

Michael Hülsmann  
Bernd Scholz-Reiter  
Katja Windt *Editors*

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# Autonomous Cooperation and Control in Logistics

Contributions and Limitations –  
Theoretical and Practical Perspectives

 Springer

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# Preface

The edited volume “Autonomous Cooperation and Control in Logistics: Contributions and Limitations – Theoretical and Practical Perspectives” consequently continues the previous publication “Understanding Autonomous Cooperation and Control in Logistics – The Impact of Autonomy on Management, Information, Communication, and Material Flow”, edited by Michael Hülsmann and Katja Windt. This first volume focuses on collating various understandings of self-organisation. It intends to establish a common perspective on basic ideas and their adoption and adaptability to logistics. Additionally, that publication identifies and compares the scope and depth of autonomous cooperation and control resulting from various, interdisciplinary understandings of self-organisation. Therefore, the first edited volume aims for developing a conceptual system for autonomous cooperation and control, which allows to interpret discipline-specifically, to functionalise, and to apply autonomous cooperation and control in the context of logistic systems. It is dedicated to provide logistics research as well as practice with first impulses for answering the question how logistics management can better cope with complexity and dynamics in supply chains and networks. All in all, the first edited volume “Understanding Autonomous Cooperation and Control in Logistics – The Impact of Autonomy on Management, Information, Communication, and Material Flow” provides a terminological, taxonomical, and analytical framework to examine, explain, and apply the principles of self-organisation in the context of complex, dynamic logistics processes.

Consistently, the second edited volume “Autonomous Cooperation and Control in Logistics: Contributions and Limitations – Theoretical and Practical Perspectives” uses the developed framework to approach the challenge of finding an optimal degree of autonomous cooperation and control of logistics processes. Therefore, this publication seeks to determine analytically the upper and lower boundaries of autonomous cooperation and control. This focus should lead to a common understanding of the enablers and impediments of applying the idea of self-organisation as a paradigmatic principle to logistics and the design, planning, and control of its processes. Hence, this edited volume is dedicated to identify, describe, and investigate – in the context of production and distribution logistics – the effects, feasibility, outcomes, barriers, driving forces, cause-effect-relations, etc. of concepts, methods, technologies, and routines, that are based on and linked with the idea of self-organisation in logistics. Therefore, it is the major objective of this edited volume

to give a broad overview about the contributions and limitations of autonomous cooperation and control of logistics processes. Furthermore, this publication should outline a first answer to how the abstract idea of self-organisation can substantially contribute to a better performance and robustness of complex and dynamic logistics systems in versatile and volatile environments. In this regard this edited volume comprises first implementations in real industrial scenarios as well and demonstrates on practical examples the logistic potential and its limitations.

Both research objects – logistics as well as the idea of autonomous cooperation and control – need an interdisciplinary approach, which can cover all their heterogeneous characteristics (e.g. technological and organisational). Therefore, this edited volume combines the different perspectives of production technology, electronics and communication engineering, informatics and mathematics, as well as management sciences and economics. The solid foundation for the necessary integration of these diverse points of view is built on the interdisciplinary research within the Collaborative Research Centre 637 (CRC 637) “Autonomous Cooperating Logistic Processes – A Paradigm Shift and its Limitations” at the University of Bremen since 2004. The CRC 637 intends to identify the rules of autonomous cooperation and control in order to develop a “theoretical backbone” for applying this paradigm on all levels of logistics systems: on the managerial decision-making level, on the information processing and communication level, and on the material flow level. Therefore, this publication edited volume covers all perspectives and levels addressed above in order to provide a comprehensive and profound picture of contributions and restrictions of autonomous cooperation and control of logistics processes – which might help to understand the related paradigm-shift and its limitations.

This publication is the result of a fruitful and pleasant cooperation, collaboration, and communication between many actors, whose invaluable work made this edited volume possible. First of all, we like to thank our colleagues and doctoral students within the CRC 637 and around this institution for the inspiring, intriguing discourses, reflections, and exchanges of ideas within the last seven years. During our debates and conversations we had the outstanding opportunity to learn from other disciplines. This included also the challenge to develop shared perspectives on the same object (i.e. autonomous cooperation and control in logistics) from the background of different scientific cultures, theoretical frameworks, and methodological approaches. Therefore, it was always an honour and contentment for us having the chance to edit this volume and we are very grateful for this exciting experience in our academic career. Secondly, we are tremendously happy and grateful for the contributions of the voluntary reviewers, who spent their limited and valuable time for improving the quality of the contributions in this edited volume. Without any doubt, the reviewers’ comments formed the various collections of a good idea, an appropriate research conception, and all the other ingredients of a scientific article into the shape of consistent and solid argumentation. There are also very helpful and important hands, which backed us up by thoroughly taking care of all the supporting activities. For this, we would like to express our appreciation to Dipl.-Wi.-Ing. Anne Schwientek, who coordinated the compilation and

editing of all articles; to Dipl.-Oec. Philip Cordes for supporting and reviewing; to Lore Zander and Dipl.-Inf. Jacob Piotrowski for handling the administrative side; to Susanne Benner and Caroline Hannemann for proof-reading and editing. Naturally, we would like to say thank you to our publisher SpringerPhysica, represented by Thomas Lehnert, for his motivating feedbacks and for giving us the chance to publish our edited volume “Autonomous Cooperation and Control in Logistics: Contributions and Limitations – Theoretical and Practical Perspectives” at SpringerPhysica’s. Finally, we would like to thank the German Research Foundation (DFG), which supported this research as part of the Collaborative Research Centre 637 “Autonomous Cooperating Logistic Processes – A Paradigm Shift and its Limitations”.

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