UNIVERSITY OF MANNHEIM
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Topic RB01: Consumer Preference for Sustainable Durable Product and Service Design

Product line design decisions are important decisions at the interface of marketing and operations that are very costly to implement and determinant for market success. In order to systematically support decision-making in this area, a number of predictive consumer behavior models (in particular based on conjoint and discrete choice analysis, see, e.g., Sawtooth Software 2023) and prescriptive mathematical programming models for optimal product (line) design based on customer preference data have been developed in the last decades. In these models, a product is considered to be a bundle of buyer-relevant attributes and their levels, respectively.

As environmental concerns are increasing, firms also have to decide how to make their products more sustainable. *Sustainable products* are "all kinds of products that have or aim at an improved environmental and social quality, which can be related back to the already mentioned implementation of environmental and social standards. The ultimate aim is to satisfy customers and gain a competitive advantage in the market." (Seuring & Müller 2008). The focus of this thesis is on consumer preferences for sustainable durable goods and services. Typical attributes of durable goods that determine the product's sustainability include its longevity, energy use during production and usage, recyclability or remanufacturability, CO2 footprint, packaging and plastic content, etc. Furthermore, service offerings related to leasing business models like maintenance and repair can have an impact on the product's environmental performance. Various empirical studies show that sustainable product attributes increase consumer willingness-to-pay and may pay off the efforts on the supply chain side (e.g., for take-back operations) if higher prices can be charged. However, cannibalization effects within the product line have to be taken into account.

The objectives of this bachelor thesis are to:

- review the empirical literature on consumer preferences and willingness-to-pay for sustainable features of durable goods;
- give an overview over the product (line) design literature which incorporates sustainable features or durable goods and service offerings into their decision-making process;
- discuss how the empirical evidence is incorporated into the product design literature and outline if there is any research gap.

Basic Literature

Alriksson, S., & Öberg, T. (2008). Conjoint analysis for environmental evaluation. Environmental Science and Pollution Research, 15(3), 244-257.

Örsdemir, A., Deshpande, V., & Parlaktürk, A. K. (2019). Is servicization a win-win strategy? Profitability and environmental implications of servicization. Manufacturing & Service Operations Management, 21(3), 674-691.

Ovchinnikov, A. (2011). Revenue and cost management for remanufactured products. Production and Operations Management, 20(6), 824-840.

Sawtooth Software (2023): Choice-Based Conjoint (CBC) Analysis, https://sawtoothsoftware.com/conjoint-analysis/cbc, last accessed on Sept. 4th, 2023

Seuring, S., & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management.

Topic RB02: Towards a Circular Business Model through Re-manufacturing

Take back regulations like Extended Producer Responsibility (EPR) are policies that require manufacturers to take responsibility for the environmental impacts of their products throughout the entire product life cycle, including after the product has reached the end of its useful life. They encourage the design of products that are more sustainable, durable, and easily recyclable and remanufacturable, leading to a more circular economy and reduced environmental impact. Remanufacturing is the production of like-new products using components retrieved from previously used products in addition to new components. On the one hand, remanufacturing can be a quite profitable business model towards circularity and it could also be environmentally so beneficial. On the other hand, remanufacturing demands more complex operations and resources, understanding consumer preferences is essential, and there is a risk of cannibalizing sales of new products. Additionally, incentivizing product returns and ensuring quality and compliance with regulations remain uncertain.

The tasks and objectives of the bachelor thesis are to:

- review current industry trends in remanufacturing as well as different remanufacturing business models;
- review some showcase examples of successful companies that have successfully embraced a circular business model through remanufacturing;
- review and classify the academic OM literature on remanufacturing with a focus on approaches to model the impact of remanufacturing-related decisions on revenue/cost and the environment.

Basic Literature:

Abbey, J. D., Meloy, M. G., Guide Jr, V. D. R., & Atalay, S. (2015). Remanufactured products in closed-loop supply chains for consumer goods. Production and Operations Management, 24(3),488-503.

Atasu, A., Guide Jr, V. D. R., & Van Wassenhove, L. N. (2010). So what if remanufacturing cannibalizes my new product sales?. California Management Review, 52(2), 56-76.

Parker, D., Riley, K., Robinson, S., Symington, H., Tewson, J., Jansson, K., ... & Peck, D. (2015). Remanufacturing Market Study. https://www.remanufacturing.eu/assets/pdfs/remanufacturing-%20market-study.pdf

Topic RB03: Evaluation of Choice-Based Conjoint Analysis Tools for Predicting Discrete Choices

Conjoint analysis stands as a cornerstone methodology in market research, product design, and consumer behavior analysis, offering valuable insights into individuals' preferences and decision-making processes. By systematically decomposing products or services into attributes and levels, conjoint

analysis allows researchers to quantify the relative importance of different features and predict how changes in these attributes influence consumer choices. However, as the landscape of choice modeling evolves and the complexities of decision-making phenomena become more apparent, the need for robust and versatile conjoint analysis tools tailored to discrete choice models is increasingly evident. In recent years many new software providers offer different capabilities for conjoint studies. One prominent software provider is Sawtooth Software which offers various options for choice based conjoint studies and different estimation methods. Other providers like OptionX, conjointly or Pollfish might have the same or superior capabilities.

The objectives of this bachelor thesis are to:

- provide an introduction into conjoint analysis and discrete choice models;
- discuss which type of conjoint analysis is suited best for discrete choice models;
- create a framework on how to evaluate software to be the best choice for scholars in this field;
- evaluate different conjoint software based on this framework;
- summarize and discuss all findings;
- critically assess the limits of your findings and outline any research gaps.

Basic Literature:

Eggers, F., Sattler, H., Teichert, T., & Völckner, F. (2018). Choice-Based Conjoint Analysis. Handbook of Market Research, Springer, Cham, 1-39.

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

Louviere, Jordan J.; Flynn, Terry N.; Carson, Richard T. (2010): Discrete Choice Experiments Are Not Conjoint Analysis. In: Journal of Choice Modelling 3 (3), S. 57–72.