UNIVERSITY OF MANNHEIM
Business School

CHAIR OF SERVICE
OPERATIONS MANAGEMENT
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Master Thesis Proposal

How can AI help in Operations Management?

AI can significantly aid operations management in various ways, optimizing processes, reducing costs, and improving efficiency. Here are several examples where AI can help in operations management, and thereby improve business models:

1. **Demand Forecasting**: AI algorithms can analyze historical data, market trends, and other factors to forecast demand more accurately. This enables businesses to optimize inventory levels, production schedules, and resource allocation.
2. **Supply Chain Optimization**: AI can analyze complex supply chain networks to identify inefficiencies, streamline logistics, and reduce lead times. This can include route optimization, inventory management, and supplier selection.
3. **Predictive Maintenance**: By analyzing sensor data and equipment performance, AI can predict when machinery or assets are likely to fail, e.g. of aircraft, railway infrastructure, or in manufacturing. This enables proactive maintenance scheduling, minimizing downtime and reducing maintenance costs.
4. **Quality Control**: AI-powered vision systems can inspect products in real-time for defects, ensuring consistent quality and reducing the likelihood of defective products reaching customers.
5. **Process Automation**: AI-driven robotic process automation (RPA) can automate repetitive tasks, such as data entry and invoice processing, freeing up human resources for more strategic activities.
6. **Resource Optimization**: AI algorithms can optimize resource allocation, such as workforce scheduling and energy usage, to minimize costs while meeting operational requirements.
7. **Risk Management**: AI can analyze data from various sources to identify potential risks in operations, such as supply chain disruptions or compliance issues, enabling proactive risk mitigation strategies.
8. **Customer Service**: AI-powered chatbots and virtual assistants can handle customer inquiries and support requests, providing round-the-clock assistance and improving customer satisfaction.
9. **Performance Monitoring and Analysis**: AI-powered analytics tools can monitor key performance indicators (KPIs) in real-time and identify areas for improvement, enabling faster decision-making and continuous optimization.
10. **Traffic Flow Optimization**: AI algorithms can analyze real-time traffic data from various sources such as cameras, sensors, and GPS devices to predict, model and optimize traffic flows. This can involve dynamically adjusting traffic signal timings, rerouting vehicles to less congested routes, and managing traffic incidents more efficiently.
11. **Public Transportation Optimization:** AI can optimize the operation of public transportation systems, such as buses, trains, and subways, to ensure efficient people flow. By analyzing

passenger demand patterns, traffic conditions, and service schedules, AI can optimize routes, frequencies, and capacity allocations to meet passenger demand while minimizing congestion and delays.

12. **Crowd Monitoring and Control:** AI-powered video analytics systems can monitor crowds in public spaces such as airports, train stations, and stadiums. By analyzing video feeds, AI can detect crowd density, identify congestion points, and alert authorities to potential safety hazards or security threats. This information can be used to implement crowd control measures and ensure a smooth flow of people.

13. **Queue Management:** AI can optimize queue management in places such as retail stores, banks, and amusement parks. By analyzing historical data and real-time queue lengths, AI can predict future demand, allocate resources efficiently, and optimize queue configurations to minimize wait times and enhance the overall customer experience.

14. **Social Distancing Monitoring:** In response to public health concerns such as the COVID-19 pandemic, AI-powered systems can monitor adherence to social distancing guidelines in crowded spaces. By analyzing video feeds or sensor data, AI can detect violations of social distancing rules and provide real-time alerts to authorities or facility managers, enabling proactive interventions to maintain safety and prevent overcrowding.

Overall, AI can play a transformative role in operations management by enabling data-driven decision-making, automation of routine tasks, and optimization of processes across the entire value chain.

The tasks and objectives of the master thesis are to

- Broadly review and classify the application areas of AI in Operations Management based on a literature review and based on company cases.
- Select a specific domain/industry and discuss applications and underlying methods in detail.
- Discuss a related case study of your choice (to be agreed upon with supervisor) from https://hbsp.harvard.edu/ in this context. Example cases are mentioned below.
- Discuss how AI might impact existing and create new business models in the future.

Requirements

- OPM 7xx
- Good knowledge in Operations Management
- Analytical skills

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

Selected Literature Recommendations

Search for OM case studies on https://hbsp.harvard.edu/ related to AI

Iansiti, M., & Lakhani, K. R. (2020). Competing in the age of AI: Strategy and leadership when algorithms and networks run the world. Harvard Business Press.

Gupta, S., Modgil, S., Bhattacharyya, S., & Bose, I. (2022). Artificial intelligence for decision support systems in the field of operations research: review and future scope of research. Annals of Operations Research, 308(1), 215-274.

Mithas, S., Chen, Z. L., Saldanha, T. J., & De Oliveira Silveira, A. (2022). How will artificial intelligence and Industry 4.0 emerging technologies transform operations management?. Production and Operations Management, 31(12), 4475-4487.

https://www.paretos.com/de/home

Example Case Studies

Grushka-Cockayne, Y. & Yucaoglu G.: Vispera (2019): Visual Intelligence for Retail, Case No. 620022, Harvard Business School Publishing

Iansiti, M., Lakhani, K.R., Mayer H. & Herman, K. (2020): Moderna, Case No. 621032, Harvard Business School Publishing