Service Operations Research Seminar FSS 2021 (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]

3. The **application period** starts on **November 13th** and ends on **November 23rd**, 2020.

4. **Admission** to the seminar is **binding** and will be confirmed by E-mail by **November 27th, 2020.**

5. 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), followed by a discussion (10 min).

6. A **kick-off meeting** for all participants will be held on **Wednesday**, **December 9th, 2020 at 12:00pm** via **ZOOM** (link will be communicated via Email). 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.

7. Each student has **eight weeks** to complete the Seminar Thesis. This timeframe can individually be set **between the kick-off day and May 14th, 2021** (Note: May 14th is the latest submission date).

8. 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**.

9. On your individual submission date, you have to…
    a. **Upload your report** (Word- / Latex-document and PDF) via Task "Upload of final Thesis & Calculations/Software Output" in the ILIAS group.
    b. *If applicable:* ***Upload your software-output*** *(in a single zip file*) via Task " Upload of final Thesis & Calculations/Software Output" 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.

10. Student **presentations** will be held by default in the regular presentation session on Thursday, **May 20th starting at 10:15 in room SO 318** (only if on-campus operations have been resumed at the University). A fast-track presentation session on Thursday, March 11th, 2021, may be offered to students who desire to start with their master thesis early in FSS21 (with thesis submission deadline on March 5th). Attendance is mandatory for all presentations on your own presentation date.

    Please **upload your presentation slides** (ppt and PDF) on **Task "Upload of Final 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.

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 of your own topic and of potentially other topics presented on the same date (10%).

13. For questions concerning the seminar contact us by email at soma@mail.uni-mannheim.de.

Seminar topics

Please note:
The amount of recommended literature does not indicate more or less workload. Your supervisor may have more recommendations for you.

Topics on Customer Behavior:

Topic S01: State-of-the-Art Methods for Predicting Consumer Choice

Life is about making choices, and therefore, many managerial planning problems, e.g. choice-based revenue management, require accurately predicting consumer choice behavior. Choice models like the (M)MNL have traditionally been estimated by using standard econometric techniques. More recently, neural networks have increasingly been employed to predict consumer choice behavior.

The objectives of this thesis are to:

- introduce the methodology of different approaches (in particular neural nets and standard econometric (M)MNL-based approaches) for predicting consumer choice;
- provide a literature review and classification of different empirical studies that compare neural nets an (M)MNL-based choice-analysis;
- discuss advantages and disadvantages with regard to important performance criteria (e.g., predictive performance as reported in the empirical literature).

Basic Literature:

Hruschka, H., Fettes, W., & Probst, M. (2004). An empirical comparison of the validity of a neural net based multinomial logit choice model to alternative model specifications. European Journal of Operational Research, 159(1), 166-180.

Shakya, S., Kern, M., Owusu, G., & Chin, C. M. (2012). Neural network demand models and evolutionary optimisers for dynamic pricing. Knowledge-Based Systems, 29, 44-53.

West, P. M., Brockett, P. L., & Golden, L. L. (1997). A comparative analysis of neural networks and statistical methods for predicting consumer choice. Marketing Science, 16(4), 370-391.

Topic S02: Predicting Consumer Behavior for Choice-based Revenue Management

Life is about making choices, and therefore, many managerial planning problems, e.g. choice-based revenue management, require accurately predicting consumer choice behavior. Choice models like the MNL have traditionally been estimated by using standard econometric techniques like the maximum likelihood (ML) procedure.

The objectives of this thesis are to:

- introduce the ML-based estimation of MNL models for predicting consumer choice in RM applications;
- discuss how to account for unobservable data;
- provide a small academic example to explain the estimation procedure;
- discuss limitations of the method.

Basic Literature:

Train, K. (2003). Discrete Choice Methods with Simulation. Cambridge University Press, New York.

Vulcano, G., Van Ryzin, G., & Chaar, W. (2010). OM practice—choice-based revenue management: An empirical study of estimation and optimization. Manufacturing & Service Operations Management, 12(3), 371-392.

Topics on Product Design:

Topic S03: Sustainable product design and conjoint analysis

In light of several recent developments, companies are forced to rethink their product design approaches. One of the most pressing developments is the increase of environmental challenges. This development has an impact on individuals and their preferences, which translates to changes in customer demand for products. Hence, companies are forced to review their product design strategies in order to not fall behind.

During product design, many decisions have to be made that affect both, the economic as well as the environmental performance of the respective product. These decisions include (but are not limited to) (1) choice of material, (2) choice of supply sources and suppliers, (3) choice of attributes and respective attribute levels, and others.

The challenge of designing products that fit to (changing) customer preferences is not new in the business world. Companies have faced similar challenges for decades. Several approaches have been developed to facilitate and support product design. For example, conjoint analysis has been widely applied for product design since the 1970s, see e.g., the early paper of Green & Srinivasan (1990). Since then, significant developments have been made, e.g. with regard to survey design, data collection and estimation methods.

The objectives of this thesis are to:

- introduce the topic of product design, with focus on current developments (environmental challenges) driving the need to rethink product design strategies;
- review the state-of-the-art approaches that have been developed to facilitate and support product design;
- introduce the Conjoint Analysis (CA) approach and discuss its relevance for product design in today's research and practice;
- discuss pros and cons of Choice-based Conjoint (CBC) as the best CA method;
- provide a recommendation for a product design approach of an electronic product;

Basic literature:

Green, Paul E.; Srinivasan, Venkat (1990). Conjoint analysis in marketing: new developments with im-plications for research and practice. Journal of Marketing 54 (4), pp. 3–19.

Bradley, J. R., & Guerrero, H. H. (2008). Product design for life-cycle mismatch. Production and Operations Management, 17(5), 497-512.

Orme, B. (2010). Getting started with conjoint analysis: strategies for product design and pricing research second edition. Madison: Research Publishers LLC. Partly available online here.

Topic S04: Product durability and planned obsolescence – Empirical evidence

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 the environment in terms of resource use as well as waste disposal.

Overall, three general types of planned obsolescence strategies can be identified. Physical obsolescence (originally "Obsolescence of quality") arises when a product breaks or wears out with time beyond repair in an unnatural manner. In this case, the product is deliberately built to break sooner than naturally. Technological obsolescence (originally "Obsolescence of function") arises when a new (technologically or functionally) superior product is introduced to the market. Psychological obsolescence (originally "Obsolescence of desirability") arises when the product becomes outdated in the eyes of consumers due to changes in fashion, style or similar.

The objectives of this thesis are to:

- highlight the pros and cons of planned obsolescence, differentiated by type if necessary;
- review the literature for planned obsolescence, focusing on empirical academic studies and potential case examples;
- develop an appropriate classification scheme for the reviewed literature;
- classify the different academic contributions and highlight the relevance of each class in terms of past and current research focus;
- discuss potential gaps in academic literature and recommend future research directions.

Basic literature:

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.

Topics on Service Design:

Topic S05: Service Quality and Customer Satisfaction in Banking Services

Service quality and customer satisfaction are closely linked. Proper design and management of service processes allows the service provider to influence the perceived service quality and thereby impact the customers' satisfaction with the service encounter. Generally, service quality can be assessed using the ServQual framework proposed by Parasuraman et al. (1988), which names five principal dimensions: reliability, responsiveness, assurance, tangibles, and empathy.

Being an exemplary service industry, banking is a crucial part of everyday life. As such, the banking sector has been subject to various studies on service quality and customer satisfaction. Both technological factors as well as demographic changes impact this industry nowadays. Most banks offer online services like online banking or automated services like ATMs. While online offers continuously increase, smaller bank facilities outside of cities face increasing costs and competitive pressure by digital competition. Hence, service quality is a growing concern for bank to remain competitive. Which factors predominantly influence the service quality, the customer experience, and consequently the customer satisfaction in banking services? Do these factors differ for the different services offered by banks? Multiple questions arise in this context, which should be discussed in this thesis.

The objectives of this thesis are to:

- conduct a literature review on the existing empirical studies measuring service quality and customer satisfaction of services provided by banks,
- review the literature in order to identify the main impact factors of service quality in the banking sector, and
- give recommendations on how banks can improve their service design and processes.

Basic literature:

Parasuraman, A Parsu & Zeithaml, Valarie & Berry, Leonard (1988): SERVQUAL: A multiple- Item Scale for measuring consumer perceptions of service quality. *Journal of retailing*, 64(1), 12-40.

Joseph, M., & Stone, G. (2003): An empirical evaluation of US bank customer perceptions of the impact of technology on service delivery in the banking sector. *International Journal of Retail & Distribution Management.*

Frei, F. X., Kalakota, R., Leone, A. J., & Marx, L. M. (1999): Process variation as a determinant of bank performance: evidence from the retail banking study. *Management Science*, 45(9), 1210-1220.

Campbell, D., & Frei, F. (2010): Cost structure, customer profitability, and retention implications of self-service distribution channels: Evidence from customer behavior in an online banking channel. *Management Science*, 56(1), 4-24.

Topic S06: How responsive is a service? – Measuring Responsiveness in Service Operations

Service quality is an important factor of customer satisfaction. A popular approach to evaluate the quality of a specific services is proposed by Parasuraman et al. (1988). This framework called Serv-Qual proposes five principal dimensions of service quality: reliability, responsiveness, assurance, tangibles, and empathy. Thereof, reliability and responsiveness are often found to be the prevailing impact factors of service quality and ultimately the drivers of customer satisfaction. Generally, responsiveness can be defined as the ability and willingness to help customers and provide prompt service.

For service providers aiming at achieving high customer satisfaction, insights in this area are very valuable as responsiveness can greatly impact the service quality. The first step is to measure responsiveness in order to evaluate and improve the performance in this field. A pragmatic and often used measure is waiting time. The time a customer spends waiting can easily be objectively measured. Moreover, service providers can try to influence waiting time through design measures of process management. However, is waiting time the main factor determining responsiveness and thus the best measure for responsiveness?

The objectives of this thesis are to:

- conduct a literature review to identify the measurement approaches for responsiveness,
- evaluate the use of waiting time as appropriate operationalization for responsiveness, and
- give a recommendation on how to measure responsiveness in service operations.

Basic Literature:

Davis, M. M., & Heineke, J. (1998): How disconfirmation, perception and actual waiting times impact customer satisfaction. *International Journal of Service industry Management*, 9(1), 64-73.

Santos Bernardes, E., & Hanna, M. D. (2009): A theoretical review of flexibility, agility and responsiveness in the operations management literature. *International Journal of Operations & Production Management,* 29(1), 30-53.

Garaus, M., & Wagner, U. (2019): Let me entertain you–Increasing overall store satisfaction through digital signage in retail waiting areas. *Journal of Retailing and Consumer Services,* 47, 331-338.

Topic S07: Managing Customer Satisfaction during Waiting Periods

Service quality is an important influencing factor of customer satisfaction. ServQual by Parasuraman et al. (1988) is a popular approach to evaluate service quality, proposing five principal dimensions of service quality: reliability, responsiveness, assurance, tangibles, and empathy. Being an important factor, responsiveness targets e.g. the prompt provision of the service or the short answer times. Despite the known relevance of responsiveness, waiting cannot always be prevented by the service provider. Keeping the customer waiting can thereby have negative effects on the service quality and correspondingly the customer satisfaction. Hence, managing the waiting periods can be a possibility to influence customer perceptions in order to diminish negative effects.

When waiting periods cannot be avoided, service providers should therefore identify measures to make the waiting more pleasant for the customer. Recommendations can be deducted from the literature on managing customer satisfaction during waiting periods. By providing more pleasant waiting periods, the perceived waiting time can be reduced, and customer satisfaction can be increased. Which measures can be used to design the waiting periods in a form that benefits the service provider?

The objectives of this thesis are to:

- conduct a literature review to identify the measures to manage customer perception of responsiveness during waiting periods,
- evaluate the role of customer activity during waiting periods, and
- give a recommendation on how to create pleasant waiting periods for customer during service encounters.

Basic literature:

Chebat, J. C., Filiatrault, P., Gelinas-Chebat, C., & Vaninsky, A. (1995): Impact of waiting attribution and consumer's mood on perceived quality*. Journal of business Research*, 34(3), 191-196.

Watkins, K. E., Ferris, B., Borning, A., Rutherford, G. S., & Layton, D. (2011): Where Is My Bus? Impact of mobile real-time information on the perceived and actual wait time of transit riders. *Transportation Research Part A: Policy and Practice*, 45(8), 839-848.

Jones, P. and Peppiatt, E. (1996): Managing perceptions of waiting times in service queues. *International Journal of Service Industry Management,* 7(5), pp. 47-61.

Topics on Service Process Design:

Topic S08: Identifying and Prioritizing Relevant Customer Journeys for Service Process Design

Optimizing the overall customer experience is crucial for any company since it drives customer satisfaction and in turn sales and word-of-mouth. To improve the respective service processes underlying each customer experience, a clear understanding is needed, which customer journeys to optimize and prioritize. Most companies have a variety of services, each with several different customer journeys depending on target segment, context, or stage in the customer lifecycle for example. Since companies cannot improve every service process at the same time, it is crucial to determine what matters most to the customer and which customer journeys have the strongest impact on the overall customer experience.

The objectives of this thesis are to:

- introduce the concepts of customer experience management and service process design;
- analyze the link between these two areas of research;
- show how individual customer journeys impact the overall customer experience;
- provide managerial implications on how companies can prioritize their effort for optimizing individual service processes.

Basic literature:

Fließ, S. & Kleinaltenkamp, M. (2004). Blueprinting the service company: Managing service processes efficiently. Journal of Business Research 57 (4), 392-404.

Hill, A. V., Collier, D. A., Froehle, C. M., Goodale, J. C., Metters, R. D., & Verma, R. (2002). Research opportunities in service process design. Journal of Operations Management 20(2), 189-202.

Lemon, K. N., & Verhoef, P. C. (2016). Understanding customer experience throughout the customer journey. *Journal of marketing* 80(6), 69-96.

Topic S09: Customer Experience Management – Integrating the Marketing and Operations Perspective

Customer experience management (CEM) is a research domain that strongly gained popularity during the last decade. Introduced as a new marketing perspective, it followed the service-dominant logic and focusses on the customers' experience with a company, a product or a service. While whole industries created a trend by actively engaging in customer experience management, extensive research in this field is sparse – despite of extensive research on customer experience itself. Started as a marketing construct, CEM is also of interest for other research disciplines. In operations management for example a similar stream called service experience management exists, which combines marketing and operations considerations in a single construct. The question, which areas elaborate on customer experience management to which extent, is important to evaluate the multidisciplinary nature of the construct.

The objectives of this thesis are to:

- introduce the terms customer experience and customer experience management including an overview of its historical development;
- provide a research map covering research on customer experience management with a focus on (but not restricted to research areas like) marketing and operations management over the last decade;
- highlight the role of operations management and present areas of future research on CEM in this context.

Basic literature:

Homburg, C., Jozić, D., & Kuehnl, C. (2017). Customer experience management: toward implementing an evolving marketing concept. *Journal of the Academy of Marketing Science*, 45(3), 377-401.

Kwortnik Jr, R. J., & Thompson, G. M. (2009). Unifying service marketing and operations with service experience management. *Journal of service research*, 11(4), 389-406.

Topics on Airline travel and scheduling:

Topic S10: Customer Utility Functions in Airtravel

The choice between different transport modes for a trip can be characterized as a discrete choice situation, as the best travel option is selected by customers. These decisions can be modelled with discrete choice models; their most prominent functional specification is the multinomial choice model (MNL). An underlying assumption of the models is the possible decomposition of the product or service in attributes with different levels, where each attribute level is connected to a particular partial utility. As example, Coldren et al. (2003) identified itinerary service characteristics for flights connecting east & west coast of the United States as attributes and estimate the part worth utilities of the respective attribute levels. The emergence of online booking engines and data availability create a new possibility to analyze real-life data for parameter-estimation.

The objectives of this thesis are to:

- introduce and compare the MNL and similar discrete choice models;
- provide an overview of empirical studies measuring the utility choice behavior of air travel and competing transport modes including attributes, their levels, and chosen segments;
- identify and discuss the state-of-the-art approach in choice model estimation for air travel;
- provide open research gaps and future trends.

Basic literature:

Adler, T., Falzarano, C. S., & Spitz, G. (2005): Modeling service trade-offs in air itinerary choices. *Transportation Research Record*, 1915(1), 20-26.

Coldren, G. M., Koppelman, F. S., Kasturirangan, K., & Mukherjee, A. (2003): Modeling aggregate air-travel itinerary shares: logit model development at a major US airline. Journal of Air Transport Management, 9(6), 361-369.

Train, K., & Ebrary, Inc. (2009): *Discrete choice methods with simulation* (Second ed.). Cambridge New York Melbourne Madrid Cape Town Singapore São Paulo Delhi Mexico City

Topic S11: Bidline approaches in airline crew scheduling

The crew scheduling problem for airlines is very complex due to a large number of flights, which have to be covered, and many regulatory, union, and internal rules which must not be violated. This complexity results in the separation of the problem in two steps: the crew pairing problem generating cost-efficient trips, called pairings, and the crew assignment problem assigning the trips to single pilots; often in the second step the preferences of crew members are considered to some degree.

While most airlines use crew rostering, which assigns pairings to specific crew members, the US airlines prefer the bidline approach. It first generates unassigned schedules consisting of multiple pairings over the month. In a second step, crew members bid on the schedules. Based on these bids the available schedules are then assigned to their pilots.

The objectives of this thesis are to:

- review the recent literature on crew scheduling and specifically the crew assignment problem;
- introduce the bidline approach including academic models and show how the problem is handled in (real-life) airline operations;
- present and analyze a chosen bidline model in detail;
- identify and evaluate future directions of research in the crew scheduling area.

Basic literature:

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. – *available by mail to makroeme@mail.uni-mannheim.de*

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

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.

Topics on Simulation Modeling:

Topic S12: Simulation Metamodeling with Neural Networks – a Powerful Approach with Applications to Process Design?

Computer simulation is the imitation of the operation of a real-world process or system. Simulation has become an invaluable tool for managerial decision making that can be considered an experimental laboratory in which to study a model of a real system. Based on what-if scenarios, simulation allows analyzing how the system's performance (output) might respond to inputs such as changes in policies, resource levels, or customer demand. The simulation data can then be used to draw inferences concerning the operating characteristics of the real system that is represented.

However, simulation may be computationally slow or expensive: i.e., it may take much computer time to obtain the response for a given combination of the simulation inputs. While the simulation model is often treated as a black box, simulation metamodels are explicit and relatively simple approximations of the input/output (I/O) function implicitly defined by the underlying simulation model. Metamodels lend support to simulation models by trying to generalize the simulation output and predicting the output for a new input combination of the expensive simulation model. Chambers and Mount-Campbell (2002) use a neural network to optimize a production process.

The objectives of this thesis are to:

- Introduce the simulation metamodeling approach with a focus on neural network metamodels;
- Review the approach of Chambers and Mount-Campbell (2002) in detail;
- Discuss advantages and limitations of the simulation metamodeling approach by Chambers and Mount-Campbell (2002) for manufacturing process optimization and discuss applicability for service processes.

Basic Literature:

Chambers, M., & Mount-Campbell, C. A. (2002). Process optimization via neural network metamodeling. International Journal of Production Economics, 79(2), 93-100.

Kleijnen, J. P., Sanchez, S. M., Lucas, T. W., & Cioppa, T. M. (2005). State-of-the-art review: a user's guide to the brave new world of designing simulation experiments. INFORMS Journal on Computing, 17(3), 263-289.

Kleijnen, J. P. (2017). Design and analysis of simulation experiments: Tutorial. A. Tolk et al. (eds.), Advances in Modeling and Simulation (Chapter 8, pp. 135-158). Springer.