

Supply Chain Analytics and Modelling

Supply Chain Analytics and Modelling

Quantitative tools and applications

Nicoleta Tipi



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PREFACE

The concepts presented in this book are the author's own interpretation, formed from a number of years working with these issues from a practical, theoretical and professional perspective. A number of examples are used, and some of these are hypothetical in nature; however, they are intended to form the base of the explanation in each case. Specific concepts on business analytics, supply chain modelling, supply chain performance measures and big data in the supply chain will be introduced where they will be supported by definitions and relevant references at the end of each chapter. Additional sources will also be provided that form the base of the reading for a particular topic. The aim of this book is to introduce the reader to old and new concepts in business analytics, to challenge their interpretation and application, and to discuss, explain and promote new avenues regarding the salient characteristics and features of analytics in the context of supply chain systems.

This book is an introduction to business analytics and modelling within the field of supply chain and could be used by:

- undergraduate and postgraduate students of business intelligence, business analytics, data analytics, modelling and simulation in the supply chain;
- undergraduate and postgraduate students of business, management, technical and engineering universities as additional reading;
- PhD researchers of business, management, information technology, information systems and engineering;
- researchers who specialize in analytics, modelling and simulation and are concerned with their applications in general;
- practitioners who are keen to understand, evaluate, implement and review some of the related techniques presented here.

The first four chapters form *Part 1* of the book, which sets out the basic concepts that are required in modelling and analysing a range of different aspects present in a supply chain system.

Chapter 1 aims to introduce the meaning of business analytics and to take a critical view at how is this seen in the current business environment. Opportunities, challenges and limitations to business analytics are discussed.

The entire book focuses on business analytics and modelling in the supply chain, but this chapter covers the main concepts of business analytics with the view to introducing the remaining chapters that focus on the supply chain.

Chapter 2 starts by providing a definition of supply chain systems and networks. Following this, the content of the chapter will delve into understanding what is modelling, but more prominently what is modelling from the perspective of a complex supply chain point of view. Interlinked ideas of analytics and modelling for complex supply chain systems that form complicated network structures are challenged in this chapter. Examples of models and modelling characteristics are embedded in this discussion.

Chapter 3 reviews the importance of data in the supply chain. Different characteristics of data are presented in this case with the view to emphasize the importance of data and data behaviours when this is being incorporated in analysis. The way in which data is structured and managed in the supply chain will be challenged in this chapter.

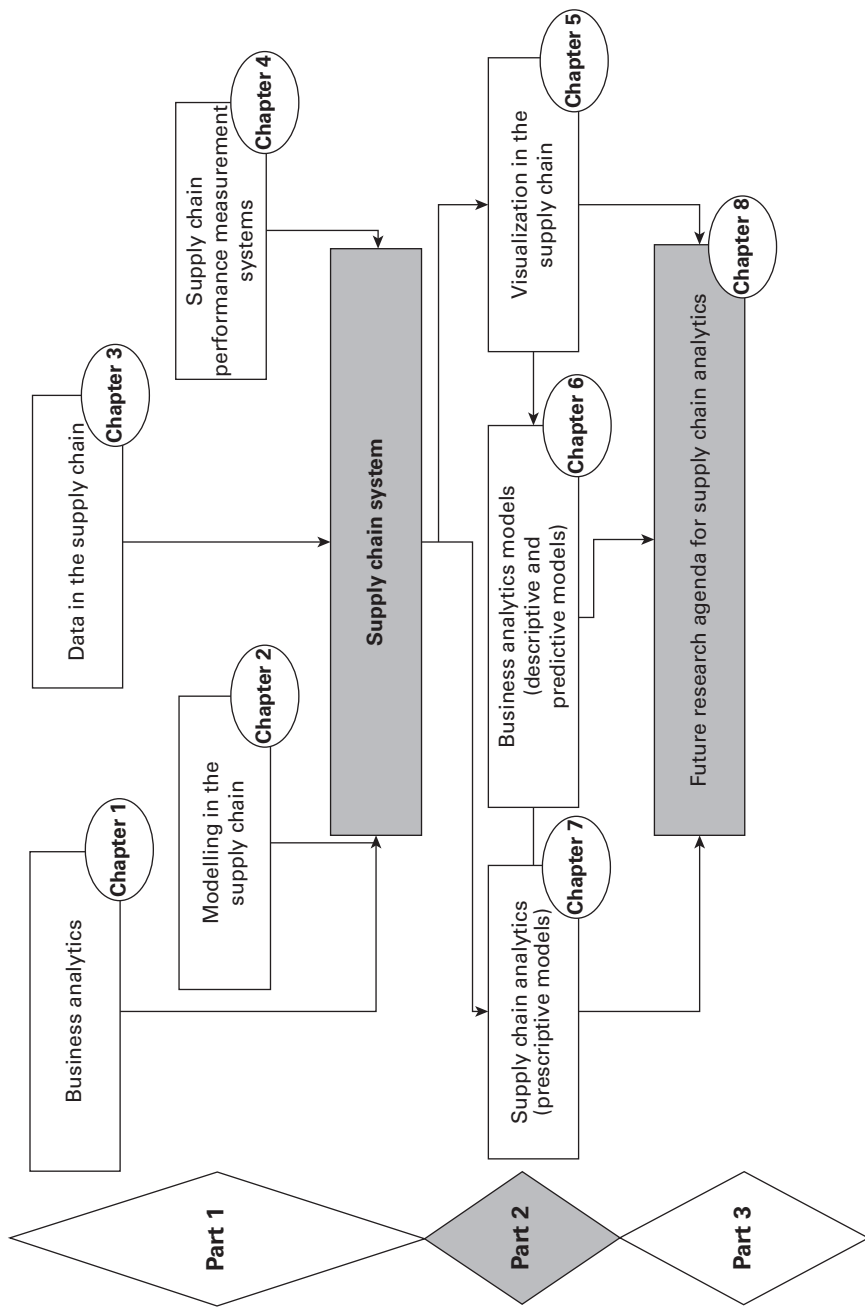
Following these three chapters on analytics, modelling and data in the supply chain, *Chapter 4* continues with a discussion on identifying and setting up performance measures that meet supply chain requirements. These measures aim to be set from the point of view of the data present in the chain to the challenges in using modelling and analytics to set up and analyse performance measurement systems. Characteristics of design and implementation of performance measures and supply chain performance measurement systems will be explained.

Part 2 looks at establishing the key important characteristics associated with current models, techniques and approaches employed in modelling and analysis. Therefore, *Chapter 5* takes a more detailed view on data and the elements required to visualize the results of analysis, or indications from measurement systems. Different visualization examples are considered in this chapter, with examples presented from data being visualized using Excel and Minitab.

Chapter 6 looks at some of the most-used business analytics models under the descriptive and predictive analytics categories, and explains how these could be used in practice. Individual examples are detailed in this chapter that again are represented with the use of Excel and Minitab.

Complex models on supply chain analytics are then taken further in *Chapter 7*, where they are presented from an optimization and heuristics modelling perspective. Examples of linear programming considering the assignment, transportation, covering and the transshipment concept are detailed in this section. All these are discussed from a supply chain context

Figure 0.1 Business analytics and modelling in the supply chain



point of view. Heuristics models dealing with facility location and vehicle routing modelling are incorporated in this chapter. All these models are grouped under the prescriptive analytics section.

Following the details presented in the last three chapters, *Part 3* outlines new directions in the area of modelling and analytics. *Chapter 8* presents and challenges the future of business analytics and modelling. This is extracted from current systematic literature reviews conducted in the field of supply chain analytics and modelling.

