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EDITORIAL

Editorial

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Global production networks, the rapid development of technology, market dynamics, fierce competition and the increasing relevance of sustainability put severe pressure on current practices in operations management. To understand the emerging issues in operations management and to provide adequate decision support, it becomes increasingly important to take an interdisciplinary perspective, combining the expertise of different scientific domains.

This special issue includes five papers that cover a broad range of topics ranging from supply chain management and cyber-physical systems to energy- and resource efficient production. All contributions feature a strong theoretical basis, bringing together theories and methodologies from management, economy, operations research, psychology, engineering, and natural sciences. At the same time, they exhibit a strong empirical basis, drawing on case studies and experimental as well as survey research. As such, the contributions provide valuable insights for academia and practice and they impressively boldface the relevance of interdisciplinary research in operations management.

Patrick Breun, Magnus Fröhling, Konrad Zimmer, and Frank Schultmann open the special issue with a study of the German metal industry, asking the question how changing regulatory conditions will effect investments in energy efficiency increasing technologies. Based on a comprehensive simulation that includes detailed techno-economic models of all major German steel and aluminum plants,

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the authors carry out a two-level analysis. At the level of the single plant, they find that there are investment programs in energy efficiency increasing technologies which are robust with respect to a wide range of future political conditions and include technologies that are currently not used. At industry level, they find that special care is necessary in designing political instruments: there are combinations of instruments which induce a very significant reduction of greenhouse gas emissions and at the same time do not impair the profitability of operations. There are, however, also combinations that render production at selected sites unprofitable and may undermine the competitiveness of parts of the German metal industry.

In the same line of research, Konstantin Biel and Christoph H. Glock shift the focus to the perspective of a single plant. In their paper "Prerequisites of efficient decentralized waste heat recovery and energy storage in production planning", they develop a master production scheduling approach that simultaneously considers capacity, inventory and energy. They refer to a production system that combines waste heat recovery based on Organic Ranking Cycles with an industrial energy storage system. The problem is formulated as a mixed-integer program which is solved using a commercial solver. The authors present results of a numerical analysis which is motivated by a steel plant. Accordingly, there are strong synergies between waste heat recovery and energy storage. If the system is appropriately configured, investing in both technologies could be profitable while at the same time increasing energy efficiency.

The question how production planning can contribute to the resource efficiency of industrial processes is tackled in the paper "Quality splitting in waste incineration due to non-convex production possibilities". Mark Müser and Harald Dyckhoff develop a non-linear techno-economic input-output model of a waste incineration plant. The analytical model allows to capture the effect of different qualities of input material on the consumption of additives for gas purification. The application of the model to a real-world case yields non-intuitive findings that question the current industry practice: waste incineration plants could benefit from an increased resource efficiency, if they changed from using homogeneous material to quality splitting.

A topic that combines the perspective of resource efficient production with cyber-physical production systems and supply chain management is covered in the paper "Additive manufacturing technology adoption: an empirical analysis of general and supply chain-related determinants". Katrin Oettmeier and Erik Hofmann consider the diffusion of additive manufacturing (commonly known as 3D-printing) as an important technology to reduce material input and revolutionize today's supply chains. They ask the question which factors determine the adaption decision and put a special focus on supply chain-related factors. Based on an online survey of approximately 200 Swiss companies from different industries, the authors apply univariate and multivariate logistic regression to identify factors controlling the adoption of additive manufacturing. They find that the main predictors are demand-side benefits such as the local, responsive, and customized production as well as the technological readiness of processes and (IT) systems. Interestingly, there is no indication for any relevance of supply-side benefits.

Abdolkarim Sadrieh and Guido Voigt close the special issue with an empirical work on "Strategic risk in supply chain contract design". The authors consider a supply chain game with one supplier and one buyer: based on a signal on the buyer's cost structure (private information), the supplier offers one or more contracts. The buyer chooses one of the contracts or rejects the offer. Having fulfilled the contract, the supplier is able to reward or penalize the buyer. Referring to the results of an experiment, the authors find that there are indications for inefficiencies due to what they coin "strategic risk", i.e., supplier concerns on the consistency of the buyer's shared information, her contract choice behavior or her adherence to payoff maximizing behavior. The experiments further show that punishment options and the rewarding of profit-maximizing contract selection help to improve supply chain performance. Selling organizations could therefore benefit from measures that increase the predictability of the supply chain partners' behavior.

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