Abstract No: 204 ***ICT, Mathematics, and Statistics***

IDENTIFICATION OF IMPACT OF DISTRIBUTION CHANNEL DYNAMICS ON ASSORTMENT PLANNING OF AUTOMOTIVE PRODUCTS

M.M. Balasooriya*, R.B. Chinnam and E. Dalkiran

Department of Industrial and System Engineering, Wayne State University, MI, USA
**gj7168@wayne.edu*

The original equipment manufacturers' (OEMs) current situation is that they carry overly complex order catalogues for configurable products such as automobiles, which results in high development, management, and supply chain costs. Our study aims to control the complexity of OEMs' configuration catalogue to decrease development and supply chain costs while improving profitability, achieving sales objectives, and maintaining strong distribution channels. Assortment planning literature is yet to account for the dynamics of the distribution channels properly, the focus of our study. We consider the impact of dealer density, customer choice complexity, and regional heterogeneity on key performance metrics such as profit, sales, revenue, and inventory levels. Our assortment planning models are developed considering both stockout-based substitution and assortment-based substitution. In addition, we include the multiple substitution behaviour of customers to generate a more realistic scenario. We used several criteria that impact customer substitution behaviour, such as commonality between substitutable products, price similarities, and customer utility when substituting. We also extend the model to consider trades among dealers. Our demand model is based on multinomial logit models widely used in assortment planning literature, which provide a closed-form solution for the probability of directly choosing any individual configuration from the OEM order catalogue. The analytical model is developed for dealers to identify the set of configurations offered in the assortment and inventory replenishment policy to optimise the dealer level profits. Moreover, we conducted simulation experiments using the model parameters to validate the results from the analytical model and expand the studies to understand the impact of trades between dealers on the overall assortment size, inventory levels, and profitability in the dealer network. In conclusion, the study showed that although individual dealers prefer large territories to have higher profits, as OEM, it is crucial to identify the optimal size of the dealer network to have better sales. Further, this study shows that the heterogeneity of dealer network impacts increasing OEM level assortment, affecting assembly line balancing and demand forecasting of productions.

Keywords: Assortment-based substitution, Assortment planning, Dealer trades, Optimisation, Stockout-based substitution