

Preface

The goal of this book is to codify ideas and results from a specific segment of the supply chain operations planning literature that has developed over the past few decades. This segment of the literature draws on the tools of operations research in order to characterize optimal solutions to problems that seek to efficiently match a producer's supply output with the demands or requirements of a set of customers and/or markets. More specifically, we will emphasize contexts in which the producer has some control over both supply and demand, i.e., situations in which some degree of flexibility in demand exists from the producer's point of view.

The evolution of the operations literature in the past half century has by and large focused on managing (or minimizing) costs while attempting to meet some external party's target output requirements. This external party often corresponds to a marketing group within the same firm, whose responsibilities include setting prices and estimating the resulting customer demand levels, in effect, determining optimal demand levels with respect to some objective. Understanding how price influences demand for a good, and thus, what constitutes an *optimal* set of demand levels, requires some knowledge of how customers will respond to one of the product's critical characteristics (in this case, price). Defining the way in which customers will respond to price in the aggregate is analogous to characterizing the degree of flexibility that exists in demand as a function of price. Customer flexibility often exists along numerous product dimensions in addition to price (e.g., product sizes, delivery quantities, delivery lead times), many of which are directly controllable via production and distribution operations.

In addition to inherent customer flexibility with respect to product characteristics, a supplier or producer often has discretion as to which customers, demands, or markets it will satisfy with its product(s). This discretion provides an additional source of flexibility in planning by permitting the producer to accept or decline certain customers or markets.

Models for operations planning have typically treated demands as fixed, exogenous parameters, based on predetermined price levels and other fixed product characteristics. This corresponds to a sequential decision making process in which different decisions that ultimately combine to determine profitability are made separately. That is, marketing and sales groups essentially estimate the demand levels for

products containing specific characteristics offered at specific prices, and operations is tasked with meeting the implied demands at the lowest delivered cost. An alternative view, which serves as the focus of this book, treats demand (and/or revenue) as dependent on key product-characteristic and customer-acceptance decisions that are made by the producer. This leads to new classes of operations planning models that effectively treat demand levels as decision variables within the planning model. The resulting models then determine the optimal production and demand levels, i.e., the most efficient match between the supply process and the inherently flexible demands. This book thus brings together several operations research based planning models that share this alternative view of sales and operations planning. As the final part of the book indicates, the models presented provide a foundation for both adapting a wealth of existing problems to this paradigm and for its extension and generalization to even broader classes of decision problems.

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