UNIVERSITY OF MANNHEIM
Business School

CHAIR OF SERVICE
OPERATIONS MANAGEMENT
Prof. Dr. Cornelia Schön

Master Thesis Proposal

Prescriptive Analytics for Distribution Network Design at Bayer Crop Science

(based on INFORMS OR & Analytics Student Competition)

Many real world business problems, such as the distribution network design problem at Bayer Crop Science considered here, pose huge challenges to decision makers due to their unstructured and complex nature. Analytics can help to make better decisions – it is the extensive use of data, statistical analysis, predictive and prescriptive models, and fact-based management to drive decisions and actions.[1] A systematic decision making process based on analytics involves the conceptualization and definition of the problem, the identification of data requirements, the collection and analysis of data, modeling and optimization, as well as analyzing the results and deriving recommendations. Analytics is often further distinguished into three categories:[2]

- Descriptive Analytics: A set of technologies and processes that use data to understand and analyze business performance
- Predictive Analytics: The extensive use of data and mathematical techniques to uncover explanatory and predictive models of business performance representing the inherit relationship between data inputs and outputs/outcomes.
- Prescriptive Analytics: A set of mathematical techniques that computationally determine a set of high-value alternative actions or decisions given a complex set of objectives, requirements, and constraints, with the goal of improving business performance.

The thesis is concerned with the design of a distribution network at Bayer Crop Science based on real data from the company. The specific task involves performing prescriptive analytics for determining product flows in presence of resource capacity constraints at manufacturing facilities. In particular, the objective of the thesis is to

- understand and mathematical formulate the distribution network design problem underlying Bayer's decision (based on information on the real problem and on literature review of distribution network design),
- understand the data requirements for Bayer's distribution network design problem and assume or estimate suitable parameters of the optimization model,

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[1] Based on Davenport, Thomas H., and Jeanne G. Harris, 2007, "Competing on Analytics: the New Science of Winning," Boston, Mass., Harvard Business School, pp. 7.
[2] http://analytics-magazine.org/the-analytics-journey/

- select or develop suitable solution methods for solving the optimization problem,
- analyze the results, perform a sensitivity analysis, and derive recommendations for the instance.

The thesis is an independent work in line with the exam regulations, but the task is part of the [2020 INFORMS OR & Analytics Student Competition](). Therefore, after completing their thesis, successful students may take an attractive opportunity to assemble in a team with other potentially interested students working on other parts of the Bayer project and participate in the competition by joining their different parts. This opportunity is voluntarily, independent of the thesis, and interested students are self-responsible to organize a team, assemble their work, derive recommendations and participate in the competition. However, the chair encourages participation and may facilitate it if possible. For further information and deadlines, please check the above mentioned INFORMS website.

Requirements:

- OPM 781
- Profound knowledge in Operations Research and Revenue Management
- Excellent analytical skills and an ability to transform real-world business problems into Operations Research models

Administrative information for writing a master thesis at the Chair of Service Operations Management can be found [here]().