An Inventory Management Model to Manage the Stock Level for Irregular Demand Items

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Abstract : An accurate inventory management policy acquires a crucial role in the several high-availability sectors. In these sectors, due to the high-cost of spares and backorders, an (S-1, S) replenishment policy is necessary for high-availability items. The policy enables the shipment of a substitute efficient item anytime the inventory size decreases by one. This policy can be modelled following the Multi-Echelon Technique for Recoverable Item Control (METRIC). The METRIC is a system-based technique that allows defining the optimum stock level in a multi-echelon network, adopting measures in line with the decision-maker's perspective. The METRIC defines an availability-cost function with inventory costs and required service levels, using as inputs data about the demand trend, the supplying and maintenance characteristics of the network and the budget/availability constraints. The traditional METRIC relies on the hypothesis that a Poisson distribution well represents the demand distribution in case of items with a low failure rate. However, in this research, we will explore the effects of using a Poisson distribution to model the demand of low failure rate items characterized by an irregular demand trend. This characteristic of a demand is not included in the traditional METRIC formulation leading to the need of revising its traditional formulation. Using the CV (Coefficient of Variation) and ADI (Average inter-Demand Interval) classification, we will define the inherent flaws of Poisson-based METRIC for irregular demand items, defining an innovative ad hoc distribution which can better fit the irregular demands. This distribution will allow defining proper stock levels to reduce stocking and backorder costs due to the high irregularities in the demand trend. A case study in the aviation domain will clarify the benefits of this innovative METRIC approach.

Keywords : METRIC, inventory management, irregular demand, spare parts

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