

Service Operations Research Seminar HWS 2019 (OPM 781)

“Current Topics in Service Operations Management Research”

General Information:

1. The goal of this seminar is to introduce participants to conducting scientific research. It thereby prepares students for writing their M.Sc./Diploma Thesis. The seminar is geared towards students intending to write their Thesis at the Chair of Service Operations Management.
2. The application procedure for this seminar is combined with those for the seminars of the Chair of Production Management (OPM 761), the Chair of Logistics (OPM 701) and the Chair of Procurement (OPM 791). Students can apply for topics from all chairs by joining the [ILIAS application group](#) and completing the online form provided there. Topics labeled with “L” refer to the Chair of Logistics (OPM 701), topics labeled with “P” refer to the Chair of Production Management (OPM 761), topics labeled with “B” refer to the Chair of Procurement and topics **labeled with “S”** refer to the **Chair of Service Operations Management (OPM 781)**. To better match topic and student background, applicants for OPM 781 may in addition send a CV and official grades overview by post to the chair or by e-mail to soma@mail.uni-mannheim.de with subject “OPM 781 Seminar Application”.¹ The application period starts on **April 29th** and ends on **May 12th**, 2019.
3. **Admission** to the seminar is **binding** and will be confirmed by E-mail on **May 20th**, 2019.
4. Each participant admitted to OPM 781 will explore one of the research topics listed below – based on the fundamental literature provided. Each participant presents his/her findings in a written report (about 20 pages) as well as in an in-class presentation (20 min + 10 min discussion).
5. A **kick-off meeting** for all participants will be held on Tuesday, May **28th**, 2019 at **13:30 pm** in SO 322. During this meeting, general guidelines for conducting scientific work will be discussed.

¹ Data protection: Please note that a breach of confidentiality and the unauthorized access by third parties cannot be excluded when transmitting an unencrypted email. Note on data protection: The submitted documents will be returned only if an envelope with sufficient postage is included. Otherwise they will be destroyed after the application process according to the requirements of the data protection law. Electronic applications will be deleted accordingly.

6. Each student has **eight weeks** to complete the Seminar Thesis. This timeframe can individually be set **between the kick-off day and October 1st** (Note: October 1st is the latest submission date).
7. To start the eight weeks completion time, please follow these **four steps**:
 - a. Go to the **Ilias Group** "OPM 781 Research Seminar"
 - b. Select the **Test** "Seminar Thesis_[YOUR NAME]",
 - c. Follow the **instructions of the Test**,
 - d. The eight weeks completion time **will start automatically after finishing the test**.
8. On your individual submission date, you have to...
 - a. **Upload your report** (Word- / Latex-document and PDF) via Task "Upload of final Thesis & Presentation" in the Ilias group.
 - b. *If applicable: **Upload your software-output** (in a single zip file) via Task "Upload of final Thesis & Presentation" in the Ilias group.*
 - c. **Submit a hard copy** at our secretary's office (Mon-Thu before noon) or at your Thesis supervisor. Please make an appointment for submitting the hard copy.
9. Student **presentations** will be held on **October 9th at 9:00 am** in SO 318. Attendance is mandatory. Please **upload your presentation slides** (ppt and PDF) on **Task "Upload of final Thesis & Presentation"** in the Ilias group one day before the presentation, latest by 18:00 pm – no changes allowed afterwards. The chair's laptop will be used to show the presentations during class.
10. Each participant acts as a discussant for one of the other presentations. The discussant is responsible for critically assessing the presented work and for opening the ensuing discussion.
11. The report and the presentations can be delivered either in English or in German.
12. The final grade for the seminar is composed of the following components: Written report (60%), presentation (30%), contribution to discussion (10%).
13. For questions concerning the seminar contact us by email at soma@mail.uni-mannheim.de.

Seminar topics

Topics on Service Design and Business Modelling:

Topic S01: Evaluating a sequence of events – theoretical insights and practical applications

In recent years, research in the field of incident-based utility measurement has strongly increased. This new perspective interprets a service as a series of event and provides insights on how to order the events to maximize the customers utility or more precisely the customers' retrospective global evaluation of a service experience. This so called remembered utility can either directly calculated using psychological constructs like memory decay and acclimation or estimated using sequence effects like peak-effect or end-effect.

This seminar thesis should consider both approaches and provide a fundamental overview of the theory and methods behind. It should explain the diverse ways of calculating remembered utility and maybe add a simple application example to make the differences of both approaches more transparent. In a last step, the thesis might derive rules for decision makers on optimally schedule their service events.

Das Gupta, A., Karmarkar, U. S., and Roels, G. (2015): The design of experiential services with acclimation and memory decay: Optimal sequence and duration. *Management Science* 62(5), 1278-1296.

Dixon, M. J., and Victorino, L. (2019): The Sequence of Service: An Affect Perspective to Service Scheduling. In *Handbook of Service Science*, Volume II, p. 49-76.

Topic S02: Service design at the interface of marketing and operations

Service design is a growing research field that gained importance with the growing significance of the service sector for our economy. Any company competing for customers, sales volumes and market size should set high priorities on designing and optimizing its services. Traditional methods of product design may be a basis but can only be adapted to some extent. This development led to the establishment of service design as a research field. Researchers working in this field usually just focus and problems and research questions within their respective research discipline. Nevertheless, only by analyzing service design decisions integratively new holistic approaches can be derived.

This seminar thesis should first provide an overview of different research disciplines working on questions of service design. It should present their key interest in that topic and not restrict the analysis to the areas named in the thesis title. Based on that the focus should be set on the interface of marketing and operations research by presenting current research papers linking tools and techniques from both areas. Besides theory, practical examples or

cases might add additional value to the analysis. In a final step, the importance and strength of such an integrated perspective should be discussed and future research opportunities should be presented.

Joly, M., Teixeira, J. G., Patricio, L., und Sangiorgi, D. (2018): Service Designers, unite! Identifying shared concerns among multidisciplinary perspectives on Service Design. *ServDes Konferenz*, Mailand.

Karmarkar, U. S. (1996): Integrative research in marketing and operations management. *Journal of marketing Research*, 33(2), 125-133.

Topic S03: Business Process Management - State of the Art, Future Research Opportunities and Implications for Service Design

Business Process Management (BPM) is a comprehensive system for managing and transforming organizational operations, based on what is arguably the first set of new ideas about organizational performance since the Industrial Revolution. The objective of the thesis is to review the current state of the art of BPM in theory and practice, and to discuss positive impact and challenges of BPM in reality, as well as future research opportunities. Furthermore, discuss what service designers can learn from BPM, given that services are basically processes.

Berente, Nicholas, Betty Vandebosch, and Benoit Aubert (2009): Information flows and business process integration. *Business Process Management Journal* 15 (1), 119-141.

Bititci, Umit S., et al. (2011): Managerial processes: business process that sustain performance. *International Journal of Operations & Production Management* 31 (8), 851-891.

Cross, Rob, et al. (2010): The collaborative organization: how to make employee networks really work. *MIT Sloan management review* 52 (1), 83.

Hammer, Michael (2015): What is business process management?. *Handbook on business process management 1*. Springer, Berlin, Heidelberg, 3-16.

Hammer, Michael, and Steven Stanton (1999): How process enterprises really work. *Harvard business review* 77, 108-120.

Kohlbacher, Markus (2010): The effects of process orientation: a literature review. *Business Process Management Journal* 16 (1), 135-152.

Neubauer, Thomas (2009): An empirical study about the status of business process management. *Business Process Management Journal* 15 (2), 166-183.

Nesheim, Torstein (2011): Balancing process ownership and line management in a matrix-like organization. *Knowledge and Process Management* 18 (2), 109-119.

Sidorova, Anna, and Oyku Isik (2010): Business process research: a cross-disciplinary review. *Business Process Management Journal* 16 (4), 566-597.

Silvestro, Rhian, and Charles Westley (2002): Challenging the paradigm of the process enterprise: a case-study analysis of BPR implementation. *Omega* 30 (3), 215-225.

Topic S04: The Business Model Canvas – a Tool for Sustainable Business Model Development?

The Business Model Canvas (Osterwalder & Pigneur 2010) is a tool for developing new or documenting existing business models. It is a visual chart with elements describing a firm's or product's customer value propositions, target customers, operations, and financial streams. The canvas is supposed to be helpful, e.g., in assessing and achieving strategic alignment between a firm's value proposition and the underlying operations. The objective of the seminar thesis is to review the tool and to critically assess its strength and limitations, in particular if sustainability is a key competitive dimension in the firm's value proposition. Furthermore, suggest improvements to overcome the limitations, if possible.

Coes, D. H. (2014): Critically assessing the strengths and limitations of the Business Model Canvas. MS thesis. University of Twente.

Joyce, Alexandre, and Raymond L. Paquin (2016): The triple layered business model canvas: A tool to design more sustainable business models. *Journal of Cleaner Production* 135, 1474-1486.

Osterwalder, Alexander, and Yves Pigneur (2010): Business model generation: a handbook for visionaries, game changers, and challengers. John Wiley & Sons.

Topics on Revenue Management:

Topic S05: The concept of fencing in revenue management

Traditional airline revenue management methods rely on booking classes with different fares and rules (e.g., the cheap booking class „A" can only be booked if the return trip includes a Saturday-night stay). By doing that, airlines try to skim of the willingness to pay of different customer groups such as business or leisure travelers. Together with the assumption of independent demand for a booking class, the analysis of a buy-up or buy-down behavior becomes relevant because in practice the strict 1:1 relation between demand and booking class does not hold. The goal of the seminar thesis is to analyze typical RM approaches under the consideration of „fencing“, i.e., describe which technique relies on fare fencing. Furthermore, a practical analysis of a self-selected airline example should give an overview on the different fare classes and corresponding rules in practice. Additionally, it should be discussed how traditional approaches perform when applied to a RM-strategy that relies on multiple booking classes without fencing criteria.

Zhang, M., & Bell, P. (2012): Price fencing in the practice of revenue management: An overview and taxonomy. *Journal of Revenue and Pricing Management* 11(2), 146-159.

Topics on Service Scheduling:

Topic S06: Test Scenarios in Airline Crew Scheduling

The Airline Crew Scheduling problem is one of the most complex crew scheduling problems in transportation, therefore a decomposition in two subproblems is state of the art. The Crew pairing problem creates pairings by deciding which flights are combined to become a work schedule of several days for a crew while in the crew assignment problem these pairings are assigned to particular crew members for a planning period such as a month. Recently, some integrated approaches were developed which cover both steps in one model and provide a better solution. In every paper the suggested improvement is tested in an “numerical study”. It contains one or several cases which most commonly consist of abstract real-life data of airlines; these cases usually vary in network complexity and size in order to test many requirements.

Aim of the seminar thesis should be to,

- introduce and compare the three model types and their most important model formulations,
- to discuss a specific model in detail,

- to analyze and compare how crew scheduling models are tested and what the typical characteristics for a test data set are (especially regarding complexity and size),
- to provide open research gaps and future trends.

Barnhart, C., Cohn, A. M., Johnson, E. L., Klabjan, D., Nemhauser, G. L., & Vance, P. H. (2003): Airline crew scheduling. In *Handbook of transportation science* (pp. 517-560). Springer, Boston, MA.

Kasirzadeh, A., Saddoune, M., & Soumis, F. (2017): Airline crew scheduling: models, algorithms, and data sets. *EURO Journal on Transportation and Logistics*, 6(2), 111-137.

Quesnel, F., Desaulniers, G., & Soumis, F. (2017): A new heuristic branching scheme for the crew pairing problem with base constraints. *Computers & Operations Research*, 80, 159-172.

Saddoune, M., Desaulniers, G., Elhallaoui, I., & Soumis, F. (2012): Integrated airline crew pairing and crew assignment by dynamic constraint aggregation. *Transportation Science*, 46(1), 39-55.

Topic S07: Crew Scheduling for Railways

In all transportation industries several scheduling steps are required to assign available resources to the given demand as the Railway Planning Process by Lusby et al. (2011) shows; somewhat similar steps can be found in the airline industry. The last step is usually crew scheduling which assigns to each trip or flight a human resource (train conductor or pilot, respectively) to operate it. Usually there are certain rules and regulations such as a maximum trip duration or a determined home base for each resource. Research has so far focused on the airline industry because airline crews represent one of the biggest cost factors in their business model; for railways there have been fewer models and approaches. While the underlying assumptions and constraints may be different, both model types share the same objective of cost minimization.

Aim of the seminar thesis should be to,

- introduce and compare crew scheduling models from railways and airlines regarding their underlying assumptions, objective, constraints, and problem size
- to discuss a specific railway crew scheduling model in detail,
- to create an academical example (optional),
- to provide open research gaps and future trends.

Barnhart, C., Cohn, A. M., Johnson, E. L., Klabjan, D., Nemhauser, G. L., & Vance, P. H. (2003): Airline crew scheduling. In *Handbook of transportation science* (pp. 517-560). Springer, Boston, MA.

Caprara, A., Fischetti, M., Toth, P., Vigo, D., & Guida, P. L. (1997): Algorithms for railway crew management. *Mathematical programming*, 79(1-3), 125-141.

Kasirzadeh, A., Saddoune, M., & Soumis, F. (2017): Airline crew scheduling: models, algorithms, and data sets. *EURO Journal on Transportation and Logistics*, 6(2), 111-137.

Lusby, R. M., Larsen, J., Ehrgott, M., & Ryan, D. (2011): Railway track allocation: models and methods. *OR spectrum*, 33(4), 843-883.

Topics on Sustainable Operations:

Topic S08: Planned obsolescence – A review

Planned obsolescence is a policy of designing a product with an artificially limited useful life, so it will become obsolete, i.e. no longer functional after a certain period of time. The rationale behind the strategy is to generate long-term sales volume by reducing the time between repeat purchases. Such a policy goes hand-in-hand with several side effects, in particular high impact on environment in terms of resource use as well as waste disposal.

The objective of the thesis is to provide a review on the topic of planned obsolescence from marketing and operations management perspective. Focus should be placed on prescriptive optimization models as well as case examples for products and industries, where this phenomenon occurs most

Goals of the thesis:

- Review the literature for planned obsolescence and classify the literature (for example, Bertrand and Fransoo (2002))
 - Focus on planned obsolescence from marketing and operations management
 - Focus on prescriptive optimization models and case examples
- Highlight (successful) companies which do not practice planned obsolescence or otherwise move towards more sustainable practices and thereby gain strong reputation as a “sustainable brand”
- Discuss practices and capabilities that are needed to move beyond unsustainable practices, in order to cope with potential downsides and risks

- Optional: Highlight the 5 most relevant contributions to this field of research from your personal perspective. Point out the facts that lead you to the selection of these contributions

Bertrand, J., & Fransoo, J. C. (2002): Operations management research methodologies using quantitative modeling. *International Journal of Operations & Production Management*, 22(2) 241-264.

Eccles, R. G., Perkins, K. M., & Serafeim, G. (2012): How to become a sustainable company. *MIT Sloan Management Review* 53(4), 43.

Eccles, R. G., Serafeim, G., & Heffernan, J. (2011): Natura Cosméticos, SA. Available at SSRN 1998220.

Echegaray, F. (2016): Consumers' reactions to product obsolescence in emerging markets: the case of Brazil. *Journal of Cleaner Production* 134, 191-203.

Guiltinan, J. (2009): Creative destruction and destructive creations: environmental ethics and planned obsolescence. *Journal of business ethics* 89(1), 19-28.

Slade, G. (2009): Made to break: Technology and obsolescence in America. Harvard University Press.

Topic S09: Transportation planning process aiming for environmental impact reduction – A review

The transportation industry plays an important role in today's world. Not only does it transport products and goods, it also connects people and nations. A downside of the growing transportation practice is the impact on environment, in terms of emissions.

Belobaba, Odoni and Barnhart (2016) describe the Airline planning process (Chapter 7). It aims at planning all relevant processes. Operations research typically focuses on the four-step Scheduling Process (Chapter 8) and Barnhart and Cohn (2004) argue that the schedule is the main product. Particular attention also needs to be placed on competition from different other transportation industries, such as railway, shipping or truck/bus.

The objective of the thesis is to critically review and classify the literature regarding the route planning and schedule design and approaches to manage emissions in Aviation industry, present the state-of-the-art, and assess the potential to achieve environmental improvements. Focus should be placed on quantitative Operations Management or Operations Research models.

Goals of the thesis

- Briefly review the importance of aviation industry for overall GHG emissions, in particular in comparison to other transportation modes (e.g, railway)
- Briefly review the Planning Process and point out the importance of Route planning and Schedule Design with respect to the environmental impact
- Review literature on Route Planning and Schedule Design with regard to environmental impact reduction and classify the literature
 - Differentiate between qualitative and quantitative literature and classify quantitative literature according to Bertrand and Fransoo (2002)
 - Review the different approaches of incorporating two objectives (economic and environmental) into the same model
 - Review, which role intermodal considerations play
 - Conclude with ideas for future research in this field
- Select one prescriptive optimization model and explain it in detail. Highlight the special features and shortcomings of the model. Discuss potential extensions.
- Optional: Highlight the 5 most relevant contributions to this field of research from your personal perspective. Point out the facts that lead you to the selection of these contributions

Aktürk, M. S., Atamtürk, A., & Gürel, S. (2014). Aircraft rescheduling with cruise speed control. *Operations Research* 62(4), 829-845.

Bauer, J., Bektaş, T., & Crainic, T. G. (2010): Minimizing greenhouse gas emissions in intermodal freight transport: an application to rail service design. *Journal of the Operational Research Society* 61(3), 530-542.

Belobaba, P., Odoni, A., & Barnhart, C. (2016): The global airline industry. John Wiley & Sons.

Gürkan, H., Gürel, S., & Aktürk, M. S. (2016): An integrated approach for airline scheduling, aircraft fleet and routing with cruise speed control. *Transportation Research Part C: Emerging Technologies* 68, 38-57.

The Economist (2018): The Technology Quarterly: Towards Zero Carbon. December 2018.

Will M. Bertrand, J., & Fransoo, J. C. (2002): Operations management research methodologies using quantitative modeling. *International Journal of Operations & Production Management* 22(2), 241-264.

Topics on Facility Location Planning:

Topic S10: Relevance of Customer segmentation in Facility Location Planning

Network design and facility location are of great importance for a wide range of public and private firms. Retail stores (e.g. supermarkets, IKEA etc.), government offices and hospitals are examples of such facilities. In a competitive environment, where service providers compete for their respective market shares, the main decision in designing such a network is where to locate the facilities; such that overall market share is maximized. When customers self-select facilities they intend to patronize, customer choices are modeled according to discrete choice models (e.g. multinomial logit model (MNL)). MNL exhibits Independence from Irrelevant Alternatives (IIA) property. In case of customer's facility patronization, this implies that every facility location is an equal substitute to other locations. This assumption is not true in practice and thus introduces bias to the objective due to constant substitution patterns of MNL. In a recent article related to retail facility location planning, the numerical study reports reduction in bias to the objective; due to consideration of customer segmentation based on socio-economic factors (e.g. age, income etc.).

The aim of thesis is a) to review literature streams which capture demand modeling using MNL in facility location planning, b) present a review of the existing models with the focus on relevance of customer segmentation, and, c) comment theoretically, on factors relevant for customer segmentation across various service industries. Provide academic examples from the service industry to support the findings of the thesis.

Müller, S., & Haase, K. (2014): Customer segmentation in retail facility location planning. *Business research*, 7(2), 235-261.

Topics on Behavioral Operations Research:

Topic S11: Integration of Customer Behavioral Models in Operations Research

The vast majority of OR models in the literature are inclined towards the "supply" side of the problem. The "demand" side is often neglected, assumed as a known parameter and modeled using simplifying assumptions. These assumptions are often not justified for real-world applications. Therefore, policy makers encounter huge uncertainties associated to customer demand while planning for their systems. To bridge the demand and supply gap, it is crucial to understand customer patronization behavior and preferences associated to service offerings. These preferences are formalized with discrete choice models. The mathematical models associated to planning problems (e.g. design and system configurations) are often Mixed-Integer Linear Programming (MILP) models.

The objectives of this thesis are to

- review OR models, in which demand and supply interact closely and where integration of customer behavioral models might result in better decisions from policy maker's perspective
- discuss methods, to integrate discrete choice models in MILP and resulting complexity of the mathematical models.
- Provide academic examples from the service industry to support the findings of the thesis.

Pacheco, M., Sharif Azadeh, S., Bierlaire, M., & Gendron, B. (2017): Integrating advanced discrete choice models in mixed integer linear optimization. Technical Report TRANSP-OR 170714, Transport and Mobility Laboratory, Ecole Polytechnique Fédérale de Lausanne.