Research School for Operations
Management and Logistics

**Exploring the Benefits of Dynamic Service Contract Pricing based on Sensor Data**

Stijn Loeys∗[1], Robert N Boute[1,2,3], and Katrien Antonio[1,4]
[1] *Faculty of Economics and Business, KU Leuven*
[2] *Technology and Operations Management, Vlerick Business School*
[3] *Flanders Make@KU Leuven*
[4] *Faculty of Economics and Business, University of Amsterdam*

We study the pricing of service contracts that cover all maintenance-related costs for a fixed, upfront fee during a predetermined horizon. We propose a fee that is periodically updated based on dynamic time-varying covariates observed during the contract. This aligns with usage-based insurance products with tariff structures based on telematics-collected data. Using Gradient Boosting Machines, we first calculate a baseline fee by predicting the costs based on a set of static covariates known at the contract's start. Interpretability is partly preserved via partial dependence plots and Shapley values. We update the baseline price based on online sensor-driven condition data and recent maintenance activities observed during the contract. Via data-driven feature engineering, we obtain a set of dynamic covariates highly correlated with actual customer machine usage. Incorporating these risk factors results in a usage-based contract price. We apply our model to a portfolio of 4173 full-service contracts of industrial equipment and show how incorporating sensor data of internal and external machine running conditions results in an experience-based pricing scheme. Our results show that with improved baseline risk differentiation and periodically updating our beliefs about customer behavior, we obtain tailored and fairer prices for these service contracts than static pricing models.

*Keywords: Maintenance, Predictive Models, Condition Monitoring, Service Contracts, Dynamic Pricing*

∗ *corresponding author, e-mail: stijn.loeys@kuleuven.be*