Spare Parts Inventory Replenishment by Utilization of End-of-Use Returns: Case of Smartphones

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Abstract

In a quest to grab the market share of smartphones, manufacturing companies and partnered e-commerce sites are offering greater benefits on exchange products. This has severely increased the concern of returns management through better remanufacturing and disposal policy. Though we know a lot about demands of new products there is no guarantee about the quality and the quantity of the returned products. Spare parts requirement are also equally difficult to gauge with the technological advancement making the components obsolete within 2-3 years span. An effective remanufacturing policy could be replenishing a portion of spare parts inventory through the returns recovery. To reduce the production uncertainty and maintain optimal inventory levels we propose a two-step methodology. First we obtain a good forecast of the return quantity and spare parts requirement by comparing results obtained using Bayesian Estimation and Adaptive Network based Fuzzy Inference System (ANFIS). Secondly, based on the return quality function, the production curve for the spare parts is determined. The study is concluded by presenting numerical cases to illustrate its usage.

Keywords
Bayesian Modeling, Remanufacturing, Forecasting and Optimization, Life cycle, Quality Function

Biographies

Mr. Vaibhav Agrawal is a final year student of the Department of Industrial and Systems Engineering enrolled in its Dual-Degree course at Indian Institute of Technology, Kharagpur. He has previously co-authored a conference paper named 'Survival Analysis of Supply Chain Using Bayesian Nonparametric' at 5th International Conference on Business Analytics and Intelligence. Also he has been involved in several other projects like determining time-to-launch of remanufactured products, development of simulation tool to assist cops during criminal chase. He has worked with the APM Terminals as a part of his internships and completed project on to 'Optimizing terminal operations through integration of Vehicle Booking System'. For the past two years he has been associated with Branding and Relations Cell IIT Kharagpur, institute recognized media and public relation body. During his tenure as Senior Coordinator, he organized the first edition of 'IIT Kharagpur Young Innovators' Program', aimed at fostering research among school students across the nation.

Dr. Akhilesh Kumar is an Assistant Professor in the Department of Industrial & Systems Engineering at Indian Institute of Technology, Kharagpur. He received his Ph.D. degree in Industrial Engineering from Wayne State University (U.S.A.) in 2011. His research interests include application of machine learning, statistical learning, data-

mining and optimization techniques to solve real-world problems pertaining to Conditioned-based Maintenance, Logistics and Supply Chain Management. He has publications in the International Journal of Production Economics, European Journal of Operational Research, Expert System with Applications, IEEE. He carried out collaborative research with multi-national companies such as Ford Motor and Delphi Automotive LLP on autonomous diagnostics and prognostics, and reverse logistics respectively. Currently he is a Co-PI from IIT Kharagpur for opportunities for Sustainable Freight Transport 'REINVEST' (R/141842) an EU-India Collaboration project. He has also recently bagged a coveted project from Department of Heavy Industry on "Digital manufacturing and industrial internet of things for enhanced supply chain coordination, quality and maintenance" along with Prof. M. K.Tiwari and Dr. Sri Krishna Kumar in collaboration with Tata Sons.