

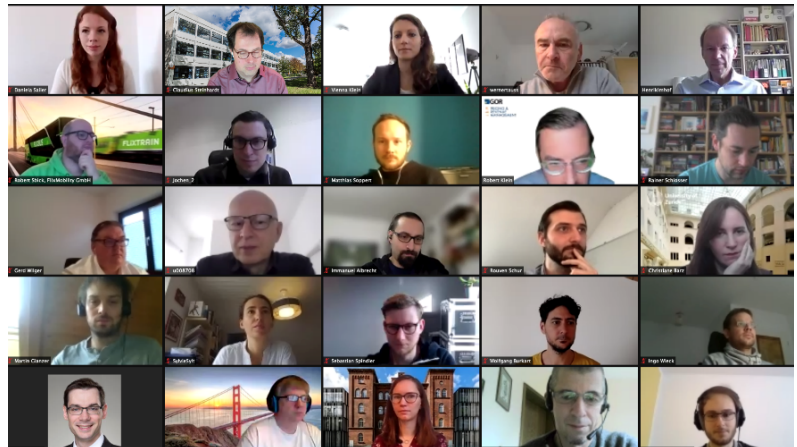
# Online Sessions of the GOR Working Group Pricing & Revenue Management

Vienna Klein and Claudius Steinhardt, Munich



Since a physical meeting of the Pricing & Revenue Management Working Group could not be held in 2021 due to the Covid 19 pandemic, an online concept was developed with the goal of providing an engaging program that links research and practice and encourages discussion and exchange among community members. In doing so, the program was designed as a series of three 2h-online sessions with different topics, each with two presentations and time for sufficient discussion.

There were around 80 registrations for each session, which on the one hand shows the importance of revenue management topics and on the other hand underlines the attractiveness of the working group, which brings together both researchers and practitioners. Experts and executives from a wide range of industries participated, such as tourism companies, mobility and logistics providers, software providers, consulting firms, as well as household appliance manufacturers and retail companies. Representatives from more than ten universities were also in the audience.



In order to also address international participants, the sessions were predominantly held in English. As an advantage of the online format, it was also possible to attract international speakers, for example from Hong Kong and New Zealand.

The first session of the series took place on February 5<sup>th</sup>, 2021. It was dedicated to recent methodological developments in revenue management. The session was opened by a talk entitled *Simulation-based Reinforcement Learning for Revenue Management*, jointly given by Dr. Henrik Imhof, Project Manager at Caweco GmbH, and Dr. Jonas Rauch, Lead Scientist at Pros. Their talk was dedicated to uncover the potential and obstacles of applying approximate dynamic programming (ADP) and reinforcement learning (RL) to revenue management problems. On the one hand, they discussed the convergence of different ADP approaches within stylized revenue management problems, on the other hand, they showed how RL approaches can be used to solve scenario-based revenue management problems that are relevant for settings of high forecast uncertainty, but that cannot be solved by traditional DP/ADP techniques.

The second talk of the session, entitled *Discrete Choice Models, Assortment Optimization and Pricing*, was given by Prof. Dr. Guillermo Gallego from the Hong Kong University of Science and Technology, one of the world's most renowned researchers in this field. He gave an overview of the theory of discrete choice models, different model types such as BAM, GAM, nested models, mixtures, and Markov chain models, and discussed their relevance to the practice of revenue management. Based on this, he also provided an overview of results and remaining challenges of assortment optimization and pricing. Finally, he briefly presented the refined assortment optimization problem, which deals with the simultaneous optimization of an assortment and the attractiveness of the products it contains by adjusting their fare restrictions.

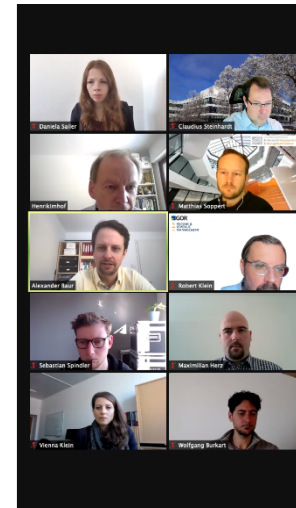
The second session was held on February 12<sup>th</sup>, 2021. Its focus was on the development and application of revenue management techniques for on-demand mobility and logistics services, in particular the application of pricing in car sharing systems and delivery services. In their presentation titled *Pricing Optimization in Free-Floating Car Sharing*, Dr. Alexander Baur, Team Lead Pricing and Analytics at Share Now, and Matthias Soppert, PhD student at the Universität der Bundeswehr München, presented a joint project in which they developed sophisticated price differentiation with the goal of reducing cost-intensive relocations that are harmful to the environment and traffic. To determine optimal prices, they proposed a Mixed Integer Linear Programming approach based on a network flow formulation, as well as a decomposition heuristic based on Approximate Dynamic Programming techniques. They also provided general insights into the potential of joint projects between academia and industry.

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Afterwards, Dr. Sebastian Koch and Dr. Maximilian Hausmann, Senior Consultant and Senior Manager - Head of Data Science & Strategy, respectively, at rpc - the retail performance company, discussed dynamic pricing as a game changer for delivery services. In their presentation *Staying Flexible in E-Commerce*, they first gave a comprehensive overview of the market situation in online grocery delivery and showed how it has evolved over the course of the Covid 19 pandemic. They then highlighted the role of dynamic pricing in managing delivery windows. To this end, they presented a reinforcement learning-based optimization approach based on a Markov decision process, and then discussed the challenges of state-space approximations and feature engineering. In a comprehensive simulation study, they demonstrated the potential benefits of the approach.

The third online session took place on February 26<sup>th</sup>, 2021. It was opened by Dr. David Post, CEO of SigmaZen, who joined from New Zealand. In his presentation, titled *Analysing Behavioural Data from Variable Opaque Products*, he first introduced the audience to the idea and aims of variable opaque products, which differ from traditional opaque products in that customers can flexibly reduce the level of opacity upfront by paying extra fees. He then presented the results of a comprehensive data evaluation study. He first showed what data was collected on a real-time booking platform implemented at Lufthansa. He then analysed the behaviour of bookers and lookers, the distribution of selected opacity levels, and the results of a predictive pattern recognition analysis, which revealed interesting insights.

The series of online sessions was concluded by a presentation from Dr. Johannes Koch, Pricing Analyst at E.ON and Rüdiger Weis from Enomic. Their presentation, entitled *Challenges in the Energy Retail Industry*, provided an interesting overview of the German electricity retail market and the resulting revenue management challenges associated with a very large and complex pricing structure. In particular, the central role of price comparison websites and the fact that transaction valuation usually falls short were discussed. An analysis showed the significant dependence of churn probabilities on the

rank on comparison websites, and the results of a survival analysis showed the dependence of churn rates on bonuses, rank, price, etc. Furthermore, product line pricing at eon.de was discussed, as well as the importance of an appropriate cost structure.

Although face-to-face exchange is certainly indispensable, the online format has proven to be a good bridging platform for maintaining mutual exchange and knowledge transfer in the revenue management community. We believe that especially now, in times of dramatic upheaval in almost all markets, the connection and integration of research and practice, as well as the informative exchange between revenue management professionals from different industries, brings significant benefits. Nevertheless, we look forward to returning to a more traditional working group meeting in attendance and therefore hope to welcome our community members back in person at the next meeting. The next meeting will take place in spring 2022, information on venue and date will be announced via the working group's community platform at [www.pricing-and-revenue.management](http://www.pricing-and-revenue.management).