UNIVERSITY OF MANNHEIM
Business School

CHAIR OF SERVICE
OPERATIONS MANAGEMENT
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Master Thesis Proposal

Airport Operations Management: Challenges, Decision Support Tools, and Cases

Airports are complex environments, with decision-making processes divided among numerous authorities, and many stakeholders pursuing their own interests. Airport operations play a critical role in the aviation industry, serving as key hubs for passenger travel, cargo transportation, and aircraft maintenance. However, airports face numerous challenges in managing their operations efficiently, effectively and sustainably. This thesis proposal aims to explore the challenges faced by airports, the analytics tools available to address these challenges, and real-world cases (e.g. from Lomdon Heathrow, Europe's busiest international airport) that demonstrate innovative solutions in airport operations.

Objectives:

- To identify and analyze the key challenges faced by airports in managing their operations, including issues such as congestion, capacity constraints, safety regulations, environmental sustainability, and customer satisfaction.
- To review models, tools and technologies available to airports for optimizing their operations, including predictive and prescriptive analytics, airport management systems and air traffic control software, and automation technologies.
- To discuss a suitable state-of-the-art optimization model in detail and make suggestions on how to extend it to make it more applicable to practice.
- To discuss potential methods to solve the proposed optimization model;
- Optional: To implement and solve the proposed model for an academic example in a suitable modeling environment, e.g. in Excel or AMPL;
- To examine real-world cases of airports implementing innovative solutions to address operational challenges, highlighting successful strategies and lessons learned.
- To develop recommendations for airports to enhance their operations based on insights gained from the analysis of challenges, tools, and cases.
- To discuss identify resrach opportunities in airport operations management.

Requirements

- OPM 781
- Good knowledge in Operations and Revenue Management
- Analytical skills and an ability to transform real-world business problems into Operations Research models

Administrative information for writing a master thesis at the Chair of Service Operations Management can be found here.

Selected Literature Recommendations:

Arun Kumaar, R., Malavika, S., Monisha, S., Sowmiya Bharani, B., & Devanathan, M. (2022). A Review to Enhance Operations in an Airport with a Deep Learning and Computer Vision Approach. In Soft Computing for Security Applications: Proceedings of ICSCS 2022 (pp. 145-153). Singapore: Springer Nature Singapore.

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Lulli, G., Odoni, A., & Santos, B. F. (2020). Introduction to the special section: Air transportation systems planning and operations under uncertainty. Transportation Science, 54(4), 855-857.

Roy, J., Pickering, C., & Beaulieu, M. (2022). Operations Management Challenges at Heathrow Airport (Part A). HEC Case study. Harvard Business Publishing Case No. HEC332-PDF-ENG, https://hbsp.harvard.edu/product/HEC332-PDF-ENG

Roy, J., Pickering, C., & Beaulieu, M. (2022). Operations Management Challenges at Heathrow Airport (Part B). HEC Case study. Harvard Business Publishing Case No. HEC333-PDF-ENG, https://hbsp.harvard.edu/product/HEC333-PDF-ENG

Simaiakis, I., & Balakrishnan, H. (2016). A queuing model of the airport departure process. Transportation Science, 50(1), 94-109.