Maintaining Service Levels during Contingency Operations

During contingency operations distribution channels and routes can often change with short notice. When this happens the lead times and lead time variability may increase which has consequences on material flow, logistics costs, and timely service to end users. One common oversight is how to properly account for the impact of shortage delays when there is insufficient inventory to satisfy demand immediately. We examine the lost sales data from a large industrial firm that uses a periodic review (s-1, s) inventory policy, where s is the base stock level. We develop a model to optimize base stock levels to meet a shortage delay objective, and an optimization model to determine the optimal probability of no stockout that considers the entire service experience to include backorder delay. We represent lost sales as a fraction of potential sales and show how to optimize base stock levels accordingly. Our contribution to the contingency inventory management literature and practice is a model for calculating a single parameter – the target service level – that accounts for the shortage delay associated with different distribution scenarios. Our model may be used to evaluate the inventory consequences of different distribution networks before or during a contingency. Additionally, our model could be used in the commercial sector to evaluate the strategic decision to offshore supply before such a decision is made, establish planning parameters in enterprise resource planning (ERP) systems, and set budgets for expediting missed orders to satisfy service response time requirements.