

Editorial

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1 Production and operations management in the automotive industry (part 1)

With more than 70 million motor vehicles sold per year the automotive industry is one of the key industries of the world. While originally rigid labour division and paced assembly lines were employed to realize low-cost mass production of automotives, nowadays flexible mixed-model assembly lines make it possible to produce a large variety of customized products. The increased manufacturing flexibility, however, imposes new challenges not only for the design of the manufacturing system but also for the logistics coordination within global supply chains. In addition, novel planning and scheduling approaches are needed in order to manage the mismatch between increased product variety and the need to improve the utilization of the capital-intensive resources.

Focussing on the latest developments in automotive supply chains and manufacturing technologies, the primary objective of this special issue is to examine research issues concerned with production and operations management in the automotive industry. For the first part of the special issue five papers have been selected for publication after a thorough peer-review according to the standards of the FSM journal. The second part of the special issue will appear in due course.

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2 Papers in part 1 of the special issue

The first paper by *H.A. Stephan, T. Gschwind* and *S. Minner* proposes a multi-stage stochastic dynamic programming approach to support real world capacity provision and adjustment decisions in automotive manufacturing networks. Motivated by empirical findings from the automotive industry a Markov demand model is developed to represent the evolution of demand over time. Benefits of the proposed solution approach are illustrated for different generic manufacturing networks.

The subsequent paper by *T. AlGeddawy* and *H. ElMaraghy* presents a new optimization model to construct the optimum layout of delayed differentiation assembly lines for a mix of products to be manufactured by the same system and optimizes the position of the differentiation points. This model employs a classification tool (Cladistics) used in biological analysis and modifies it to conduct commonality analysis of the candidate products. A family of automobile engine accessories was used as an example to demonstrate the practical benefits of the proposed optimization model.

A collaborative SCM framework is developed in the paper by *S. Oh, K. Ryu, I. Moon, H. Cho* and *M. Jung*. They specifically address the trustworthiness of partners in an automotive supply chain and propose a framework in which the relationships between the partners are modelled as a fractal. Each fractal is represented by a goal model and generates a production plan taking the trust value of participants into account. To validate the developed framework in the automotive industry, simulation studies are conducted.

In their paper *T. Schöneberg, A. Koberstein* and *L. Suhl* address the application of forwarding-based inbound logistics networks which are established to reduce costs and environmental pollution by consolidating transportation orders from different suppliers to a final recipient. So-called “delivery profiles” are defined which restrict the deliveries of each supplier to a specific frequency. The selection of delivery profiles is supported by use of a new mixed-integer programming model.

The final paper by *N. Boysen, M. Liedner* and *A. Scholl* investigates the problem of re-sequencing the models between the various stages in the final assembly of automotives. Because of conflicting objectives and restrictions in the paint and the body shop, perturbations of an initial sequence will regularly occur which are accomplished with the help of re-sequencing buffers. The paper shows how to adapt famous solution approaches for mixed-model assembly line scheduling in face of a given number of re-sequencing buffers.

3 Concluding remarks

This special issue has greatly benefited from the cooperation among the authors, reviewers, and editors. We would like to express our sincere thanks to the reviewers for their excellent and timely refereeing. Last, but not least, we thank all authors for their contributions which made this special issue possible.