

Service Operations Research Seminar FSS 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. Each participant 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).
3. Each participant also 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.
4. A **kick-off meeting** for all participants will be held on Friday, **December 7th, 2018 at 10:15 am** in SO322. During this meeting, general guidelines for conducting scientific work will be discussed.
5. The written reports have to be **submitted** electronically on CD and as a hard copy by Monday, **April 29th**, 2018 before 12 noon at our secretary's office.
6. Student **presentations** will be held on the **May 8th** (starting at 10:15am in SO318). Attendance is mandatory. Presentation slides have to be submitted one day before the first presentation day before 6pm – no changes allowed afterwards.
7. The final grade for the seminar is composed of the following components: Written report (60%), presentation (30%), contribution to discussion (10%).
8. The report and the presentations can be delivered either in English or in German.
9. 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 [LIAS 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 la-

beled 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 **November 12th** and ends on **November 26th**, 2018.

10. **Admission** to the seminar is **binding** and will be confirmed by e-mail on **December 3rd**, 2018.
11. For questions concerning the seminar contact us by email at soma@mail.uni-mannheim.de.

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.

Seminar topics

Topics on Service Design:

Topic S01: How Can Service Providers Use Big Data for Service Design and Decision Making?

Translating analytics into useful decision support systems, performance metrics, and service innovations has always been challenging for service operations researchers and practitioners. How service providers, and specifically frontline employees, can use big data analytics in service encounters is still in its infancy.

A call for a more human-centered focus on service system design implies that the information generated from analyses of service operations can lead to advancements in automation that mimic human-behavioral capabilities within a service system.

The objective of the thesis is to comment theoretically on the following questions:

- How will big data drive service design changes?
- How useful are data analytic predictive approaches like machine learning, which uses algorithms to interpret data and extract knowledge, compared to more human-centered approaches for operational design and management decision making?
- How can big data be used to contribute to service automation, including ways to increase its human centeredness?

Field, J. M., Victorino, L., Buell, R. W., Dixon, M. J., Meyer Goldstein, S., Menor, L. J., and Zhang, J. J. (2018): Service operations: what's next? *Journal of Service Management* 29(1), 55-97.

Newman, A. J., Daniel, K. C., and Oulton, D. P. (2002): New insights into retail space and format planning from customer-tracking data. *Journal of Retailing and Consumer Services* 9(5), 253-258.

Topic S02: Finding the Best Sequence of Events Through Optimization Models

The sequence of events plays a crucial role for the customers' evaluation of a service experience. With the optimal sequence utility, repurchase and positive word-of-mouth can be maximized. Optimality might be derived prospectively in terms of predicted utility or retrospectively in terms of remembered utility. Both constructs can either be modeled directly using psychological constructs like memory decay and acclimation or estimated using sequence effects like peak-effect or end-effect. This seminar thesis should review all these models and provide a comprehensive overview of optimization models in the field of sequential service design.

The following guiding questions should be a first orientation for the thesis: What are objective function, decision variables and constraints? What solution method is used? Is the focus on remembered or predicted utility, and why? Did the authors use psychological constructs or sequence effects to model the sequential relationship and for what reason? A summary table of the findings will provide additional value.

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 Thompson, G. M. (2016): Bundling and scheduling service packages with customer behavior. Model and heuristic. *Production and Operations Management* 25 (1), 36–55.

Topic S03: On the Link Between Sequence Effects and Psychological Constructs

What customers remember from a service is of special interest for any service provider as it directly impacts repurchase behavior and word-of-mouth. The construct of interest is called remembered utility. To calculate it, a service needs to be interpreted as a series of events, each providing instant utility to the customer. These instant utilities can then be transferred to remembered utility either directly with psychological constructs or with sequence effects as approximations. Although both perspectives are different, they are closely linked: The psychological construct *memory decay* for example states that people remember recent events better than former ones. It thus explains why the sequence effect *end effect* is a valid approximation.

In a first step, this thesis should provide a comprehensive overview of the most important psychological constructs and sequence effects. Based on that, it should describe the link between these constructs and provide empirical evidence from research papers. A figure or table summarizing the link might provide additional value.

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., and Verma, R. (2013): Sequence effects in service bundles. Implications for service design and scheduling. *Journal of Operations Management* 31 (3), 138–152.

Topics on Revenue Management and Product Line Design:

Topic S04: Revenue Management in Railway Companies

Revenue Management (RM) for Railway Companies is a small but active research field. Railway business can be divided in passenger and cargo traffic, i.e. transporting people in regional or long-distance trains and transporting freight in cargo trains. Although both branches are dealing with railway traffic, they have significant differences in their business model and revenue management models have to be adapted on these special properties. Since a working paper of Armstrong, Meissner (2010) is currently the only paper that gives an overview of RM in the rail industry, the objective is to do a literature review for railway RM with a focus on recent contributions in renowned journals. The literature review should include explanations of the different approaches in research and compare/distinguish them among each other.

Armstrong, A., and Meissner, J. (2010): Railway revenue management: overview and models. Working Paper.

You, P. S. (2008): An efficient computational approach for railway booking problems. *European Journal of Operational Research* 185(2), 811-824.

Hetrakul, P., and Cirillo, C. (2014): A latent class choice based model system for railway optimal pricing and seat allocation. *Transportation Research Part E: Logistics and Transportation Review* 61, 68-83.

Topic S05: Incorporating Process Design Aspects into Product Line Design

In the last four decades, a variety of mathematical programming models for optimal product line design based on data from conjoint analysis have been developed. In these optimization models, a product is defined in terms of selected attributes and their levels, respectively, and product design involves the decision to assign a selected level to each product attribute, chosen from a set of alternative (discrete or continuous) attribute levels. While general models are widespread, models explicitly incorporating process design aspects into product line design are rare. By now, only a few optimization models consider processes at least to some extent. Those models are very specific with regard to the way they include the process perspective (e.g. through detailed schedules or the construct of operating difficulty). A generic approach is still missing.

The following thesis should present an overview of product line design models and discuss their applicability in a service context. A special priority should be set on the integration of processes in optimization models. If no tool is able to consider processes on a generic level yet, those tools that consider processes from a different perspective should be critically reviewed.

Pullman, M. E., and Thompson, G. (2003): Strategies for integrating capacity with demand in service networks. *Journal of Service Research* 5(3), 169-183.

Raman, N., and Chhajed, D. (1995): Simultaneous determination of product attributes and prices, and production processes in product-line design. *Journal of Operations Management* 12(3), 187-204.

Topic S06: Constrained Assortment Optimization under the Mixed Multinomial Logit Model

The constrained assortment optimization problem under the mixed multinomial logit model is highly relevant in practice. However, even moderately sized instances of this problem are challenging to solve directly using standard mixed-integer linear optimization formulations. This has motivated recent research exploring customized optimization strategies and approximation techniques. Sen et al. (2017) develop a novel conic quadratic mixed-integer formulation. This new formulation, together with McCormick inequalities exploiting the capacity constraints, enables the solution of large instances using commercial optimization software. The objective of the thesis is to review the recent literature on the assortment problem and discuss the approach of Sen et al. in detail.

Sen, A., Atamturk, A., and Kaminsky, P. (2017): A conic integer programming approach to constrained assortment optimization under the mixed multinomial logit model. arXiv preprint arXiv:1705.09040.

Topic S07: Models of Stochastic Demand when Price and Availability matter

A variety of mathematical forms have been developed to characterize demand functions which depend on a firm's operational and marketing decisions. The focus here should be on stochastic demand function where price and availability are considered as explanatory factors. Stochastic demand models differ from the deterministic models because random factors may affect the consumer demand.

The objective of the thesis is to review analyze the common approaches in the literature to model such stochastic demand functions of price and availability. It should be analyzed how mean and variance change with explanatory variables. Furthermore, is the functional form reasonably assumed or empirically supported? Does the model grasp the empirically observed impacts of price and availability on demand?

Huang, J., Leng, M., & Parlar, M. (2013). Demand functions in decision modeling: A comprehensive survey and research directions. *Decision Sciences*, 44(3), 557-609.

Topics on Service Scheduling:

Topic S08: Airline Crew Assignment: Current state of research and practical applications

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. The latter problem has so far received less attention but enjoys a high practical relevance in practice as it is quite important for pilots how their working schedules look like. The solution methods range from a bidding approach, where each crew member bids on vacation times and particular flights, over seniority rules to simple assignments according to fixed events.

Task of the thesis is to compare the different current approaches in the Airline Crew Assignment and to show how the scientific approaches are applied in the business world, especially in commercial crew planning software.

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

Boubaker, K., Desaulniers, G., and Elhallaoui, I. (2010): Bidline scheduling with equity by heuristic dynamic constraint aggregation. *Transportation Research Part B: Methodological* 44(1), 50-61.

Kasirzadeh, A., M. Saddoune and F. Soumis (2017): Airline Crew Scheduling: models, algorithms, data sets. *European Journal of Transportation Logistics* 6(2), 111-137.

Topics on Sustainable Operations:

Topic S09: Industry 4.0 and the Circular Economy for Sustainable Operations

What is the circular economy (CE) and how can Industry 4.0 and Digitization help to manage in line with CE principles and make operations more sustainable? The objective of the thesis is to critically review and classify the empirical and normative literature, present the state-of-the-art, and assess the potential of Industry 4.0 to achieve sustainable operations.

de Sousa Jabbour, A. B. L., Jabbour, C. J. C., Godinho Filho, M., & Roubaud, D. (2018): Industry 4.0 and the circular economy: a proposed research agenda and original roadmap for sustainable operations. *Annals of Operations Research*, 1-14.

Jabbour, C. J. C., de Sousa Jabbour, A. B. L., Sarkis, J., & Godinho Filho, M. (2017): Unlocking the circular economy through new business models based on large-scale data: An integrative framework and research agenda. *Technological Forecasting and Social Change*.

Topic S10: The Potential of Servicizing as a Sustainable Business Model

Servicization is a business strategy to sell the functionality of a product rather than the product itself. It has been argued that servicizing business models is environmentally friendly as it encourages manufacturers to take more responsibility for their products and to offer products with higher efficiency. Furthermore, under servicizing, the firm charges customers based on the product usage, and the quantity of products required to meet customer needs may be smaller because the firm may be able to pool customer needs.

Motivated by these arguments, an increasing number of papers investigate the economic and environmental potential of servicizing business models. The objective of the seminar paper is to critically review and synthesize the empirical and normative literature, assess the potential of servicizing as a sustainable business model, and identify open questions as future research opportunities.

Agrawal, V. V., and Bellos, I. (2016): The potential of servicizing as a green business model. *Management Science*.

Örşdemir, A., Deshpande, V., & Parlaktürk, A. K. (2018): Is servicization a win-win strategy? profitability and environmental implications of servicization. *Manufacturing & Service Operations Management*.