Book Review
Title: Planning and Scheduling in Manufacturing and Services
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Planning and Scheduling in Manufacturing and Services is not only written in a simple and clear manner, but is also offers a scholarly presentation of planning and scheduling problems, models, solutions methods and systems. Pinedo's book is an effective combination of planning and scheduling theory with practical applications which help the reader to immediately link mathematical models to real-world problems and computer-based decision support systems. The book is organised in a way that facilitates a progressive introduction to the fascinating topic of planning and scheduling. There are four parts and six appendices in addition to a CD-ROM containing additional resources. Part I gives an introduction to problems, notation and models of planning and scheduling problems. Parts II and III are dedicated to detailed presentations of important problems in the manufacturing and services industries respectively. Each part is made of several chapters and each chapter is dedicated to problems in a particular area covering their detailed description, formulation, applications and illustration with a real-world example. Part IV is somehow a distinctive feature in Pinedo's book because it gives a nice presentation of important issues to consider when designing and developing computerised planning and scheduling systems. Practitioners and those interested in developing computerised scheduling systems will find the three chapters in part IV very useful. Based on his experience with real-world scheduling systems, Pinedo gives many insights into the important aspects that must be considered when developing this type of applications and those issues that still require further research and development. The appendices offer readers an overview of solution methods including mathematical programming, heuristics and constraint programming. The appendices do not go into much depth but give a reasonable overview of each topic. The last appendix is a short user's manual for the Lekin System, a machine scheduling system included in the CD-ROM. The book's website has a handful of useful resources including updated OPL models that are compatible with ILOG CPLEX versions released after the publication of this book.

Part I of the book is very effective in setting the scope and importance of planning and scheduling by using several illustrative examples of problems in this area. The book gives also a clear idea of the way in which such problems are embedded into the complex decision-making process in manufacturing and services. Parts II and III offer a rich collection of planning and scheduling problems clearly described and formulated without employing complicated notation (readers interested in a more mathematical oriented approach would like to see alternative books). The similarities and differences between planning and scheduling problems arising in manufacturing and those arising in services are covered in good detail in this book helping the reader to appreciate the peculiarities and significance of the various models presented. At the end of each chapter the reader will find a series of interesting exercises that represent a nice combination of theory and practice which help the reader to assimilate concepts more effectively. Also at the end of each chapter, Pinedo gives 'Comments and References' which is basically a paragraph or two that concentrate a number of references to scientific papers relevant to each of the topics presented in the chapter. This is a very nice feature of this book because the interested reader can quickly identify at the end of each chapter, additional scientific reading for a particular topic.

Planning and Scheduling in Manufacturing and Services gives a progressive presentation of algorithms for planning and scheduling in starting with the CPM and PERT techniques. The author discusses the suitability of these approaches but also their limitation prompting the reader's interest for the more elaborate and robust solution techniques discussed in later chapters. Also in a progressive manner, the book introduces models and formulations and discusses the difficulty to formulate important constraints and subjective criteria that exist in some real-world planning and scheduling problems. Solution approaches are also presented progressively starting with a textual description of the underlying logic, followed by the corresponding pseudocode and finally reinforced with a worked example offering the reader several ways to understand the given approach. Also, the differences and similarities between problems in planning and problems in scheduling are clearly explained in chapter 8 in which the topic is supply chains. Also in each chapter, the book

describes a real-world scenario, in many cases involving well-known global companies, in which a problem is modelled and solved using some kind of computer-based system.

The organisation and presentation of this book makes an enjoyable reading but this might also represent a small disadvantage for some readers. The reason for this is that in general, chapters in the book should be read sequentially because material presented in each chapter, including the appendices, make a reference to material presented earlier in the book. Another observation is that some chapters do not provide the same elements as the rest of the book. For example, chapter 9 would benefit from some kind of formulation of the timetabling problem discussed (even an incomplete model would help if a full one is not possible due to confidentiality). Also, chapter 12, dedicated to workforce scheduling, does not include the description of a computerised application as is the case of other chapters.

Overall, *Planning and Scheduling in Manufacturing and Services* is a valuable resource for students, academics and practitioners interested in planning and scheduling. In this book, Pinedo gives a comprehensive presentation of problems, models and solution approaches for planning and scheduling problems in two important sectors: manufacturing and services. This book is a very effective combination of theory and practice presented in a simple and clear style making it a very enjoyable reading.