

Editorial: Management of complexity and uncertainty in supply chains

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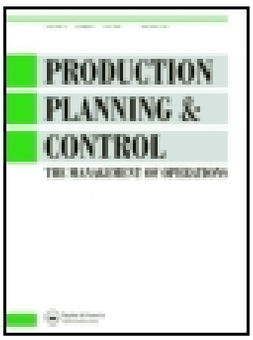
Valerie Botta-Genoulaz, Michel Gourgand. Editorial: Management of complexity and uncertainty in supply chains. Production Planning and Control, 2008, 19 (7), pp.629-631. hal-00392202

HAL Id: hal-00392202
https://hal.science/hal-00392202

Submitted on 5 Dec 2018

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Production Planning & Control

ISSN: 0953-7287 (Print) 1366-5871 (Online) Journal homepage: http://www.tandfonline.com/loi/tppc20

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To cite this article: Valérie Botta-Genoulaz & Michel Gourgand (2008) Management of complexity and uncertainty in supply chains, Production Planning & Control, 19:7, 629-631, DOI: 10.1080/09537280802571456

To link to this article: http://dx.doi.org/10.1080/09537280802571456

Published online: 05 Dec 2008.

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Production Planning & Control
Vol. 19, No. 7, October 2008, 629–631

Taylor & Francis
Taylor & Francis Group

EDITORIAL

Management of complexity and uncertainty in supply chains

Nowadays companies are evolving in a more networked economy. Thanks to the vertiginous advances in the development of information and communication technologies and under the fierce competition of global markets, companies are transforming their production structures and rethinking their business architecture in order to streamline their processes. Different tendencies make the environment in which they evolve more complex, such as outsourcing, mergers or buyouts of activities, virtual enterprise development that induces temporary relations to be mastered, price pressure, etc. In addition, companies are faced with more uncertainties, downstream about customer demand, and upstream about the reliability of suppliers' processes or more generally about reliability and pertinence of exchanged information.

New ways of doing business and managing supply chains must be developed. The objective of supply chain managers is to enable their firms to excel in the accomplishment of their essential processes in order to gain performance. To reach this objective the traditional vertical integration is no longer sufficient for added value creation and for core-business well positioning. The challenge for supply chain managers is the multiple levels of integration required to optimise network effectiveness and efficiency. They should work with suppliers that could not only provide low-cost, high-quality and on-time delivery but also involve cross-company planning and serve customers' needs in the most appropriate way. This implies the development of new collaborative practices between business partners, and synchronised operation planning methods to answer problems related to this complexity and uncertainty that rationalise and optimise supply chain processes and reduce costs.

These issues concern both academics and industrialists. The International Conference on Information Systems, Logistics and Supply Chain (ILS), organised on the 15–17 May 2006 in Lyon, has addressed a broad range of topics related to supply network, logistics operations management, supply chain management and optimisation and information systems. Participants had the possibility to discuss emerging industrial issues, to share common practices and recent research development and to identify research opportunities in the area of supply chain management.

The eight papers published in this special issue of *Production Planning & Control* were selected among the best contributions discussed at the ILS conference, re-written and re-reviewed. Their contents are promising and present substantial advances in supply chain research to overcome complexity and uncertainty by providing new inventory and replenishment rules, process integration methods, coordination practices or synchronised planning mechanisms in a wide variety of contexts and applications.

In the first paper, '*A canonical model for the analysis of manufacturing systems*', Faria studies the problem of just-in-time (JIT) supply chains by comparing synchronous JIT, where the production systems of both the supplier and the customer are strictly synchronised, and the mission JIT, where the supplier dispatches periodically a batch of a given part type to the customer. He proposes a new analytical tool for analysing JIT systems, the canonical model, which allows key performance indicators for competitiveness to be assessed for a large range of design issues and for different operational modes. The author shows how this model may help planners of manufacturing systems to determine the most effective solutions in terms of reliability, such as manufacturing equipment redundancy, safety stock dimensioning or maintenance policy.

The paper '*Integration of production and shipping planning*: *a co-operative approach*', by Baptiste, Alsène and Gaudimier, deals with the integration of the production planning and the shipping planning processes in a real company within a JIT environment. They propose a decision support system to schedule simultaneously the production and the semi-trailers used for shipping, by an explicit integration model that considers the critical domains of each actor. Their original integration approach is tested on the industrial case.

In the third paper, '*Scheduling coordination in a supply chain using advance demand information*', Giard and Mendy analyse the efficiency of current mechanisms of scheduling coordination when

ISSN 0953–7287 print/ISSN 1366–5871 online
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DOI: 10.1080/09537280802571456
http://www.informaworld.com

suppliers' processes are not completely reliable. They present and justify new scheduling coordination rules allowing synchronous production in an unreliable environment. Their new approach has been benchmarked in the automotive industry as an appropriate method to avoid stock outs and decrease the safety stock, compared to scheduling rules based on the kanban system or the periodic replenishment review system.

Van den broecke, Aghezzaf and Van Landeghem, in their paper '*Cyclical volume planning and fair share mix decisions, delivering a more robust service level*', investigate the ability to integrate scheduling and lot sizing decisions within the semi-process industry. They propose a tuned algorithm and discuss the impacts on stock values, service levels and set-up and inventory holding costs. The main benefit of the model integrating volume planning and mix decisions, shown by an application to a photographic film producer, is the ability to reduce demand amplifications, prohibiting market demand nervousness to enter into upstream operations, which allows a major reduction in needed safety stock at the intermediate product level.

Lee and Wang address a problem encountered by a medical centre in Taiwan in their paper '*Managing level of consigned inventory with buyer's warehouse capacity constraint*'. They study the impact that a buyer's warehouse space capacity constraint has on a manufacturer's total set up, inventory holding, and replenishment costs when both the supplier and buyer in the supply chain agree to adopt a consignment purchasing policy. They propose an integrated inventory control model, making joint economic lot size decisions of a manufacturer's production batch and the replenishment lot subject to consignee's warehouse space capacity constraint, to minimise the manufacturer's total cost. This model enables managers to move from a reactive mode to a proactive one by taking the suppliers' perspective.

The paper '*A model for level-loading production in the process industries when demand is stochastic*', by Rappold and Yoho, examines a multi-item integrated production-inventory system in which changeover times are significant on the process equipment, and customer demand is highly uncertain. They develop a production stabilising policy in which the length of the production cycle is kept between a lower and a upper limit, and discuss how capacity utilisation and demand uncertainty interact with lower and upper limits to affect system performance. The accuracy of the approach is evaluated by a numerical study based on multi-colour glass plants.

In their paper '*A win–win solution for the bullwhip problem*', Boute, Disney, Lambrecht and Van Houdt study an important supply chain research problem, which is the bullwhip effect where demand variability increases as one moves up the supply chain. They propose an inventory replenishment rule that reduces the variability of upstream orders and generates a smooth order pattern resulting in a win-win solution for both supply chain echelons, without increasing stock levels. They also discuss a range of other order variance reduction tools like vendor managed inventory (VMI). They illustrate the benefits of their contribution on two cases: the ordering pattern of a bakery company and the order smoothing of a UK grocery retailer.

Finally, in the paper '*Coordination and demand uncertainty in supply chains*', Sepulveda Rojas and Frein present the importance of coordination for different levels of uncertainty about customer demand. They have defined a framework to study different coordination scenarios, considering the perimeter of decision making and information sharing between supply chain members. The influence of coordination is tested on two cases: a scheduling case inspired from a dyadic supply chain in computer industry and a short term planning case based on the Beer Game.

The guest editors would like to thank the authors for their valuable contributions reserved for this special issue and the reviewers for their precious referee work.

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