Evaluating the Effectiveness of Spare Parts Inventory Management Methods for Warranty Service Satisfaction

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Abstract

After a mobile communication device (MCD), such as a smartphone or tablet, has been sold to the public, the customer may find that there is a defect. Each MCD is sold with a warranty that covers the repair of manufacturing defects and is supported by the MCD manufacturer. A third party warranty service provider (WSP) is contracted by the MCD manufacturer to perform the MCD repairs and ships the repaired MCDs back to the customers. The contract established between the MCD manufacturer and the WSP clearly specifies the minimum required service levels for repair lead time and fill rate that must be met by the WSP to maintain a high level of customer satisfaction.

The objective of this research was to assess the effectiveness of two different spare parts replenishment methods that are used by a large manufacturer of semiconductors and electronics located in the Pacific Northwest. The effectiveness of a spare parts replenishment method was measured as its ability to meet minimum required service levels (defined based on contract agreements between XYZ Corporation and the WSP) at a minimum cost. The two spare parts replenishment methods under study are called the manufacturer managed spare parts inventory (MMSPI) and the advanced ship process (ASP).

A simulation approach was used to model each spare parts replenishment method and to assess their performance based on several common performance measures, including average repair lead time, average fill rate, and average total system cost. Then, a $2^k$ experimental design was implemented to test how the performance of the spare parts replenishment methods was affected by changes in the experimental factors mean arrival rate of defective MCDs to WSP and shipment lead time from XYZ Corporation to WSP.

The results showed that both spare part replenishment methods satisfy the minimum service level requirements established by XYZ Corporation, and that at the same time there is no statistically significant difference in average total system cost between the MMSPI and ASP spare parts replenishment methods. However, the results also showed a significant difference in the average repair lead time and average fill rate which indicate that the ASP spare parts replenishment method provides a shorter lead time and higher fill rate when compared to the MMSPI spare parts replenishment method at the same level of demand arrivals.

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