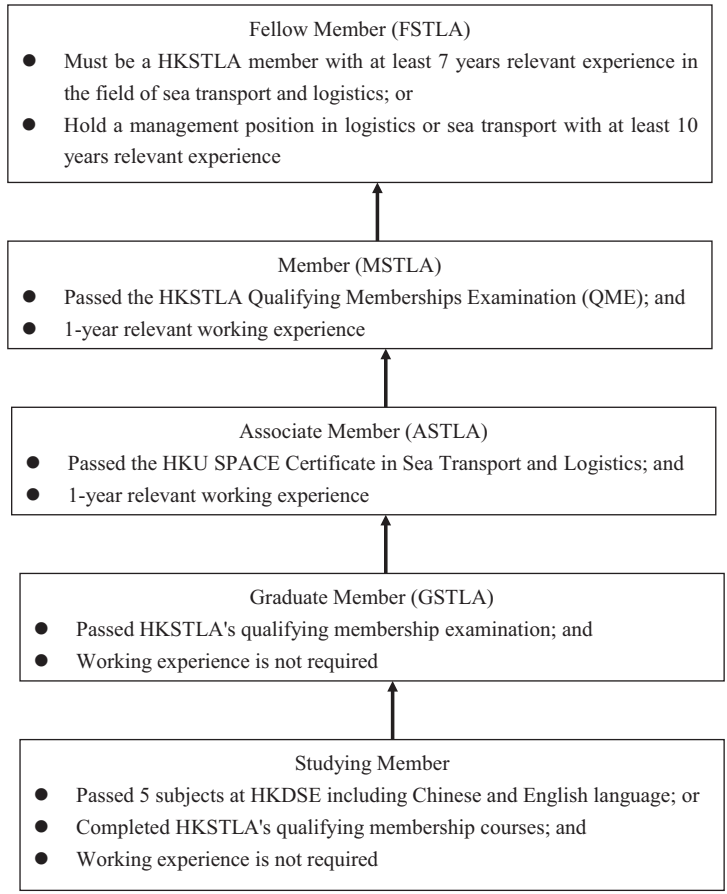

Figure 10.2 HKSTLA membership structure.

Source: HKSTLA (2017).

HKLA collaborates with the China Federation of Logistics & Purchasing (CFLP) in managing certification examinations in Hong Kong. The main objective of these examinations is to improve the competitive advantage of Hong Kong logistics practitioners to work in Mainland China. In addition, HKLA is now working with various government departments, organizations and tertiary institutions to organize regular seminars, meetings and training courses (HKLA, 2017). Basically, HKLA divides individual membership into four main classifications according to the candidate academic qualification

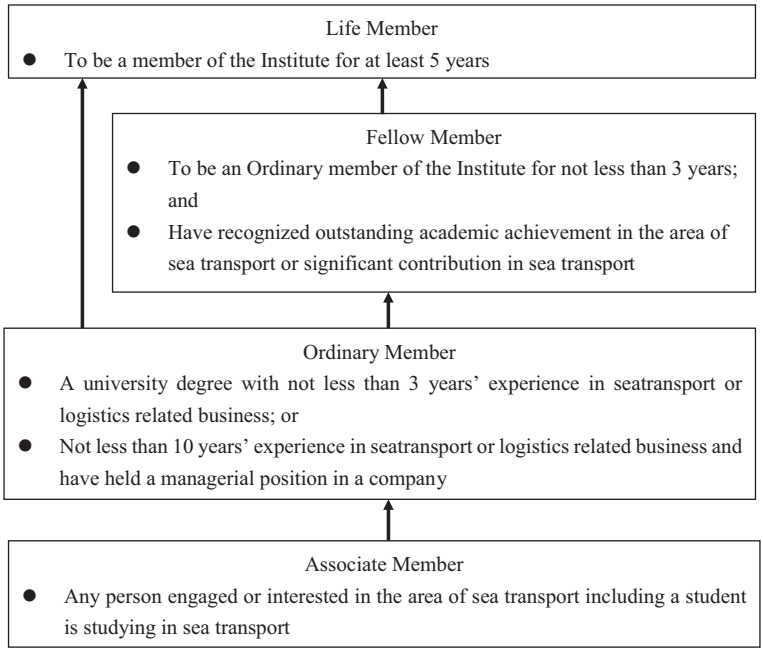

Figure 10.3 Institute of Seatransport membership structure.

Source: Institute of Seatransport (2017).

and relevant working experience. HKLA membership structure is provided in Figure 10.4.

10.1.7 Canadian Institute of Traffic and Transportation

Canadian Institute of Traffic and Transportation (CITT) was established by the industry for industry in 1958 (Figure 10.5). To create sustainable career-long learning and comprehensive career-path development for members, CITT offers five main aspects, including (1) professional certification in logistics (the CCLP designation); (2) courses on business and logistics management; (3) annual Canada logistics conference; (4) SCL webinar series; and (5) professional SCL talent pool. In general, CITT sustains all types of organizations, including manufacturers, global traders, retailers and others who transport resources, raw materials or goods. Up to now, nearly all of Canada's leading transport operators, major ports and 3/4PLs are CITT members (CITT, 2017).

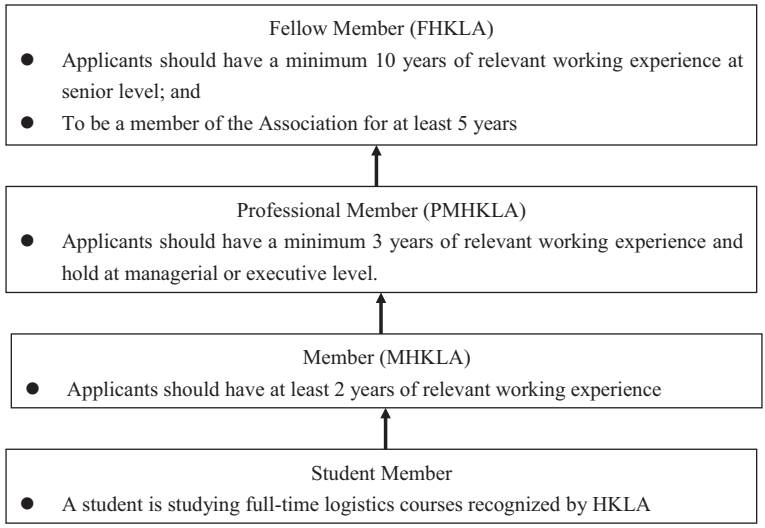

Figure 10.4 HKLA membership structure.

Source: HKLA (2017).

10.1.8 Fast Track—Certificate in Logistics Programme

There is a fast track method to obtain CCLP designation. For example, in Manitoba, Canada, the Certificate in Logistics (CLog) Programme is offered by the Transport Institute of the University of Manitoba (UMTI) and the Red River College (RRC). Students are required to finish eight of the eleven courses provided in the programme. The design of the programme offers maximum flexibility to students whose can select from five courses offered by RRC and six courses offered by UMTI. Basically, most of the courses offered by UMTI align with the curriculum of CITT. Hence, students who obtain CLog could conclude with their CCLP designation with preliminary courses provided at various other post secondary institutions or RRC. The programme definitely meets logistics employers' expectation of establishing a new level of formal education and professionalism. After the completion of the programme, graduates will have a higher chance to work in the transport and logistics industries, especially mid- and senior-level positions, in receiving, distribution, inventory, shipping, marketing and management position in sectors like:

- government: municipal, provincial, federal;
- agribusiness: feed industry, grain handling, food processing;
- manufacturing: woodworking, machinery, metal industry and packaging;

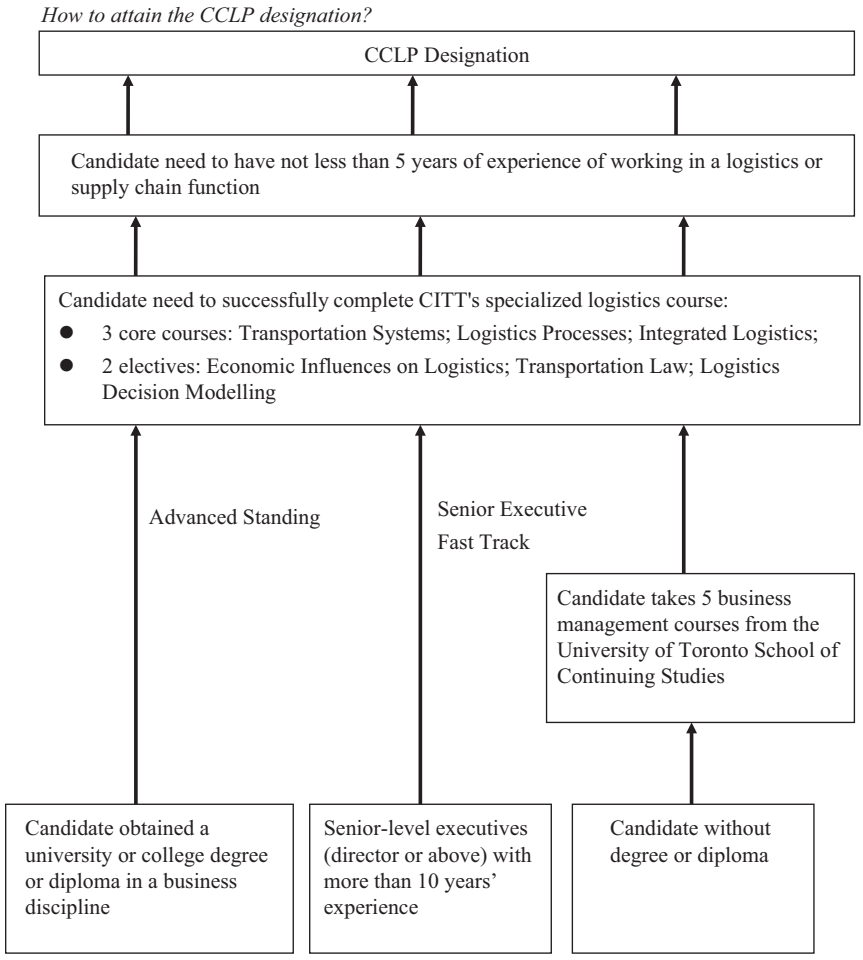

Figure 10.5 How to attain the CCLP designation?

Source: CITT (2017).

- carriers: railways, airports, pipelines, trucking, marine and airlines;
- third-party logistics providers: customs brokers, public warehousing and freight forwarders.

Entrance Requirements: To be considered for the CLog programme, applicants are required to acquire a high school Manitoba Grade 12 standing. Besides, applicants having higher levels of educational qualification and at least five years of work experience in either logistics or transport industry will be considered (UMTI, 2017).

Features: The main features of the programme offer a job-specific curriculum educated by experienced industry professionals. It confronts participants with developing analytical and research skills that will enhance them to create sound business decisions according to their integrated logistics training. Courses are not merely theoretical, but offer practical training that is critical to obtain the necessary skill sets so as to fulfill the challenges of the marketplace. Courses are delivered in the classroom, either online or through correspondence (UMTI, 2017).

The courses in the CLog provided by UMTI are listed in Table 10.1.

10.1.9 International Warehouse Logistics Association—Canadian Council

Starting from the late 1800s, International Warehouse Logistics Association (IWLA) has been offering warehouse logistics organizations. IWLA became popular in the mid-1970s. IWLA-Canada is governed by a seven senior logistics and warehousing professionals and managed by an executive director. It offers a wide range of services to members including (1) representations at all governmental levels for input in regulatory and legislative matters; (2) networking and educational events; (3) facilitating cross-border operational connections with members across North America; and (4) linkage with partner members for supply chain particular services and products. Also, IWLA-Canada collaborates with Canadian Supply Chain Sector Council (CSCSC) in the evolution of supply chain job descriptions and National Occupational Standards for the logistics industry. Regular seminars and conferences are also provided from time to time. In order to train up logistics professionals and upgrade their skills in the workplace, IWLA-Canada and the Schulich School of Business at York University deliver different business programmes together (IWLA, 2017).

10.1.10 Supply Chain Management Association

In 1919, the National Association of Purchasing Agents (NAPA) established the first Canadian chapter in Montreal. Subsequently, NAPA set up the Council of Canadian Purchasing Agents Association (CAPA). Supply Chain and Logistics Management (SCL) started as Canadian Association of Physical Distribution Management (CAPDM) in 1967. In 1969, CAPA was officially renamed as the Purchasing Management Association of Canada (PMAC) so as to recognize the practitioner as a professional purchasing manager. In order to align with the practice of logistics, the name of CAPDM was significantly changed to Canadian Association of Logistics Management (CALM) in

Table 10.1 Courses offered in the CLog

Name of subject	Subject description	Equivalent
Logistics fundamentals	Introduction to the concepts and theory of business logistics, with particular emphasis on logistics management, the delineation of issues pertaining to the planning, organizing and controlling of transportation and logistics activities, and the development of analytical tools and problem-solving techniques used in the field of logistics.	CITT—Integrated Logistics—Level 3—Mandatory
Economic applications in transportation	Introduction to the concepts and applications of economic theory as applied to transportation with emphasis on the costs determining transportation supply under competitive and regulated freight rates: an examination of the front haul/back haul problem and the role of trade in determining the derived demand for transportation; and to demonstrate the interrelation between transportation and economic development.	CITT—Economic Influence on Logistics—Level 3
Legal issues in transportation	A review of Federal and Provincial statutes governing the establishment and operational requirements of transport services; to develop and understand the historical, constitutional and regulatory issues in the development of Canada's transportation systems; a review of the rights and liabilities of carriers and transport authorities; to develop an understanding of the procedures, including dispute and appeal mechanisms, available to shippers and carriers before various transport agencies and boards.	CITT—Transportation Law—Level 3
Transportation policy and regulation	Introduction to the social, cultural, political and economic forces that influence transportation policy and regulation; the historical examination of transportation policy; the effects of subsidies, taxation and regulation on the structure, behavior and performance of transportation and logistics industries, and to develop an appreciation for current transportation policy trends in Canada.	CITT—One miscellaneous business credit—Level 2

Table 10.1 (*cont.*)

Name of subject	Subject description	Equivalent
Risk assessment and safety	To develop a basic understanding of the concepts and terms of risk management; to learn to identify and measure risk in your own facility and to learn how to use risk assessment techniques. The course will provide basic knowledge to be used as a tool for safety, training and planning measures within your own facility.	CITT—Foundations of Risk Management—One Business Credit—Level 2
Marketing services	To develop a basic understanding of the concepts, terms, theories and analysis of issues related to marketing of services. To provide an understanding role of marketing in a modern corporation and the responsibilities of the managerial personnel within their firm's operations. The notions of marketing concepts, segmentation, mix and strategic marketing will be explained within the context of changing economic realities in the organizational environment.	CITT—Marketing: An Introduction—One Business Credit—Level 2

Source: UMTI (2017).

1992. SCMA achieved a breakthrough in 2013. SCL and PMAC were finally integrated with each other, and thus, SCL and PMAC are under the SCMA. Additionally, SCMA provides Supply Management Training (SMT) courses and seminar and its Supply Chain Management Professional (SCMP) designation programme is accredited by the CSCSC. Besides, candidates are only eligible for professional accreditation by acquiring at least three years of progressive practical experience of supply chain management with a minimum six months in a supervisory or managerial position. SCMA now has almost 8,000 members working for either the public or private sectors. Hence, it is proud to be the leading and largest logistics association in Canada (SCMA, 2017).

10.1.11 The Canadian Courier & Logistics Association

The Canadian Courier & Logistics Association (CCLA) is mainly targeted for time-sensitive logistics service providers and couriers operating in Canada. It demonstrates a key role of research, education and advocacy on issues

influencing logistics industry. The membership of CCLA comes from overnight trans-border integration firms, messenger companies and large organizations with global delivery networks, for examples, FedEx, DHL, TNT, Purolator, UPS and Canada Post Corporation. In total, CCLA members are now running their operations in over 200 countries. In addition, it has organized five main working committees which can provide the best knowledge and professional skills for the logistics industry in Canada. These key working committees include cargo security, customs, courier process, regulatory and urban mobility. CCLA offers only corporate membership and the membership level is determined by the company's annual revenue (CCLA, 2017).

10.1.12 Institute of Chartered Shipbrokers

The Institute of Chartered Shipbrokers (ICS) is an internationally recognized professional body for all members of the commercial maritime industry worldwide. ICS was established in London in 1911 and was further granted a Royal Charter in 1920. Currently, ICS has 24 branches across the globe, which includes 3,500 individuals and 120 company members. Members can grasp various opportunities which foster their career in the maritime industry and show the commitment to professionalism (Institute of Chartered Shipbrokers, 2017).

In order to provide professional maritime education and training, ICS has designed and operates its own distance learning program, TutorShip. Until now, TutorShip courses are provided in 16 distance learning centers operated by the Institute around the world. Prior to being granted an ICS membership, the applicant is required to pass professional qualifying examinations (PQE). Basically, PQE is divided into two main groups. Group 1 is focused on compulsory subjects. The student is required to pass all four compulsory subjects. These compulsory subjects represent the basic underpinnings of the entire activity within the commercial shipping industry. Group 2 focuses on specialties which encompass a wide range of practical shipping areas. The student is required to pass any three subjects under Group 2 (ICS, 2017). The details of PQE are demonstrated in Table 10.2.

After passing PQE, a student is eligible for applying for ICS membership. In general, ICS provides three main membership categories. The brief descriptions are listed in Table 10.3.

10.2 Conclusion

In this chapter, we have illustrated typical representative logistics associations in Hong Kong and Canada. The trend of logistics associations attempts

Table 10.2 ICS professional qualifying examinations

Group 1 (compulsory subjects)	● Introduction to shipping ● Legal principles in shipping business ● Economics of sea transport & international trade ● Shipping business
Group 2 (specialisms)	● Dry cargo chartering ● Ship operations & management ● Ship sale & purchase ● Tanker chartering ● Liner trades ● Port agency ● Logistics & multi-modal transport ● Port & terminal management ● Offshore support industry ● Shipping law ● Marine insurance ● Shipping finance

Source: ICS (2017).

Table 10.3 Brief descriptions of ICS membership

Type of membership	**Requirements**
Member (MICS)	● The applicant is working in the commercial shipping industry, which includes brokers, agents, principals, owners, lawyers, seafarers, insurers and covers a wide range and scope of activity at the time of application; and ● the applicant has passed the ICS PQE or has submitted a dissertation that fulfils the criteria and is approved by the ICS's Education and Training Committee; and ● the applicant has satisfied the Controlling Council that he or she is a proper and fit person to become a member.
Fellow (FICS)	● The applicant should be a fully paid up member; and ● the applicant should be a principal in a firm, or a person holding a senior position or a director of a firm within the commercial shipping industry during the time of application; and ● the applicant has satisfied the Controlling Council that he or she is a proper and fit person to become a fellow.
Retired	● Fellows and members who retire from shipping business either temporarily or permanently and are no longer employed in shipbroking may, if they desire, become retired members or retired fellows, respectively.

Source: ICS (2017).

to extend their networks into different geographical regions, attract new members in various logistics sectors and provide professional training courses for tertiary education institutions. To a certain extent, logistics associations are one of the key stakeholders in the logistics industry. However, logistics associations are now facing different challenges, which include (1) keen competition with different logistics associations; (2) encouraging young people to join logistics associations; (3) obtaining financial support from corporates; and (4) expanding the membership database by either inspiring current members or recruiting new members due to a lack of jurisdiction status. Therefore, the government is urgently in need of support for logistics associations to ensure sustainable development in the future.

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Chapter 11

LOGISTICS EDUCATION

Education generates human capital and competitive advantages of nations, including the logistics and supply chain sectors. In order to meet ever-changing logistics business environment, the logistics education in Hong Kong has undergone significant changes in the postmodern era. In this chapter, we will achieve the following objectives:

- provide an overview of Hong Kong's logistics education;
- evaluate the impact of the 334-education reform on the development of Hong Kong's logistics education; and
- summarize the restructuring of logistics education in Hong Kong.

11.1 Introduction

Logistics industry is traditionally one of the four economic pillars of Hong Kong (The Census and Statistics Department, 2016). Within service, the logistics industry has generated 6 percent of Hong Kong's total GDP in 2015. Thanks to the domestic demand and investments, Hong Kong's annual growth rate (in terms of GDP) has recorded an average of 5.38 percent between 1974 and 2015 (The Census and Statistics Department, 2016). Recently, Hong Kong has become an international hub for trade, business and finance, notably, with Mainland China entering the World Trade Organization (WTO) in 2001, the introduction of Mainland and Hong Kong Closer Economic Partnership Arrangement (CEPA) in 2003 and the introduction of the "Belt and Road" initiative in 2015. As such, the logistics industry has made significant economic contributions to the ever-changing global environment. However, Hong Kong's logistics industry has faced keen competition with neighboring countries in the Asia-Pacific regions. To further strengthen and consolidate the competitiveness of Hong Kong's logistics industry in the world, it would be crucial to develop a comprehensive logistics education. In today's global and dynamic environment, there has been increasing concern that professional education could be an effective approach to improve productivity, and employees of the highest quality have the quality and competency to respond

effectively to continuous changes (Becker, 1993). Recently, there has been a tremendous growth in academic institutions considering apprentice-style, non academic learning approaches to add on their "professional" and "practice-based" programs (Bourner et al., 2001).

The logistics industry demonstrates as an illustrative example, notably after its fundamental transformation from a largely unskilled labor industry to a capital-intensive one, and provided significant insight into the current of tertiary education in logistics and supply chain studies (Wong et al., 2014). In the 1999 Transportation and Logistics Educators Conference, William Copacino from Andersen Consulting highlighted that companies are now experiencing a strain on their skilled knowledge labor in the new millennium. In other words, the human capital will be critical in the rapidly changing business environment. In the context of logistics industry, all the activities are human centric (Malhotra and Grover, 1998). There is an increasing need for highly skilled logistics or supply chain professionals especially since supply chains have evolved in wider scope and complexity (Bourlakis et al., 2013). In the early years, most of the higher educational institutions failed to recognize the multi-disciplinary nature of supply chain management (Wong et al., 2014). Apart from this, employers are now expecting logistics or supply chain professionals to not only acquire core entry-level skills (i.e., inventory, quality control, transportation and warehousing skills), but also communication, analytical, cross-functional and holistic skills (Fawcett and Rutner, 2014). This is the time for higher educational institutions to redesign the curriculum of logistics and supply chain education with the purpose of fitting the self-actualization needs of the younger generation.

Logistics and supply chain education have received considerable attention from the logistics industry participators and scholars. A variety of scholarly activities on logistics and supply chain have been emerging in the form of seminars and conferences around the world. For instance, the British Academy of Management, the Australian and New Zealand Academy of Management and the International Association of Maritime Economists (IAME) organize regular conferences for logistics and supply chain management. In this chapter, we would emphasize on the concept of logistics and supply chain education as an interdisciplinary academic field that includes logistics and supply chain management, critical monolithic skills and knowledge for being management trainees in companies. On the one hand, logistics and supply chain programs should fulfill the ever-rising national and international standards within the logistics industry and establish the amalgamation between human activities and the circumstances of logistics environment. On the other hand, logistics and supply chain programs require alignment with the demands for different logistics stakeholders. Their curricula do not only focus on the specialized

functional areas (Larson, 1977), but also consider a variety of business and management skills, for instance, decision-making, problem-solving, communication, analytical, leadership, organizational knowledge, interpersonal skills and so on (Tobias, 2003). The main objective of logistics and supply chain programs is to equip students with sound knowledge, professional attitude and proper skills in the logistics industry. Nevertheless, the demands for sub-degree logistics and supply chain programs is continuously expanding rapidly, and the reasons remain unclear.

To fill this gap, we inform practice in the roles and areas of sub-degree education, especially in the concept of professionalization among logistics and supply chain industry. Also, we adopt the Human Capital Approach in examining students' perception of the costs and benefits of enrolling in sub-degree professional courses. We will investigate sub-degree students' expectations of sub-degree programs, notably their wider professional development, their study pathway and personal development. To conduct a comprehensive study of sub-degree logistics and supply chain education, we analyze graduates' evaluation on their personal and professional development, as well as their mobility path in their professions after taking sub-degree courses.

11.2 Hong Kong's Sub-degree Logistics and Supply Chain Education

In general, Hong Kong's Associate Degree (AD) in logistics and supply chain education are made up of 60 percent general education subjects and 40 percent discipline-specific subjects. AD in logistics and supply chain management programs aims to enable students to acquire generic business skills and knowledge specific to logistics sectors or job functions. In order to maintain sub-degree logistics and supply chain education, all the qualifications of the sub-degree education programs are required to undergo the quality control of the Qualifications Register (QR) of the HKSAR. In the Qualifications Framework (QF), sub-degree logistics and supply chain education programs are commensurate with Level 4 of the Generic Level Descriptors (HKCAAVQ, 2008). Until now, only the Hong Kong Polytechnic University is offering UGC-Funded Higher Diploma in International Transport Logistics program. But, it will be phased out after 2019. Other self-financing educational institutions are providing self-financing sub-degree logistics and supply chain programs. The key information is summarized in Table 11.1.

Hong Kong sub-degree educational institutions are facing unprecedented challenges from a gradual decline in student population and a tremendous growth in the number of sub-degree educational institutions. In the academic year 2012/13, double cohorts of students appeared in Hong Kong (i.e., Hong

Table 11.1 Self-financing sub-degree logistics and supply chain programs

Institution	Program
City Community College of City University of Hong Kong	Associate of Business (Administration in Global Logistics and Supply Chain Management) Associate of Science in Airport Operations and Aviation Logistics
HKCC, PolyU	Associate in Business (Logistics and Supply Chain Management)
HKU SPACE, The University of Hong Kong	Higher Diploma in Logistics and Transport
Vocational Training Council	Higher Diploma in Airfreight Management and Global Logistics

Kong Advanced Level Examination and HKDSE) leading to a significant increase in the number of students for sub-degree programs. According to the Information Portal for Accredited Post-secondary Programs—"iPASS," a general overview of enrollments of full-time accredited self-financing post-secondary programs from 2007/08 to 2017/18 academic years has been provided and summarized in Table 11.2. In the coming 10 years, the sub-degree educational institutions are expected to face an obstacle to the students' enrollment. The Education Bureau predicted that Hong Kong would face a declining of S6 graduate population as summarized in Table 11.3.

In the context of logistics and supply research, the studies of sub-degree logistics and supply chain education has remained seriously scarce. Most of the studies have been focused either on postgraduate degree (Grant and Bourlakis, 2010); (Bourlakis et al., 2013) or undergraduate degree students (Myers et al., 2004; Daud and Ab Talib, 2013; Tobias, 2003; Larson, 1977). Wu (2007) has discussed that the previous studies appeared to have a number of methodological pitfalls. A majority of logistics and supply education research is largely case study-based, as well as the current status of logistics and supply chain programs at the college level have been found to be ignored. Also, little attention has been addressed to students, the direct users of educational services. Understanding this, we conducted a questionnaire survey with students enrolling in a sub-degree logistics and supply chain program at the Hong Kong Community College (hereafter called "HKCC"), the Hong Kong Polytechnic University (hereafter called "PolyU"), to collect the survey data. The chapter does not only enlarge the scope and depth of research area in logistics and supply chain education, but also contributes theoretically to our understanding of the curriculum of sub-degree logistics and supply chain programs.

Table 11.2 Enrollments of full-time, accredited, self-financing, post-secondary programs (2007/08–2017/18 academic year)

Academic year	AD	HD	Degree	Top-up degree
2007/08	20,558	22,714	6,856	
2008/09	20,118	23,584	8,584	3,342
2009/10	23,019	24,303	9,814	4,647
2010/11	27,506	24,648	10,799	6,220
2011/12	27,822	23,974	12,003	7,177
2012/13	31,093	27,601	15,870	9,593
2013/14	26,575	25,471	18,509	12,023
2014/15	20,475	19,214	21,893	15,219
2015/16	20,047	17,960	24,499	15,128
2016/17	20,743	16,265	24,258	13,350
2017/18	21,367	14,664	24,195	13,075

Source: Information Portal for Accredited Post-secondary Programs—"iPASS" (2019).

Table 11.3 S6 graduate population in the coming 10 years

Year	Number of S6 graduates
2015	61,900
2016	57,100
2017	52,300
2018	51,900
2019	48,500
2020	45,600
2021	43,600
2022	42,700
2023	43,800
2024	46,400

Source: Education Bureau (2015).

11.3 Methodology

We designed and conducted a questionnaire survey based on the Likert-style score scale (1 = strongly disagree; 2 = disagree; 3 = fairly disagree; 4 = fairly agree; 5 = agree; 6 = strongly agree) and distributed it to an intended study sample, that is, students who had enrolled in sub-degree programs in logistics and supply chain. The survey was conducted in the form of a self-administrated questionnaire. In March 2015, 104 questionnaires had been distributed to current students (i.e., 31 year 1 students and 26 year 2 students) studying logistics and supply chain program at the Division of Business and Hospitality

Management at the HKCC, PolyU; we also considered 47 graduates from the program to provide in-depth analysis of the study. In 2001, HKCC was established as a subsidiary of PolyU (Hong Kong Community College, 2016). HKCC, PolyU is now one of the key higher educational institutions to offer sub-degree logistics and supply chain program. The Associate of Business (Logistics and Supply Chain Management) program is among the 11 programs within the HKCC's Associate Degree Scheme in Business. This program has experienced a steady growth in the number of applicants from secondary school students since its inception in the 2006/07 academic year. To respond to the ever-changing needs of the business environment, students are required to complete both 36 credits of general education (GE) subjects and 24 credits of discipline-specific (DS) logistics and supply chain subjects. Since all of the respondents completed their respective logistics and supply chain program for one semester, we expected that all of them could give relevant answers based on real learning experiences.

The response rate was highly satisfactory—92.3 percent with 96 completed questionnaires by May 2015. We designed the questionnaire such that it was divided into two main sections. In Section A, participants were asked to provide their personal profiles relevant to their studies and work experiences, for example, their highest academic qualification, nationality, age, family background, years of working experience within a logistics industry and so on. In Section B, participants were required to provide detailed information about their studies pertaining to employment and higher education enrollment as well as their plans and preferred work in the future. The questionnaire also covered the following key topics: (1) issues considered when deciding to currently pursue their logistics and supply chain programs; (2) channels of information before selecting to study logistics and supply chain programs; (3) a description of the logistics and supply chain programs that the students were currently pursuing; and (4) the students' expectations, notably in career paths after graduation, academic knowledge and personal development. Closed-end questions were presented in the form of statements and the respondents indicated how strongly subjects agree or disagree with statements on a six-point scale (i.e., eight to nine statements per theme). Next, we will show descriptive statistics of all the answers collected from the questionnaires under Sections A and B before analyzing the results of sub-degree students in associate degree of logistics and supply chain programs.

In this study, respondents' answers are only employed for academic purpose with strict confidentiality. The responses collected will only be reviewed in aggregate. In addition, certain information in the discussion section and the survey questions were designed according to semiformal in-depth discussions with different relevant materials or parties including industrial practitioners,

researchers and logistics journalists. In order to address the study objectives and to ensure validity, the questionnaire has largely extracted any ambiguous wordings and removed double-barrel items (Marginson, 1997).

To ensure the statistical sensibility of the collected data, we have measured a series of t-tests to examine their reliability and paid attention to nonresponse bias in the results (Armstrong and Overton, 1977; Marginson, 1997). The non response bias was computed by dividing the 96 survey respondents into three groups and we illustrated this sample to conduct data analysis. The test results show that the mean value among current students (i.e., year 1 and year 2) and graduated students was statistically significant at a 5% significance level, hence, suggesting that nonresponse bias was not a considerable issue.

11.4 Data Analysis

11.4.1 Background Information

Most current students enrolled in sub-degree logistics and supply chain programs have completed HKDSE; 87.5 percent of graduates have finished Hong Kong Advanced Level Examination before proceeding to their sub-degree logistics and supply chain programs. For nationality, we have to pay attention to the fact that HKCC students are composed of local students or students from neighboring countries or regions. While 88.5 percent of the students are locally born in Hong Kong, few non–Hong Kong students (i.e., 9.5 percent of students come from Mainland China; 1 percent each from the United States and Macau) enrolled in such programs every year. In HKCC, all the students were required to obtain English language (Level 2) in HKDSE or English language (Grade E) in Hong Kong Certificate of Education Examination (HKCEE) or equivalent. Hence, there is less restriction in using English language as a medium of instruction within their logistics and supply chain programs.

11.4.2 Professional Experiences before and during Enrollment

Over half of the students had working experience before enrollment. As expected, most students did not have any professional logistics and supply chain experiences before enrolling in their logistics and supply chain programs, although quite a few of them had worked in non-logistics and supply chain-related full-time and part-time jobs. Also, only 6.3 percent of the students planned to work part-time during their studies. This was only desire to strive for further studies in a logistics and supply chain programs through Non-JUPAS application.

11.4.3 Plan after Graduation

Of the current students, 89.3 percent planned to keep going onto their undergraduate education in logistics and supply chain studies after graduation, and 65 percent of graduates intended to continue their undergraduate studies in a logistics and supply chain programs after graduation. From the survey findings, the responses for all other sectors provided positive feedbacks and were similar except for the shipbuilding industry. Most of the current students and graduates expect their ideal work to obtain professional life. Over 80 percent of survey respondents indicated that their ideal work was inventory management (89 percent); transport industry (88 percent); procurement management (88 percent); operations management (86 percent); and warehousing industry (83 percent). Shipping industry was ranked as the sixth most preferred option (79 percent), closely followed by ship brokerage (72 percent). Based on the collected data, the survey respondents least preferred to end up working in the shipbuilding industry (66 percent).

11.4.4 Motivations to Enroll in Logistics and Supply Chain Programs

In our data analysis, achieving certain professional status for personal career development is a crucial consideration of current students pursuing such a program. Broadly speaking, 89.6 percent of students mentioned that logistics and supply chain traditions play a vital role in making their decision to enroll in logistics and supply chain programs. Not surprisingly, 91.6 percent of students mentioned that the economy of their hometowns were closely associated with jobs related to a logistics and supply chain industry. Indeed, only 4.2 percent of students reported that their parents had a negative view of logistics and supply chain studies. Thus, the results indicated that 87.5 percent of students expressed that the current program is the first choice (most aspired) during their sub-degree application.

11.4.5 Issues Considered in Enrolling for a Logistics and Supply Chain Program

In this section, we addressed the key issues considered by respondents when enrolling in a logistics and supply chain program. The results indicate that the top three key issues considered by sub-degree students when pursuing a logistics and supply chain program are: (1) to enhance knowledge about the logistics/supply chain industry through a wide variety of logistics activities (e.g., seminars, site visits, career talks, mentorship etc.); (2) to enhance

knowledge about logistics/supply chain industry through the courses provided by the program; and (3) the high quality of teaching staff. The findings show that sub-degree students pay the least attention to "no alternative choices of program." The statistical results showed that students who are explicit about the logistics and supply chain program is the most aspired when they apply for their sub-degree programs.

11.4.6 Information Channels for the Logistics and Supply Chain Programs

The questionnaire included question(s) to learn how the respondents knew about the current program they are enrolled in. Surprisingly, the parties, for instance, friends, former teachers, known person and family members were not effective information channels for the logistics and supply chain programs. In terms of promotion, the advancement of information technology is the most effective information channel for students to explore the programs. Comparing with other promotional tools (i.e., advertisement on public transport, newspaper, exhibitions and logistics professional bodies), the students search the program information without any time and place restrictions.

11.4.7 Description of the Logistics and Supply Chain Programs That the Respondents Are Currently Pursuing

In general, the survey respondents reflected positive feedback about the current program. The majority of survey items have been categorized within a range of "fairly agree" to "strongly agree" except (1) the courses are too practically based and (2) the workload is too heavy. The current program outcome fits with their initial expectation. The sub-degree students expressed that the program aligns with the logistics industry's development and it is taught by well-qualified teaching staff. In other words, the sub-degree students can increase their professional competence and skills and transmit from their academic knowledge to job-relevant skills.

11.5 Discussion

The contemporary business environment encompasses a wide and growing range of subjects and fields of sub-degree level. Without a doubt, there is a continuously increasing demand for sub-degree professional studies from various kinds of occupational groups. There are two major reasons for this phenomenon. First, an increasing number of employers (ranging from business firms to government) demand high educational qualification in hiring workers who

hold more senior positions. Also, they want to secure workers who are highly motivated and more skilled by sponsoring them to attend professional education. Based on human capital theory, it advocates that education significantly increases productivity (Becker, 1993). The assumption appears in hot debate (Lau, 2015) that the theory continues to underpin many investment decisions by business firms and governments. Many firms now support and encourage their employees to achieve higher levels of professional education on human capital grounds (Carter and Lindsay, 1996).

Prior to enrolling for the program, each cohort of students lacks relevant logistics working experience. Surprisingly, almost 90 percent of survey respondents point out that the current logistics and supply chain program is the first choice during their sub-degree application. Achieving certain professional status for personal career development is a determining factor in current students pursuing such a program. The results offer strong evidence that the program outcome fits with the students' initial expectation. Regarding survey respondents' knowledge on the program, the key parties, notably, friends, former teachers, known person, family members and logistics associations, have demonstrated insignificant impact on the program. Broadly speaking, the educational institutions would use common promotional tools, for instance, placing program advertisement on public transport, newspapers and exhibitions. However, the students indicate that they are most likely to know of the program through information technology (e.g., the internet). In the forthcoming years, the educational institutions plan to concentrate on program promotion by adoption of different information technology devices (i.e., website, WhatsApp, Facebook and SMS).

Based on the collected survey data, only 10.7 percent of the current students and 35 percent of graduates prefer to work after graduation. The majority of students intend to choose further study from a variety of programs, for instance, University Grants Committee–funded programs and self-financing programs in local universities, as well as nonlocal programs from overseas universities. Over 80 percent of the students respond that their ideal work would be logistics and supply chain sectors pertaining to inventory management, transport industry, procurement management, operations management and warehousing industry. Hence, the design of the program is expected to comprise theoretical and practical learning elements. Since we expect graduates to acquire strong critical thinking and analytical skills, the educational institutions are suggested to consider offering new subjects like fundamentals of operations management, research methods, project management, engineering mathematics and so on.

Regarding the survey respondents' concern about the critical issues in enrolling for the programs, a professional program should possess the following

key components: (1) enhancing knowledge about the logistics/supply chain industry through a wide variety of logistics activities (e.g., seminars, site visits, career talks, mentorship etc.); (2) enhancing knowledge about logistics/supply chain industry through the courses provided by the program; and (3) high quality teaching staff. The teaching staff uses different effective teaching methods to help students transmit their job-relevant skills and enhance their logistics and supply chain knowledge.

As shown by our findings, many students feel that the programs are being too academic. To overcome this, tertiary institutions should consider building up their networks with the local logistics industry. In order to allow students to expand their strong industrial networks, tertiary institutions should collaborate with logistics associations (e.g., The Chartered Institute of Logistics and Transport (CILT), Hong Kong Sea Transport and Logistics Association (HKSTLA)) and logistics firms to organize vocational training programs, mentorship, internship placements, seminars and site visits. Recently, tertiary institutions invited academic advisors from popular foreign universities to conduct periodical reviews and sought advice from various program leaders to redesign their logistics and supply chain programs. Other key stakeholders from articulation partners and a logistics industry, notably industrial associations, current and potential employers, and alumni, were also invited to provide advice as part of the programs. Their feedback gives an insight into program development in the future. Additionally, the tertiary institutions have established sound internal quality assurance systems, for instance, implementing P-LOAP, organizing the Learning and Teaching Quality Committee (LTQC) and aligned with external quality assurance systems, for example, Hong Kong Council for Accreditation of Academic & Vocational Qualifications (HKCAAVQ), Association of MBAs (AMBA), the Association for the Advancement of Collegiate Schools of Business (AACSB) and the European Foundation for Management Development-European Quality Improvement System (EFMD-EQUIS). This helps educational institutions to maintain excellent quality of education and redesign logistics and supply chain program from being theory based to being application based.

11.6 Conclusion

The contributions of this chapter are threefold. To start with, its findings help to answer and predict the development of sub-degree studies in logistics and supply chain education. Hence, we provide constructive suggestions on how Hong Kong's sub-degree programs can make a solid articulation to both university degrees (both local and overseas) and professional bodies. In addition, it will draw useful guidelines for the professional groups on how to improve the

quality of these sub-degree courses in the future. Last but not least, we conduct sophisticated investigations to support credentials and professionalization in our research.

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Chapter 12

CASE EXERCISES IN GLOBAL SUPPLY CHAINS

Supply chain management is an applied subject. In order to facilitate the learners on how to apply the different learning knowledge and concepts into a practical workplace and dynamic business environment, various case exercises in global supply chains are provided in this chapter. In this chapter, we will achieve the following objectives:

- foster supply chain management subjects delivery as an additional learning tool to supplement textbooks and
- encourage learners to achieve the expected learning outcomes by providing them with supplementary exercises and case studies.

12.1 Specialized Warehouse

Assume that you are the business development manager of ABC Liner Shipping Company. Recently, ABC Liner Shipping Company launched a new shipping routing in order to create a new logistics business. The new shipping routing will pass through key container ports including Qingdao, Ningbo, Savannah, Charleston, Boston and New York. You need to select *ONE* container port to provide the recommendations on how to develop a specialized warehouse.

Note 1: Specialized warehouse is served for special handling commodities, for instance, cold storage, hazardous material, household goods, agricultural products, bulk petroleum and chemical storage, document storage, whiskey, bulk lumber and so on.

Note 2: The characteristics of liner shipping include (1) common carrier, (2) fixed schedule, (3) fixed route and (4) regularity

12.2 The Belt and Road Initiative in Maritime Transport Networks

The Belt and Road Initiative refers to the Silk Road Economic Belt and 21st Century Maritime Silk Road, a significant development strategy launched by the Chinese government with the intention of promoting economic cooperation among countries along the proposed Belt and Road routes. The initiative has been designed to enhance the orderly free-flow of economic factors and the efficient allocation of resources. It is also intended to further market integration and create a regional economic cooperation framework of benefit to all. Assume that you are the vessel planning manager of a liner shipping company. You need to manage four 2,000 TEU container ships, four 6,000 TEU container ships and four 10,000 TEU container ships for a 60-day sailing schedule. You are requested to design the ship routings for Intra-Asian regions and the Belt and Road Initiative countries. Also, you need to plan which container port(s) is/are the hub port(s) and feeder port(s). You need to conduct the analysis of above scenario and provide the recommendation on how to operate the proposed ship routings.

Note 1: For information about the Intra-Asian regions, please access: http://info.hktdc.com/shippers/vol28_6/vol28_6_logistics02.htm.

Note 2: For the Belt and Road Initiative countries, please access: http://china-trade-research.hktdc.com/business-news/article/The-Belt-and-Road-Initiative/The-Belt-and-Road-Initiative/obor/en/1/1X3CGF6L/1X0A36B7.htm.

12.3 Container Storage in Maritime Transport Networks

Thanks to globalization, the international trade pattern has demonstrated unequal distribution in different parts of the world. Consequently, some countries/regions have shown a surplus in container storage while others have demonstrated a deficit in container storage. You are requested to conduct an analysis of the above scenario and provide recommendations on how to solve the problems that arise.

12.4 The Sustainable Future of Rail and Port Facilities in Northern Canada

12.4.1 Background

Since its establishment in 1929, the Hudson Bay Railway (HBRY) served as the only land access that connected the Town of Churchill from southern Canada. For more than a century, the railway had served the port of Churchill as was

the gateway to northern Manitoba (MB) and to the Town of Churchill and nearby northern communities in Canada (Tables 12.1 and12.2). Historically, it was operated and managed by the Canadian National Railway (CNR) until

Table 12.1 Tons exported via port of Churchill (1997–2003)

Country	Volume
Belgium	370,164
Brazil	450,450
Columbia	55,000
East Africa	123,150
Egypt	192,735
Italy	370,164
Libya	123,180
Mexico	1,118,111
Morocco	303,151
Nigeria	899,078
Portugal	28,000
Saudi Arabia	49,280
South Africa	366,677
Spain	724,977
Sudan	415,435
Turkey	209,975
Venezuela	162,209
West Africa	182,383

Table 12.2 Total Canadian grain exported from the port of Churchill

Year	Tonnes (‘000)
2002/03	352
2003/04	398
2004/05	386.2
2005/06	327.6
2006/07	411.7
2007/08	581.6
2008/09	424.4
2009/10	529.4
2010/11	600.7
2011/12	507.8
2012/13	294
2013/14	440.7
2014/15	397.3
2015/16	122.9

Note: Operations in the port of Churchill were suspended since August 2016.

Sources: Churchill Gateway Development Corporation, Canadian Grain Commission, Hudson Bay Railway.

1997 when OmniTrax, an American private company, took over its ownership, operation and management. Meanwhile, OmniTrax took over the port of Churchill from Transport Canada. In this case, the railway operation included technical and commercial activities, as well as maintenance. In August 2016, the port of Churchill and all connected freight railway service were shut down by OmniTrax, not long after the end of the monopoly of Canada Wheat Board (CWB) on wheat purchase in western Canada, which consequently allowed wheat farmers to sell their harvest to whatever company they wanted, instead of going through CWB. On May 23, 2017, OmniTrax announced that because of severe floods, rail service between Amery and Churchill would close indefinitely. Throughout 2017 and the first half of 2018, it was uncertain when the rail tracks would be repaired due to a disagreement over which entity took responsibility. Losing its only rail (land) access has influenced the tourism industry, imposing huge economic consequence on the Town of Churchill's rather fragile economy.

Despite the town's strategic importance that also hosted Canada's only Arctic deep-water port, the railway was never financially sustainable. After the privatization of CNR in 1995, the federal government allowed CNR to sell the Churchill Railway to OmniTrax in 1997 without requesting the new owner to uphold the statutory common carrier's obligation to move duly loaded cars to their destination. At the same time, the federal government upgraded Churchill's port facilities before OmniTrax took over.

As mentioned, catastrophe occurred to Churchill when the CWB's monopoly on wheat purchase was cancelled in 2011. The CWB served all of western Canada by strategically utilizing the country's geographical resources. However, its single-desk selling authority was ended. Grain grown in the Hudson Bay route catch basin was predominantly marketed at vessel volumes through the port of Churchill by the CWB. The end of CWB alleviated congestion to the west coast by lowering handling and transportation costs to farmers. Anticipating Churchill would be in trouble without the CWB's orderly marketing powers, the government invested private grain companies with a five-year, US$9.20 per ton freight subsidy to help OmniTrax and camouflage the consequence from dismissing the CWB. Once the subsidy ended, grain companies gave up using Churchill as the port for export, as private companies cannot be expected to act beyond their own self-interest.

Taking the Churchill Railway back from a foreign cooperation is widely supported but, like the other replacement of ownership in the transportation industry in North America, they serve only as a staging ground upon which the mechanisms of cooperation are deployed. The operation of the rail made apparent the contestations between operating cooperation's interest and regional development. Local communities, especially indigenous ones,

expressed frustration at the way in which OmniTrax operated the rail, notably: (1) it did not take proper actions to maintain the railway's safety and quality and 2) it did not make serious attempts to sustain job opportunities for local/surrounding communities.

12.4.2 Influences of Rail (Land Access) Disruption to Churchill

The flood that took place in May 2017 washed out more than a hundred parts of the rail tracks. In this case, OmniTrax declined to repair the rail tracks. Hundreds of remote northern communities along the railway line were thus left isolated. An illustrative example can be found in the grocery prices at the local Northern Store (the only major supermarket in the Town of Churchill) (Table 12.3). Even with a "northern allowance" to compensate the community for the extremely high prices, the costs of grocery kept rising. On the other hand, fuel lost a viable, economic transportation option that resulted in increasing price and unstable supply. For instance, in June 2017, the average price of gasoline in Winnipeg was $1.17 per liter. The price in the Churchill's only gas station soared to $2.17 per liter.

Table 12.3 The prices of selected grocery items between Northern Store (Churchill, MB) and Superstore (Winnipeg, MB), October 2017

Item	Quantity	Price in Northern Store Churchill, MB (P_c)	Price in Superstore, Winnipeg, MB (P_w)	Ratio (P_c/P_w)
Grocery				
Tropicana Orange Juice	2.63 l	14.29	4.97	287.53%
Danone Activia Yogurt	650.00 g	6.09	3.87	157.36%
Beatrice Milk	4.00 l	10.89	4.59	237.25%
Beatrice Milk	2 .00 l	5.95	3.2	185.94%
Lays Potato Chips	255.00 g	5.85	2.47	236.84%
Wonder Bread White	570.00 g	5.25	2.48	211.69%
Produce				
Apples gala bag	3.00 lb	4.99	3.49	142.98%
Broccoli (iceless)	1.00 pc	10.79	2.97	363.30%
Blade Steak (boneless)	1.00 kg	25.79	13.48	191.32%
Houseware				
Tide liquid high eff orjg	1.47 l	15.89	5	317.80%

Note: All prices are expressed in Canadian Dollars (CAD). l, liter; g, gram; lb, pound; pc, piece; kg, kilogram.
Sources: Yufeng Lin during his visit to Churchill in October 2017.

The town of about 900 people had lost 93 full-time jobs (more than 10 percent of the total population) one year after the closure of the port of Churchill. The subsequent closure of the HBRY resulted in the spinoff effects on the tourism and the transshipment industry. Laid-off Churchill workers either took up other jobs or left the community for work elsewhere or remain unemployed. Without an adjacent community, residents either left their family in Churchill or moved south altogether. Meanwhile, Churchill heavily relied on tourism, including the summer season when Beluga whales show up along the Churchill River and, of course, the polar bear season, which starts from mid-October until late November. Hotels and tour companies got numerous cancellations, with the price of travel now out of reach for many visitors: regardless of the commuting cost to Winnipeg, plane tickets from Winnipeg to Churchill could cost as much as CAD 1,400 per round trip. Independent travelers were expected to fill the gaps between the busy seasons or even the hours between tour groups, but they were much more sensitive to the fluctuations of commuting costs than family or tour travelers. The fact was that the suspended rail service had led to a sharp decrease in independent tourists in 2017. Residents of the Town of Churchill were frustrated about the disagreements and conflicts between the government and OmniTrax, leaving them without trains and abandoned. Also, the uncertainty of the railway being repaired in the future was growing among the community.

The dominos have fallen: the railway needs probably two decades of maintenance, Churchill is suffering economic losses and northern communities are cut off from essential services. Canada has lost a third of its railway track miles in the last three decades. Abandonment may generate more profit for CNR, but their increased profit should not be regarded as an improvement in the overall efficiency of national transportation system; therefore, abandonment of railway lines cannot be merely a rail company's decision without people being compensated somehow. Also, governments have been far too lax in upholding people's interest in this matter.

12.4.3 The Future of Churchill

A key benefit of developing such infrastructure is the benefit the northern communities of Canada are likely to receive. Unlike the Russian side which has quite a high population, it is not the case for Canada. The increased activities in the Northwest Passage will, therefore, open the northern communities up and make movement of goods easier. Due to the nature of the Canadian Arctic, communities are mostly accessible by (expensive) air. The existence of a railway, a port and an airport makes the Town of Churchill, located along the Hudson Bay, strategically very important to the opening of northern Canada

and the Arctic region. Such critical infrastructures can be so important that a damage or malfunction of any can create a huge impact on the community. Knowing how important the Arctic and for that matter the Northwest Passage (NWP) is likely to become, the Canadian government has stepped up work in this region.

The port of Churchill, which is hitherto the only deep-water port in Canadian Arctic, is very strategic to successful shipping business in the future should the NWP begin to experience traffic increase. Port infrastructure is, however, still not acutely developed to cope with a potential increase in business. This has been due mainly to less shipping activity and the high cost involved in operating such a facility. Currently, there is little incentive to continue to ship items through the port of Churchill, as alternatives like via the ports of Vancouver (BC), Prince Rupert (BC) and Montreal (QC) offer cheaper and more efficient services to overseas markets (e.g., East Asia, Europe). However, looking ahead, the Churchill Township and its infrastructure can potentially play a key role in global shipping and supply chains. At the same time, Churchill is key to delivering goods to the Canadian northern communities. Thus, the non-functioning of the port of Churchill would create a complicated life for the populace. Should NWP reach an operational level similar to that of the Northern Sea Route (in northern Russia), the movement of goods to Churchill and other northern communities are very likely to substantially speed up. Also, it is highly likely to generate numerous job opportunities for the local population.

Finally, people would be much more willing to move to the community to work knowing they are assured of supplies. The cost of living is very high in these areas, and so this discourages people from taking up employment. An improved and fast means of delivering cargoes means that employees are assured of food and other essentials. The uncertainty about food and travel would be laid to rest. Tourism would improve tremendously. Like many other Arctic towns and communities, accessibility in terms of cruise ships would improve the tourist potential of these places. Many people nowadays want to know how the Arctic looks and the natural fauna and flora in this region, but the difficulty in traveling through ice has prevented such voyages. The ice melt, therefore, presents an unprecedented opportunity for tourism in the Arctic areas.

12.4.4 The Big Deal and Challenges Ahead

Despite such, there were some good news in August 2018: a deal had been reached between OmniTrax and a Canadian consortium (hereinafter called "the Consortium"; see Appendix) to purchase and repair the damaged rail

line that is, hitherto, the only land link for the Town of Churchill and nearby northern communities. In an official statement, the Town of Churchill announced that the Consortium consists of northern communities, Toronto-based Fairfax and AGT Foods. HBRY has said the rail line has been losing money for years and the necessary repairs would cost tens of millions of dollars (CAD). The Honorable Brian Pallister, MLA, premier of the Province of MB, Canada, emphasized that the deal is an extremely positive one for the residents of the Town of Churchill and the MB Province will undertake financial arrangements so as to ensure a propane resupply for the upcoming winter. Indeed, the "rebirth" of these facilities can be pivotal in transforming MB from being a "landlocked" province that relies on US/North American trade to becoming a "maritime" province that can export MB (and adjacent Canadian provinces, e.g., SK, AB) products and resources to major markets around the world.

Also, the Consortium that has purchased the rail tracks and the port of Churchill's facilities is considering employing a new transportation infrastructure operating company to repair, operate and manage such facilities (through a 10-year concession agreement) (see Glossary of Terms). However, being such an operator is far from easy. Although the tensions between the private sector and regional development as outlined above may be somewhat simplified, the oppositions can be irreconcilable. People believed further investment in Churchill Railway might be merited, particularly because of the potential Arctic shipping. Simultaneously, despite the progress of railway repair, environment, social and economic issues also need to be addressed. All in all, the new operator must find a solution so as to operate and manage the facilities in a way that can merge/integrate the ambivalent, and potentially, conflicting demands of the port/Town of Churchill. The objectives are to reap the benefits of the development of Arctic shipping (thus integrating the Arctic into global supply chains) and ensure that the rail and port facilities will directly benefit the economic and social well-being of the Town of Churchill and nearby northern communities. In other words, to ensure that the new operation is sustainable, we might need to consider developing some kind of hybrid business and management model that would allow the rail and port facilities to form part of an efficient "operational" system of global supply chains while also ensuring that they are part of a "regional" system that poses direct benefits to local/surrounding regions. Needless to say, as a profit-making business, the operator needs to ensure that the business model would be financially sound in both the short and long terms, while it also needs to possess environmental awareness, where the Arctic can be highly sensitive to even the slightest pollution.

12.4.5 Your Task: Develop a Sustainable Business Plan

Assume that you are a multinational transportation infrastructure facility operator that would like to bid for the operation and management rights for the Churchill rail and port facilities. What you need to do is to prepare a proposed business plan that highlights your company's vision (the next 10 years) on the future of Churchill rail and ports and, of course, how you can successfully implement such a vision from the (1) economical/financial, (2) environmental and (3) socially responsible perspectives. As mentioned earlier, transportation infrastructures are simultaneously part of the global supply chains and of the local/surrounding regions. You need to present your ideas and plans to the Consortium and convince them that you can provide the best visions and business plans for the short- and long-term future success of the rail and port of Churchill. Within a 10-year time frame, in this business plan, you *must* include the following:

- your general vision for the Churchill port and rail facilities, including market opportunities and challenges (e.g., what types of products and/or passengers that the rail and/or port can realistically handle, and why?);
- your management model, including your team (e.g., what types of skills, qualifications and accomplishments they can bring to the table?) and a simple financial structure;
- how your plan can facilitate the development of shipping in the Arctic, benefit global supply chains and help transform MB's provincial economy;
- how your plan can provide direct benefits to the economic and social well-being of the Town of Churchill and nearby northern communities in Canada; and
- how your plan reflects environmental awareness of the Arctic region.

APPENDIX

Consortium

A consortium is a group made up of two or more individuals, companies or governments that work together toward achieving a chosen objective. Entities participating in a consortium will pool resources but otherwise are only responsible to the group in respect to the obligations that are set out in the consortium's agreement. Therefore, every entity that is under the consortium remains independent with regard to their normal business operations and has no say over another member's operations that are not related to the consortium. (*Source*: Investopedia.com)

Concession Agreement

A concession agreement is a negotiated contract between a company and a government that gives the company the right to operate a specific business within the government's jurisdiction, subject to certain conditions. Concession agreements may also refer to agreements between the owner of a facility and the concession owners or concessionaires that grant the latter exclusive rights to operate a specific business in the facility under specified conditions. (*Source*: Investopedia.com)

Hitherto

up to this time; until now: a fact hitherto unknown to here. (*Source*: Dictionary.com)

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