In modern organisational/corporate management, the area of Supply Chain Management (SCM) has been considered as a competitive strategy for integrating suppliers and customers with the objective of improving responsiveness and flexibility of manufacturing/service organisations. The optimal design of a supply chain is therefore a crucial issue of SCM researchers and practitioners. An effective supply chain policy can reduce average holding inventory level as well as expected cost. Significant advances have recently been made in the theory and in applications under the drive of the inevitable prevailing trend of globalisation and today’s competitive knowledge-based economy. Undoubtedly, the introduction of e-commerce/e-business has sped up this process simply because the flow of information is far too fast and geographical boundaries with respect to the information flow become less and less important. On the other hand, it is still essential to focus on the SCM as an integrated system with physical flow of materials, manufacturing planning and control, and physical distribution. The development of models and approaches for SCM has become a challenging topic toward the optimisation of supply chain priorities. There are numerous articles and reports published in the areas of SCM.

The objective of this book is to promote, exchange, and disseminate information and research results on optimisation models and approaches of SCM. This book will address problems of SCM from modeling, conceptual and practical perspectives such that researchers and practitioners in SCM can keep up with the development of this field and have a better understanding and collaboration among them. Review articles, conceptual and analytical and empirical analysis on SCM are also included.

Effective coordination plays an important role in the successful operation of modern manufacturing and inventory systems. If no such coordination exists,
then the vendor and the buyer will act independently to make decisions that
maximise their respective profits or minimise their costs. This may not be op-
timal if one considers the supply chain as a whole. How best to achieve
effective coordination between the suppliers and the buyers is both a current
managerial concern and an important research issue. Chapter I considers
coordination in a single-vendor multi-buyer supply chain by synchronising or-
dering and production cycles. The synchronisation is achieved by scheduling
the actual ordering days of the buyers and coordinating it with the vendor’s
production cycle while allowing the buyers to choose their own lot sizes and
order cycle.

A supply chain or network may be considered to be a set of linked processes
connecting downstream customers to upstream suppliers, factories, distribu-
tion centers and retailers.

It was reported in recent work that productive efficiencies between stages in
a serial linkage of processes were modeled so that linear programming could
be used to determine optimal throughput. Chapter II proposes how these
theoretical results might be extended and applied to supply chain manage-
ment, especially to the monitoring of chains and supply networks for effi-
ciency, capacity and continuous improvement. Moreover, discussions on pos-
sible applications of this study to the upcoming and important area of e-busi-
ness are provided.

Significant advances have been made in the computational studies of optimi-
sation and optimal controls. A number of efficient computational techniques
are now available for solving various classes of optimisation and optimal con-
tral problems numerically. Despite the development of advanced information
technology and significant advances in the computational studies of optimisation
and optimal controls, there are still many issues which need to be addressed
with a view to enhance the application of SCM in real life environments and
further theoretical development. In Chapter III, a single echelon supply chain
problem is posed as an optimal control problem of a system with time delays,
and thus solved by adopting techniques from the theory of computational op-
timal controls. An illustrative numerical example is also provided to demon-
strate the effectiveness of the novel technique.

It is inevitable for SCM to be affected by the life cycle of products. In Chap-
ter IV, a systematic and in-depth discussion of three main interrelated life
cycles affecting the dynamics of supply chain associated with products is pre-
sented, namely, innovation, the market, and the location. References to real-
world products are also given in the chapter for readers to relate the theory.
Literature on supply chain management has acknowledged the effects of forecasting techniques, lot sizing rules, centralising information systems, vendor managed inventory, and various biases and noises on order variability or bullwhip effect. In Chapter V, the order variability from a buyer is shown to be affected by the payment terms offered by the supplier. A new mathematical model is proposed and numerical simulation results are presented to demonstrate the substantial effects of payment terms.

In Chapter VI, lengthy discussions on globalisation on SCM and the resulting ideas of two different schools of thoughts, namely, standardisation and adaptation of products, are presented. This chapter has laid the theoretical groundwork for a strategy that captures the advantages of both schools, and has given the suggestion of a delayed adaptation strategies that may profitably address the efficiencies required by competition and the product features demanded by increasingly discerning customers.

In Chapter VII, a detailed comparison between Genetic Algorithm (GA) and other meta-heuristics are given for solving SCM problems which are potentially very complex and very size-formidable, with thousands of variables. The weakness of GA is also addressed in the chapter. Readers having a background of computational optimisation would find this chapter interesting.

One of the most interesting aspects of supply chains is their intrinsic dynamic behaviour. Dynamic interactions can cause unexpected and undesirable results. There are both external and internal reasons for this. In Chapter VIII, some of the principal dynamics features of supply chains are reviewed. A study of the relationship between the competitiveness of the supply chain and its intrinsic dynamics is provided, for both positive and negative aspects.

In order to achieve a successful implementation of electronic commerce (EC), it is necessary to review and restructure the logistics activities of the enterprise. In Chapter IX, such a review, defined as re-engineering, is provided. Four stages of EC — and the links between — are presented: Brochureware, e-commerce, e-Business, and e-Enterprise. A self-diagnosis tool is also provided, which is the first detailed checklist for a systematic analysis of a company’s processes. It is the first step in the re-engineering of logistics activities for EC since it allows a company to evaluate its situation within the EC framework.

It is well known that traditional inventory models that assume the inventory can all be used to fulfill the future demands are no longer applicable for perishable products. Many authors have contributed to the area in the literature. In Chapter X, a detailed literature review is presented for these works on the
interaction and coordination in supply chains with perishable products. Professionals and researchers may find this chapter useful.

The topics are discussed with sufficient detail to enable the readers to follow the procedure and calculations quite easily. The book is directed toward graduate students interested in the conceptual, analytical and empirical analysis on SCM. To avoid the necessity of frequent and disruptive cross-referencing, the chapters are designed to be as independent of each other as possible, and are self-contained. The mathematical requirements for most of the chapters are at the first-year graduate level.