Coordinating Service-Sensitive Demand and Capacity by Adaptive Decision Making: An Application of Case-Based Decision Theory*

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ABSTRACT

The subject of this article is the simultaneous choice of product price and manufacturing capacity if demand is stochastic and service-level sensitive. In this setting, capacity as well as price have an impact on demand because several aspects of service level depend on capacity. For example, delivery time will be reduced if capacity is increased given a constant demand rate. We illustrate the relationship between service level, capacity, and demand reaction by a stylized application problem from the after-sales services industry. The reaction of customers to variations in service level and price is represented by a kinked price-demand-rate function. We first derive the optimal price-capacity combination for the resulting decision problem under full information. Subsequently, we focus on a decision maker (DM) who lacks complete knowledge of the demand function. Hence the DM is unable to anticipate the service level and consequently cannot identify the optimal solution. However, the DM will acquire additional information during the sales process and use it in subsequent revisions of the price-capacity decision. Thus, this decision making is adaptive and based on experience. In contrast to the literature, which assumes certain repetitive procedures somewhat ad hoc, we develop an adaptive decision process based on case-based decision theory (CBDT) for the price-capacity problem. Finally, we show that a CDT DM in our setting eventually finds the optimal solution, if the DM sets the price based on absorption costs and adequately adjusts the capacity with respect to the observed demand.

Subject Areas: After-Sales Services, Capacity Planning, Case-Based Decision Theory, Decision Analysis, Pricing, and Queueing Theory.

*We thank two anonymous referees and the associate editor for their constructive comments. Following their advise led to a noticeably improved exposition of our research.

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