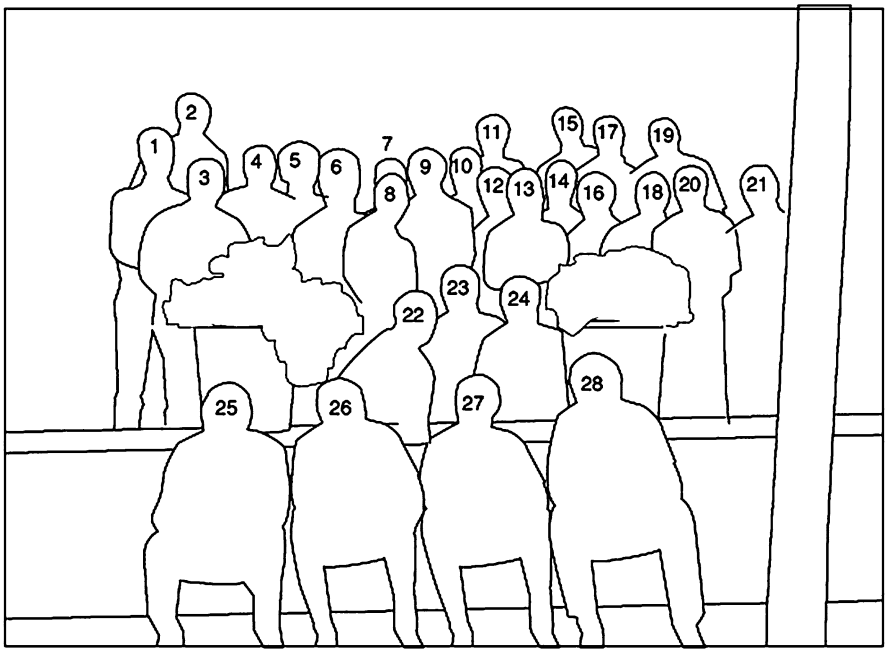
# Preface

The origins and history of the research work underlying this volume stem from a series of conferences which began in 1997 on the Island of Samos, Greece. In May of that year, Professor Christos Papadopoulos convened thirty-five research scientists and practitioners from all over the world to share their knowledge of the application of stochastic modeling and processes in manufacturing systems. Figure 1 shows the participants from the first conference

His organization and skill at managing the first and subsequent conferences inspired us all to follow him in his quest to encapsulate and extend the work to what it

**Fig. 1** Participants in Samos, Greece at the 1st meeting



1. R. Buitenhek
2. J. M. Smith
3. Greek Manager
4. Ron Askin
5. M. O'Kelly
6. J. Darzentas
7. T. Christofides
8. Jeny Darzentas
9. S. Gershwin
10. E. Tatsiopoulos
11. Yves Dallery
12. S. Yerelan
13. Greek Manager
14. B. Tan
15. G-J. Van Houtum
16. Greek Manager
17. G. Liberopoulos
18. Greek Manager
19. Y. Adamis
20. C. Heavey
21. G. Vouros
22. Tayfur Altiok
23. C. Papadopoulous
24. S. Makris
25. L. Laios
26. E. Triantaphyllou
27. H. Perros
28. H. Zijm

**Fig. 2** List of participants at the 1st meeting

has become in the present day. Christos is seated in the center of the photo, identified as #23 in Fig. 2.

Since 1997, there have been eight workshop/conferences every 2 years continuing the important seminal efforts of Christos. The conference/workshops held to date include:

- First Conference, *Performance Evaluation and Optimization of Production Lines*, Samos Greece, May 19–22, 1997
- Second Conference, *Analysis and Modeling of Manufacturing Systems,* Tinos Island, Greece, May 16–20, 1999
- Third Conference, *Design and Analysis of Manufacturing Systems*, Tinos Island, Greece, May 19–22, 2001
- Fourth Conference, *Analysis of Manufacturing Systems,* Samos Island, Greece, July 1–4, 2003
- Fifth Conference, *Analysis of Manufacturing Systems- Production Management,* Zakynthos Island, Greece, May 20–25, 2005

- Sixth Conference, *Analysis of Manufacturing Systems,* Luntern, The Netherlands, May 11–16 2007
- Seventh Conference, *Stochastic Models of Manufacturing and Service Operations,* Ostuni, Italy, June 7–12, 2009
- Eighth Conference, *Stochastic Models of Manufacturing and Service Operations,* Kusadasi, Turkey, May 28-June 02, 2011

During the seventh workshop in the Netherlands, the scientific committee arrived at the acronym **Stochastic Models of Manufacturing and Service Operations (SMMSO)** as a characterization of the research topics covered by the workshop. The *IX*th conference is scheduled to be held in Germany at the end of May 2013.

While there is some overlap and natural integration, the following nine categories of research issues and concerns have emerged as the academic discipline of the conferences:

- [Performance Analysis (PA)]: Decomposition, queueing theory, Markov processes, exact and heuristic methods and simulation.
- [Production Systems (PS)]: Flow, transfer, and Bernoulli lines, material handling systems, open, closed, and mixed queueing network models.
- [Supply Chains (SC)]: Bullwhip effect, cross-docking, transportation systems.
- [Production and Inventory Control (IC)]: Part-release mechanisms, make-to-order/make-to-stock, push/pull systems, base stock, lean manufacturing, lead times, lot sizing.
- [Quality Control (QC)]: Inspection stations, defects, machine failures, feedback.
- [Energy and Environment (EE)]: Sustainability, recycling, and waste management.
- [Optimization (OP)]: Buffers, servers, workload allocation, and routing.
- [Sequencing and Scheduling (SS)]: Job shops, open shops, admission control, release dates.
- [Engineering Economy and Finance (EF)]: Evaluating alternatives, amortization, cost analysis, and cost savings.

Figure 3 graphically depicts the subject matter discussed at most all of the SMMSO conferences and while the theory of stochastic processes, optimization, and production-inventory systems remain the academic underpinning for all the topics, it is the unique way in which the participants interact with these topics that has laid the foundation for this volume.

We conceived the idea of this volume as a way to document the foundations and academic principles of the **SMMSO** philosophy. This volume is designed to be a tutorial introduction to many of the research topics and issues encompassed by **SMMSO**. Thus, the intended audience of this volume are those people from academia and the practicing world who deal with all aspects of stochastic modeling in manufacturing and service systems.

The topics included in the various chapters are ordered as depicted in Fig. 4 and summarized below:

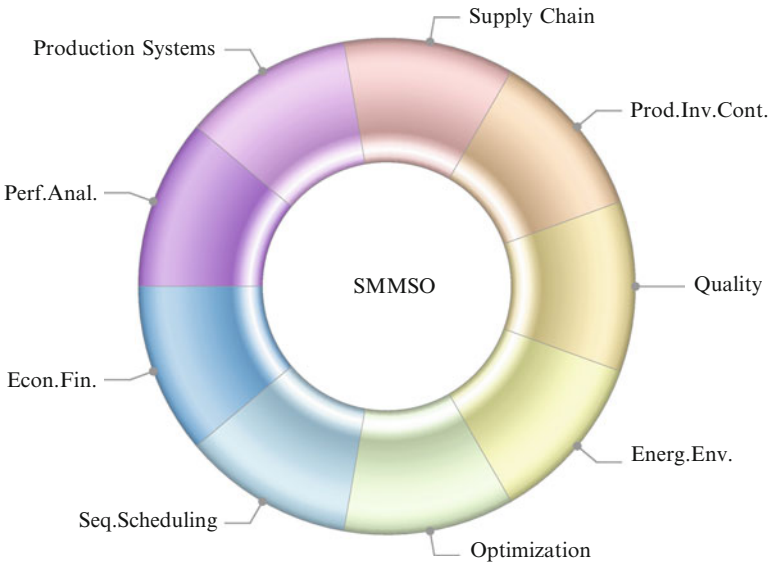



**Fig. 3** Subject matter of the SMMSO conferences

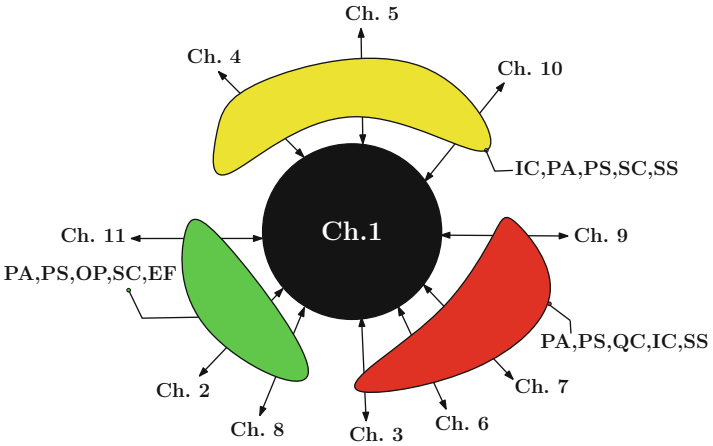



**Fig. 4** Organization of the chapters in the volume

- Chapter 1: John A. Buzacott, *The Design of Manufacturing Systems to Cope with Variability*. The first chapter is by the founder of Stochastic modelling of manufacturing systems. A comprehensive, insightful overview of the impact of variability in stochastic modeling on all aspects of manufacturing systems from job shops to flexible manufacturing systems. A must reading to start.

- Chapter 2: Xiao Cai, Sunderesh S. Heragu and Yang Liu, *Modeling Automated Warehouses Using Semi-Open Queueing Networks*. A comprehensive and

**Fig. 5** Participants in Ephesus, Turkey at the 8th SMMSO meeting

informative overview of semi-open queueing networks and their impact on the design and operations of automated warehousing.

- Chapter 3: P. Fernandes, M.E.J. O'Kelly, C.T. Papadopoulos and A. Sales, *Exact Analysis of Discrete Part Production Lines: The Markovian Queueing Network and the Stochastic Automata Networks Formalisms*. A comprehensive overview of exact methods to evaluate the performance of discrete part production lines and an informative introduction of the Stochastic Automata Networks for the analysis of production systems.

- Chapter 4: Kai Furmans and Martin Veit, *Models of Leveling for Lean Manufacturing Systems.* An introduction to stochastic models for lean manufacturing systems with a focus on practical methods to evaluate heijunka levelling in lean production systems.

- Chapter 5: Fikri Karaesmen, *Value of Advance Demand Information in Production and Inventory Systems with Shared Resources*. An insightful and informative survey of the methodology and approaches of advance design information in production and inventory systems.

**Fig. 6** Tayfur Altiok

- Chapter 6: Jingshan Li, Semyon M. Meerkov, and Liang Zhang, *Production Systems Engineering: Review and Recent Developments*. A *tour de force* of the field of Production Systems and its impact on manufacturing systems.

- Chapter 7: George Liberopolos, *Production Release Control: Paced, WIP-Based or Demand-Driven? Revisiting the Push/Pull and Make-to-Order/Make-to-Stock Distinctions*. A thorough discussion of push/pull and make-to-order/make-to-stock classifications of various production control mechanisms and precise definitions of these commonly used terms.

- Chapter 8: J. MacGregor Smith, *Queueing Network Models of Material Handling and Transportation Systems*. A detailed introduction and discussion of topological network design of transportation systems and presentation of various methods to analyze series, merge, and split topologies by using state dependent queues.

- Chapter 9: B. Tan, *Analysis of Output Variability*. A complementary chapter to Buzacott's presenting an overview of the methods to obtain performance measures related to the variability of the output from discrete-material flow production systems that are modelled as Markovian systems.

- Chapter 10: Horst Tempelmeier, *Stochastic Lot Sizing Problems*. A comprehensive overview of the issues and methods for stochastic lot sizing problems with random demands.

- Chapter 11: Nico J. Vandaele, *From Operational to Financial Evaluation of Manufacturing Systems*. An instructive discussion of the need and the types of modelling approaches to link the operational performance evaluation to the financial evaluation of manufacturing systems.

The conference publications have not only spawned a number of new ideas, but have resulted in journal publications in the **Annals of Operations Research (AOR), OR Spectrum, IIE Transactions**, and a Kluwer Special Volume.

The photo in Fig. 5 is from the most recent meeting in Ephesus, Turkey in 2011. One of the founding participants and the invited speaker at the *VIII* conference, Professor Tayfur Altiok from Rutgers University, recently passed away. Tayfur is the fourth person to the right seated in the top leftmost row in Fig. 5 and also shown in Fig. 6. He was a vital member of the first conference and the last meeting. He will be sorely missed.

We trust that you will find in this volume a valuable set of tutorials and fundamentals of the various research topics of the SMMSO universe.

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