Preface

1. INTRODUCTION

Today’s business world calls for technological driven logistics and supply chain management advances, characterized by appropriate technology adoption and applications. Technological solutions leading to modern logistics and supply chain management highlights the underpinning capacity demand for applied logistics towards efficient and sustainable economy development trend. With theories and technological advances in applied logistics research, I was happy to produce this book would provide researchers, practitioners, and academicians with insights into a wide range of topics relevant to advances in logistics, supply chains, and industry experiences. Before introducing the book content and each book chapter, the preface first gives an overview of the two important research activity streams in applied logistics to address the grand challenges to develop SCM to support sustainable economy:

- Smarter supply chains with instrumentation, interconnection, and intelligence
- Supply chain networking excellence towards sustainable economy

2. TECHNOLOGICAL ADVANCE FOR SMARTER SUPPLY CHAINS

Technology advance is a vital driver for business innovation and value creation. This stream of technological solution will study and advance technologies to enable supply chain innovation to sustain applied logistics with instrumented, interconnected and intelligent supply chains, introducing value creation in SCM with impact on future business including manufacturing and trade. To bring the convergence of the digital and physical spaces in SCM, technology enablers are to be explored and developed for supply chain instrumentation and network integration with flexible and scalable internetworking capabilities. Towards enabling dynamic business relationship for far more collaborative business interactions, technology framework and tools are to be studied and developed by understanding and analyzing the challenges and requirements for supply chain (information, logistics, service and finance) synchronization, coordination, and control to manage resources, deploy technologies, and deliver services to design, manage and control competitive supply chain networks and solutions.

Let’s take Hong Kong as an example. Hong Kong has been one of the busiest business centers in the world, partly due to its convenient geographical location. When geographical advantages become less prominent, facing fierce competition in the region and worldwide, core competence of Hong Kong’s trade, logistics and services industries heavily relies on supply chain excellence in its global reach and integration for long term competitiveness. Built upon and to further strengthen Hong Kong’s already existing trade and logistics strengths, integrating the environmental thinking into supply chain management would
help Hong Kong to further develop environmentally friendly and social responsible methodologies and practices for supply chain excellence enabling 1) more efficient collaborative methods and operational processes in and across the industries in Hong Kong, across the border, and globally, and 2) innovative capabilities and business models for Logistics Service Providers to sustain Hong Kong economy growth. The branding value of the sustainable development methods would strengthen comparative advantages of local and regional industries, supporting Hong Kong and region’s economic transformation into a low carbon economy by developing technology rich, high value-add and service oriented industries.

And China is now the world second largest economy power, with attractive fast developing domestic market. China is also more open to the world, and its currency RMB is being internationalized. The new geo-political-and-economic environment changes (including the Free Trade Agreement between China and ASEAN, ECFA) surrounding Hong Kong will pose both challenges and opportunities to Hong Kong’s logistics and trade industries in this new order of international trade and economic development. Business and technologies innovations will be vital for Hong Kong to become more competitive to further develop its supply chain excellence with network orchestration capabilities to coordinate, synchronize, and control the logistics, finance and information flows in the region. Core competence of Hong Kong will be built upon its capabilities for value creation in managing resources, developing technologies, and delivering services to design, manage, and control competitive supply chain networks and solutions.

3. DEVELOPING SUPPLY CHAIN NETWORKING CAPABILITIES FOR SUSTAINABLE ECONOMY

Today’s global marketplace is increasingly volatile, interconnected, and inter-dependent. Rapid and constant change has forced logistics and supply chain management to develop capacity to adapt. When flooded with more information than ever, supply chain visibility has to enable the business to see and act on the right information. With increased exposure to shocks and disruptions, supply chain management has to address the urgent concerns on risk management. While cost containment is still a high priority, SCM has to be more a lead to revenue growth rather than cost savings. In this capacity development, SCM will have to enable more intimate customer relationships for companies. Thus, in addition to supply management, SCM will have to supply the networking capabilities for companies to reach their customers to compete in today’s volatile and interconnected global economy.

Furthermore, responding to the changing political and economical landscape in the world, advances in applied logistics will help re-think and re-position of Logistics and Supply Chain Management (SCM) in its role to support efficient and sustainable economy. Core competence of SCM will be developing the networking capabilities to drive for supply chain excellence, fitting into current trend and call for environmentally friendly and social responsible economic growth. Understanding and analyzing the applied logistics challenges, dynamic business relationships emerge a core capability for applied logistics to develop to gain competitive advantages. The grand challenges of developing supply chain networking capabilities could be composed of interrelated lines of sub-problem components with smaller scope suitable for a collective set of academics and researchers to tackle. In tackling these sub problems, various research methods have to be developed and deployed including modeling, empirical research, case studies, case research, optimization, best practice, and benchmarking.

This networking capability development would help reposition supply chain management for supporting and enhancing regional business centers. For example, China is engaged in massive logistics infrastructure development currently, and it is claimed to be one of the biggest logistics infrastructure
market in the world in the coming five years. For example, the development of high-speed rail network in China and connecting with other continents will be able to develop and release more and more capacities for goods movement. Inter-modal transportation with logistics interconnection facilities and services will then become an attractive yet green alternative. China is also setting up more and more inland bonded logistics parks which have already posed considerable impact on the goods flows through Hong Kong for import/export. Bonded manufacturing as well as related logistics and supply chain operations will have to be studied upon such changes. Furthermore, China’s green initiatives in many industries have also resulted considerable impact on logistics and supply chain management. All of those developments will change the logistics landscape in the region, causing Hong Kong to re-think and reposition herself to leverage its current supply chain leadership and to further develop competitive advantages for participating and helping China to modernize her logistics infrastructure and supply chain management practices. All those efforts will help Hong Kong’s logistics and trade industries and eventually benefit Hong Kong to further develop as the business centre in the region.

4. SUPPLY CHAIN NETWORKING EXCELLENCE TOWARDS SUSTAINABLE ECONOMY

Managing a competitive firm in today’s turbulent and volatile business environment is becoming an extremely difficult task as product variety, complexity and quality demands increase, and revenue margins decrease. Hence, participating in business networks has become inevitable for any organization that strives to achieve or maintain a competitive advantage.

Since traditional views of value creation such as the resource-based view of the firm or transaction costs economics failed to fully explain these new interconnected market structures, a large body of literature has evolved that describe strategic, organizational, or technological exigencies for the conduct of businesses in networks, constituting an interdisciplinary new strand for theoretical and applied research. Most of the central contributions of the past years have examined business networks assuming mostly stable environmental conditions or a hierarchic distribution of power (e.g. automotive industry as frequently used case study). However, not all business networks share this characteristic.

Conversely, the great part of today’s networks is non-hierarchical and dynamic, implying an intermittent but direct process of peer-to-peer collaboration. Without relying on an administrative “super-structure”, dynamic networks are supposed to use the capabilities of the single firms more effectively. But there is also a downside: due to its stringent complexity and volatility, the network is often subject to strong side effects such as increased coordination and setup costs, higher search and evaluation costs, or issues related to product assembly, delivery and exploitation.

In this book, we intend to fulfill the mission of the International Journal of Applied Logistics (IJAL) to disseminate innovative findings for applied research and development in logistics and supply chain management. Providing researchers, practitioners, and academicians with insight into a wide range of topics, this summation book of IJAL disseminates the theories and technological progressions in applied research, advances in logistics and supply chains, and industry experiences in the adoption of developed and emerging theories and technologies to enhance competitiveness towards enabling efficient and sustainable knowledge-driven economy.
The book includes the following 19 book chapters, classified into three sections. Section one is enabling smarter SCM. Section two is developing networking excellence. Section three is towards sustainable economy.

5. BOOK CONTENT OVERVIEW

To provide readers an easy reference of the book content, abstract of each book chapter is introduced with author information.

Section 1: Enabling Smarter SCM

Chapter 1 starts off the book by extending the vulnerability analysis of a RFID authentication protocol, and offers solutions to security weaknesses through enhanced measures. Vajda and Buttyan (VB) proposed a lightweight RFID authentication protocol, called XOR. Defend, Fu, and Juels (DFJ) analyzed it and proposed repeated keys and nibble attacks to the protocol. In this chapter, the authors identify the source of vulnerability within VB’s original successive session key permutation algorithm. They propose three improvements, namely removing bad shuffles, hopping the runs, and authenticating mutually, to prevent DFJ’s attacks, thereby significantly strengthening the security of the protocol without introducing extra resource cost.

Chapter 2 presents multi-period, dynamic game models in principal-agent theory, which are opposite to static, single period game models. The research comes from industrial practice and the conclusions are more operational and feasible in theory. Finally, the research is applied into two famous companies in different industries and shows good effectiveness.

Chapter 3 discusses how, in a normal port operation, yard cranes are used to move containers from one location to another for import, export or relocation purposes. In order to locate the positions of containers, a database is set up in the office server to store the current locations of existing containers within the yard. Whenever the Rubber Tyred Gantry (RTG) crane operator moves a container around, the database has to be updated via a program installed in the Vehicle Mounted Terminal (VMT) fitted to the crane. This requires the establishment of a communication channel between the server and the crane VMT. The current practice is to make use of wireless networks, even though these are susceptible to attenuation and interferences in rugged surroundings as in a port. This paper describes and explores another alternative, that of using 2G/SMS for short messages and 3G networks for real-time scenarios. These methods are more reliable as major telecommunication service providers normally expend substantial resources in infrastructure development. They also provide a cheaper alternative in terms of reducing maintenance expenses.

Chapter 4 starts by stating a wide range of definitions of supply chain management (SCM) have been developed over the last three decades. The philosophy of SCM is based firmly on a recognition that it is only by working in a more integrated manner that competitive advantage can be maximised. However, for this to become a reality the development of common definitions and understandings between supply chain partners is a critical success factor. The corollary of this is that a lack of definitional consistency and a common understanding is an inhibitor to the successful adoption of SCM thinking in practice.
This paper reviews a number of definitions of SCM, as well as discussions and analyses of such definitions. This leads to the central point posited in the paper – the need for a ‘unified definition’. Such a definitional construct, labelled the Four Fundamentals of SCM, is proposed with the core of the paper providing a narrative description of this construct based on a wide range of literature.

Chapter 5 presents an optimized supply chain for ‘knowledge products’. Based on the traditional logistics model for academic knowledge, knowledge creation and delivery are discussed. A new framework of an optimized supply chain for ‘knowledge products’ is developed. A semi-structured interview was undertaken to capture and analyze the knowledge logistics in a traditional publishing setup. Findings include the illustration of a new optimized supply chain for the manufacturing and distribution of ‘knowledge products’. Realised benefits are discussed showing a significant reduction in total supply chain processing. Research in this domain involves the actual knowledge creators (publishing companies). Connecting knowledge delivery systems to the supplier presents challenges including information sharing and openness to accessing their systems. More challenges are discussed with implications, primarily related to commitment, partnership and re-engineering of present systems. Publishing companies still follow the same traditional supply chain for knowledge creation. They have moved towards custom publishing, but their processes remain practically the same. Publishing companies have to change their mindsets and re-engineer their processes.

Chapter 6 is focused on a sub domain of quality, namely, quality of service. Considering supply chain management, the authors believe that it is important to distinguish between a quality of product (also service) offered by producers and service providers and a quality of service which is achieved between any supplier and customer, not only a consumer, along a supply chain. Quality of product represents producer’s/service provider’s commitment and is subject of various quality certificates issued by inspection authorities. This research examines the quality of service, which is provided by a supplier to its customer along the supply chain, between any pair of chain elements fulfilling this relation, including the common retailer-consumer relation. The authors introduce measurement points into a consumer-centric supply chain model for the defined criteria and defined the method of their monitoring and overall supply chain quality of service evaluation. Finally, the authors assess the envisaged impact of the results of their measurements on supply chain excellence, providing management with an opportunity to identify weak spots.

Chapter 7 brings up the idea that until recently, transportation risk management has mostly dealt with natural or man-made accidental disasters. The September 11th tragedy has made transportation operators, as well as shippers and public authorities, aware of a new type of risk, man-made and intentional. Securing global transportation networks has become an important concern for governments, practitioners and academics. In the current time-based competition context, securing transportation operations should not be sought at the expense of time effectiveness in physical and informational flow processing. In this paper, the authors describe a project for the design of an expert-system dedicated to maritime container security risk management, present a literature review on decision-support systems dedicated to transportation risk management, and discuss the various steps of expertise modeling in a transportation risk management context.

Section 2: Developing Networking Excellence

Chapter 8 examines the airline industry to develop a synergy model in internal and external suppliers for Asian airlines industry. An extensive literature review is conducted to present a synergy model to develop Asian airline competitiveness, safety and service quality. The literature review is highlighted to seek the
relationships between internal marketing and internal service quality and identify whether the relation of supplier can moderate them. The review reveals that a synergy model based on internal marketing, internal service quality and supplier relations can overcome the Asian industrial phenomenon, especially in maintaining the service consistency and competitiveness. This model is needed for developing airline service and safety. Research in airline business is critical, as the quality of the airline service is declining in contrast with this industry’s growth. This paper provides insight into two important suppliers needed for the success of the airline industry.

Chapter 9 presents a survey of Indian third-party logistics (3PL) providers and compares the state of the industry with that in 2004 based on an earlier survey. The 3PL industries of India and North America are also compared. The survey finds that the Indian 3PL industry lags behind North America in terms of global reach and breadth of service. Indian 3PL providers also underperform in key variables that determine performance levels. Other problems identified by the survey are the lack of awareness among Indian shippers, shortage of management talent, inadequate infrastructure, complex documentations, and multiple tax systems. Despite these limitations, the Indian 3PL industry is growing. Many global players are entering the Indian market through direct investments, acquisitions, and alliances. The Indian government is also improving the infrastructure, reducing paperwork, simplifying taxation systems, and implementing economic policies conducive to growth. This paper provides significant insights for logistics managers, government, and other stakeholders.

Chapter 10 argues that managing dependencies via coordination is an effective solution for the problems that arise from these interdependencies in supply chains. This can be practical via a set of methods called coordination mechanisms. Numerous coordination mechanisms have been discussed before in literature. This paper develops a new classification of these mechanisms on the basis of information technology (IT) impact on them. This classification proves the important role of IT in better coordinating supply chains and help managers distinguish between coordination mechanisms that are created and improved by information technology and thus lead them to have the best choice based on their infrastructures and organization type.

Chapter 11 discusses how supply network issues recently have attracted a lot of attention from industrial practitioners and academics worldwide. Supply networks are highly complex systems. The oscillations in demand and inventory as orders pass through the system have been widely studied in literature. Studies have shown that supply networks can display some of the key characteristics of chaotic systems. Chaos theory is the study of complex, nonlinear, dynamic systems; therefore it can be useful for studying the dynamics of supply networks. In this paper the authors implemented a system dynamic approach and simulated a chaotic multi-level supply network. The authors analyzed the effects of decision parameters, delivery lead time and shipping lot-size on chaotic behavior of the whole supply network. The simulation revealed that an increment in lead times or shipping lot-size has a similar impact on chaotic behavior of the system and reduces the chance of chaotic behavior occurrence.

Chapter 12 describes how delivery reliability has shifted from being an order winner to being an order qualifier in many industrial and service sectors. Thus, companies are forced to take into consideration all the aspects that might impact on such an indicator. This paper focuses on the European machinery and equipment industry, an important instance of the non-hierarchical network concept, to investigate the relationships existing among supply-side uncertainty, delivery reliability to the final market and the adoption of possible leverages to mitigate problems, namely buffers and incentives. The authors formulate the research hypotheses and test them against a set of collected data in 3 European countries. The final discussion about the results provides insights about the real effectiveness of buffer and incentive based approaches, as well as some directions for future research.
In Chapter 13, the authors describe how new business opportunities rarely conform to the way the industry traditionally approached the market, which is an opportunity for newcomers and flexible small and medium-sized enterprises to be the first in recognizing and taking advantage of emerging market opportunities. However, newcomers and small and medium-sized enterprises may be too young or too small to possess all the required competencies and resources. They need to organize themselves in business networks, in which business partners complement each other. This article suggests a sketch of the form and methods of a framework that allows the ‘Quality of Information’-based discovery of potential business partners who can offer resources like sensors, actuators, and processing services. In the Real World Internet, this would enable small and medium-sized enterprises to create an appropriate business network and to quickly react to emerging business opportunities.

Section 3: Towards Sustainable Economy

Chapter 14 discusses how China and its population are confronted with fundamental environmental challenges, as both, environmental degeneration and the impact of climate change, exhibit critical social, economic and political implications for their future development. Among the various environmental challenges China faces, pollution issues, soil erosion, acid rain, and sea-level rise are identified. This variety of environmental issues increases the underlying complexity of how best to address these challenges, especially as China’s growth strategy has the potential to exacerbate the negative impact on the environment further. The strategic decision which development strategy China will follow – a ‘growth first and clean up later’ or ‘cleaning up while growing’ – carries serious implications not only for the environmental situation in China itself, but for the global community as well.

Chapter 15 reviews and discusses the debate over the effectiveness of environmental regulation in promoting industrial Technological Environmental Innovation (TEI). Using the innovation-friendly regulatory principles adapted from Porter and van der Linde (1995a, 1995b), this paper demonstrates how properly designed and implemented environmental regulation (TEI promoting regulation) has played a critical role in promoting TEI in the transport industry in California and Hong Kong. In both cases, it has shown that stringent environmental regulations that send clear and strong signals for future environmental performance requirements are critical in promoting TEIs in the public transport industries. Unlike traditional command-and-control regulations, TEI promoting regulations are strongly supported by incentive and capability-enhancing measures.

Chapter 16 starts with the concept that today, business organizations seem to be involved in the processes of sustainable development. Therefore, not only economic indicators of performance are considered but also the environmental responsibility is equally important. The environmental responsibility covers social responsibility and natural environment responsibility. The latter demands taking into account promotion of sustainable use of renewable natural resources, reducing the emissions and wastages, decrease of energy consumption. The first part of the paper includes presentation of benefits resulting from IT (Information Technology) resources virtualization, grid computing and cloud computing development. The second part contains a model of IT governance for sustainability.

Chapter 17 examines the vertical integration level of environmentally sustainable and non-sustainable companies. The first part develops the theoretical foundation for linking sustainability strategies to organizational structure. The second part empirically examines the vertical integration level of 144 sustainability-focused companies in 9 different industries. The results demonstrate that sustainability-focused companies in the Health Care Industry and the Industrials Industry tend to have more vertically
integrated organizational structures than their industry competitors that are not pursuing such a strategy
since these two industries are production oriented and they have closer relationships with their suppli-
ers. There was no significant difference in the vertical integration level of sustainability-focused versus
non-sustainability-focused companies for the other seven industries studied. Research shows the linkage
between environmental strategies and vertical integration has not been thoroughly examined. This study’s
results are useful to researchers and managers who are interested in corporate sustainability behavior.

Chapter 18 discusses how recent years saw the global wave of new low-carbon economy which is a
strategic measure to cope with global warming, and it has gained concerns from many governments. As
the representatives of developing countries, China is responsible for “common but distinguishing duty
for global climate change.” Many policies have been made to develop low-carbon economy with the
hope to advocate and innovate low-carbon economy in some industries and cities during these years.
Therefore, it is a theoretical and innovative project to find a low-carbon economical model for various
industries and carry out the experiments of low-carbon economy in some cities. Hence, guided by low-
carbon economy theory, choosing booming Chinese tourism industry as the object, this paper constructs
an operation framework system of low-carbon tourism development from the advantage of low-carbon
tourism to the proposal of low-carbon tourism definition so as to conclude an execution scheme of “six
elements” of low-carbon tourism with selecting OCT East (Chinese national ecotourism demonstration
district) and Mt. Danxia (World Geo-park) as demonstration districts to discuss about models and
methods of low-carbon economy in tourism.

Chapter 19 suggests that recently, with the environmental crisis, Green supply chain management
(or GSCM), and in particular closed loop supply chain model, has received considerable attention by
researchers. Closed loop supply chain model aims at reduction of waste and generating profit for en-
terprises through integrating forward and reverse logistics. Unfortunately, there is limited research on
general models for closed loop supply chains in literature. In this paper, extending and enhancing previous
models, a general model is proposed for closed loop supply chains using linear programming. The goal of
this study is to minimize the leakage of a closed loop supply chain to avoid waste and reduce SCM costs.

6. THE WAY FORWARD

Applied logistics is full of potentials facing grand challenges to develop smarter supply chains to achieve
networking excellence towards supporting sustainable economy. This book as a summation of International
Journal of Applied Logistics would help you gain insight into this important field with latest develop-
ment. I would call you attention to this field and look forward to your contribution to this field as well.

Enjoy your read!

Zongwei Luo

ETI, The University of Hong Kong, Hong Kong, China