



OTTO VON GUERICKE  
UNIVERSITÄT  
MAGDEBURG

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FAKULTÄT FÜR  
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# Forschungsbericht 2022

Lehrstuhl BWL, insb. Operations Management

# LEHRSTUHL BWL, INSB. OPERATIONS MANAGEMENT

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## 1. LEITUNG

Prof. Dr. Sven Müller

## 2. HOCHSCHULLEHRER/INNEN

Prof. Dr. Sven Müller

## 3. FORSCHUNGSPROFIL

Data-Driven Operations Management:

- Applied Optimization & Modeling
- Predictive Analytics & Modeling
- Assortment, Revenue, and Pricing
- Transport, Logistics, and Crowds
- Marketing, Health, and Energy

## 4. KOOPERATIONEN

- LEWAK greenprojects

## 5. FORSCHUNGSPROJEKTE

**Projektleitung:** Annegret Lewak, Prof. Dr. Sven Müller  
**Kooperationen:** LEWAK greenprojects  
**Förderer:** Sonstige - 01.10.2020 - 31.12.2025

### **Einfluss von Gemeinwohl - Rendite auf die Anwendung der Portfolio - Theorie nach Markowitz**

Im Rahmen des Projekts soll die Bereitschaft zu Verhaltensänderung im Investitionsverhalten aufgrund von Bewertungsanpassungen untersucht werden. Unter Bezugnahme auf aktuelle Befunde im Kapitalmarkt hinsichtlich des Parameters "Klimafreundlichkeit" wird insbesondere der Frage nachgegangen ob ähnliche Tendenzen auch im Bereich "sozioökonomischer Mehrwert" gefunden werden können. Ausgehend von der Portfolio - Theorie wird untersucht, inwiefern sich die Ausgestaltung von rational choice durch konkrete Anwendung von Prinzipien der Akzeptanzmodelle aus der Verhaltenstheorie um Parameter der Gemeinwohltheorie erweitern lässt. An der Forschungsschnittstelle von Ökonomie, Ökologie und Soziologie entstehen hierdurch konkrete Handlungsvorschläge für Politik und Unternehmen.

**Projektleitung:** M.Sc. Christoph Rippe, Prof. Dr. Sven Müller  
**Förderer:** Haushalt - 01.09.2016 - 31.08.2022

### **Das Repair-Kit Problem bei Kundendifferenzierung**

In bisherigen Publikationen zum Repair-Kit Problem wird für alle Kunden von identischen Ersatzteilbedarfs-wahrscheinlichkeiten ausgegangen. Setzt man stattdessen verschiedene Kundengruppen voraus und geht davon aus, dass Ersatzteile nur bei einer vollständigen Reparatur beim Kunden verbleiben, ist die Job-Fill-Rate eines Service-Technikers nicht mehr nur von der Zusammensetzung seines Repair-Kits sondern auch von seiner Tourenplanung abhängig. Ziel dieses Projektes soll es sein, zugleich die Zusammenstellung des Repair-Kits und die Tourenplanung des Service-Technikers zu optimieren.

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**Projektleitung:** Annegret Lewak, Prof. Dr. Sven Müller  
**Förderer:** Stiftungen - Sonstige - 01.03.2021 - 29.02.2024

### **Open the window of opportunity - renewable energies as a facilitator for maximization of the common good**

Our research is set to get a better understanding about whether the common good can be improved by specific project designs. The projects in our study are investment projects in the area of renewable energies. They are defined by attributes like "amortization timeline", "investment volume" and "expected return". The specific set of characteristics define a type of project, which is considered a product. Choice makers decide which projects provide individual maximum utility. We conduct an empirical experiment to analyze the trade - offs between the attributes.

We assume that the return of each project can be split into two types: a) the classic monetary benefit (tangible return) and b) increasing common good (intangible return). B can be maximized by deciding that a or parts of a can be allocated to a common fund instead of cashing in. Participants with low income get access to the fund and therefore can increase their personal profit on their invest in a disproportional way. We consider this re - allocation of income within the group as an indicator for increase of the common good. Our problem is to select a sub - set of the overall pool of projects and present them to the choice makers in order to maximize the common good.

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**Projektleitung:** Lucas Weber, Prof. Dr. Sven Müller  
**Förderer:** Haushalt - 01.02.2021 - 31.01.2024

### **Sales Operations Management**

This project considers an implementation of the sales force deployment problem with explicit contiguity constraints. The task is to improve the existing approaches in terms of fairness: assign sales territories to the sales representatives such that the profit contribution among sales locations becomes more equal. The aim is to find and implement constraints to avoid that and to design and assign sales territories in a "fairer" way. Moreover, the consideration of locational capacities and schedules is intended. The project should deliver heuristic and exact solution algorithms to the sales force deployment problem.

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**Projektleitung:** Lucas Weber, Prof. Dr. Sven Müller  
**Förderer:** Haushalt - 01.02.2021 - 31.01.2024

### **Crowd Operations Management**

We are interested to determine the relationship between commuter satisfaction of transit services and waiting time. Satisfaction is a crucial KPI for many transit operators and waiting time is mainly influenced by the design of public transport services (timetable, scheduling). Moreover, we develop models and algorithms to manage passenger boarding operations in urban transit systems such that dwell times are minimized. We account for variable passenger demand (routes and travel times) as well as transit timetables and capacities. In particular, the impact of (monetary) incentives to control passenger flows while embarking and debarking will be analyzed. This project joins insights from pedestrian simulation, microeconomics (discrete choice), and operations research.

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**Projektleitung:** Dr. Lorena Silvana Reyes-Rubiano  
**Kooperationen:** Deutsches Zentrum für Luft- und Raumfahrt (DLR) Cochstedt, Dr. Kristin Wendt und Ing. Daniel Sülberg  
**Förderer:** Haushalt - 01.12.2021 - 01.05.2026

### **Operations research for delivering humanitarian aid**

Disasters are unexpected events characterized by uncertainty in their impact. These events may generate disruptions on the road network, such as collapsed bridges, or roads covered by water or debris. The affected roads cannot be used to travel on. Disruptions reduce the number of roads to reach victims, i.e., to people affected by the disaster. Their impacts are more severe in networks with a limited number of roads, e.g., rural zones. Thus, we define a disrupted road network as a subnetwork of the known road network that contains the roads that still work. Most works addressing the problem of unknown information in a disrupted road network assume that a set of probable scenarios can model disruptions and uncertainty. Despite the growing number of studies in humanitarian logistics, there is a limited number of research addressing response operations after a disaster and the use of drones. Organizations in disaster management, such as the Humanitarian OpenStreetMap Team and WeRobotics have been starting to include new technologies. The use of drones in humanitarian logistics led to a decrease in the operational times needed for immediate explorations. In current practice, a drone tries to cover the whole affected zone using a zigzag trajectory. However, a drone usually can only cover a limited number of geographical points of the affected zone within a reasonable time. Routing operations to plan the flight of a drone are inefficient and they do not meet the needs of humanitarian logistics. As a result, several commercial and industrial projects are looking to develop tools to improve the reliability of routing decisions, to reduce expenses and flight times of the fleet of drones. In particular, in cases in where flight routes have to be defined on the fly.

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**Projektleitung:** Dr. Lorena Silvana Reyes-Rubiano  
**Kooperationen:** Universität für Bodenkultur Wien, Wien, Prof. Patrick Hirsch  
**Förderer:** Haushalt - 01.01.2021 - 01.05.2023

### **Integrated mobility concept for healthcare workers and ambulant patients**

Hospital treatment and home care face rising demand in Europe. The rise is caused by increased life expectancy and the growing trend of old people living alone. Thus, the demand for transport of home care workers and vulnerable people is increasing. Today, the transport of home care workers and vulnerable people is performed independent of each other which also leads to congestion of urban areas. We propose an integrated mobility concept to deal with the transport of home care workers and non-time-critical patients. The integrated mobility concept involves a trip sharing system combined with the additional option of walking for home care workers. The home care service provision is related to the drop-off and pick-up of home care workers at the home of patients. Vulnerable people are transported from their homes to hospitals or other medical facilities and then they are picked up after the end of their hospital treatment. We consider that each home care worker and home care job have an associated qualification level. This work addresses the transport of non-time-critical patients

and home care workers. Different qualification levels, service time windows, maximum ride times and maximum working hours have to be considered. We implement a matheuristic algorithm to determine this integrated transport. A series of computational experiments allow us to evaluate the impact on the waiting and driving times of the home care workers and non-critical patients. Afterwards, we compare the waiting time and driving time of individual trips versus shared trips. This evaluation sheds light on standards for waiting and ride times.

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**Projektleitung:** Dr. Lorena Silvana Reyes-Rubiano  
**Förderer:** Haushalt - 01.01.2021 - 01.05.2023

### **Revenue Maximizing Tariff Zone Planning for Public Transport Companies**

This project presents two approaches to design a counting zones tariff system applicable for urban public transport service providers. The proposed approaches are oriented to a counting zones tariff system that maximizes the expected revenue for a given price system. It is assumed that the price per zone takes a discrete set of values, the number of public transport trips depends on the price system, public transport passengers always choose the time-shortest path. The exact method aims to partition the transport network into zones and find a price per zone such the total expected revenue is maximized. The heuristic approach reduces the problem size; it only considers transport network connections with the most significant revenue. In extensive numerical studies with artificial test instances, it is evaluated for different network structures and public transportation demand which of the proposed approaches perform best. This project sheds light for service providers on how the service area can be zoned to maximize expected revenue through a counting zones tariff system.

## 6. VERÖFFENTLICHUNGEN

### BEGUTACHTETE ZEITSCHRIFTENAUFsätze

**Reyes-Rubiano, Lorena; Voegl, Jana; Hirsch, Patrick**

An online algorithm for routing an unmanned aerial vehicle for road network exploration operations after disasters under different refueling strategies

Algorithms - Basel: MDPI, Bd. 16 (2022), 6, insges. 21 S.;

**Rippe, Christoph; Kiesmüller, Gudrun P.**

The added value of advance demand information for the planning of a repair kit

Central European journal of operations research - Heidelberg: Physica-Verl., 1999 . - 2022, insges. 25 S.;

[Imp.fact.: 2.407]

**Rippe, Christoph; Kiesmüller, Gudrun P.**

The repair kit problem with imperfect advance demand information

European journal of operational research - Amsterdam [u.a.]: Elsevier . - 2022;

[Imp.fact.: 5.334]

**Roemer, Nils; Müller, Sven; Voigt, Guido**

A choice-based optimization approach for contracting in supply chains

European journal of operational research - Amsterdam [u.a.]: Elsevier . - 2022;

[Imp.fact.: 5.334]

### NICHT BEGUTACHTETE ZEITSCHRIFTENAUFsätze

**Zimmermann, Julia**

On the design of a flow line with intermediate buffers and mixed corrective maintenance

Magdeburg: Otto-von-Guericke-Universität Magdeburg: Fakultät für Wirtschaftswissenschaft, 2022, 1  
Online-Ressource (24 Seiten, 0,5 MB), Diagramme - (Working paper series; Otto von Guericke Universität  
Magdeburg, Faculty of Economics and Management; 2022, no. 4);

### DISSERTATIONEN

**Zimmermann, Julia; Müller, Sven [AkademischeR BetreuerIn]; Kleber, Rainer [AkademischeR  
BetreuerIn]**

Spare parts and buffer planning for unreliable flow lines with two machines and one buffer

Magdeburg, 2022, 1 Band (verschiedene Seitenzählungen), Diagramme, Formeln