# Simultaneous Lot sizing and Lead-time Setting (SLLS) Via Queuing theory and Heuristic search

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## ABSTRACT

Materials requirements planning (MRP) is a widely used method for production planning and scheduling. Planned lead-time (PLT) and lot size are two of the input parameters for MRP systems, which determine planned order release dates. Presently, planned lead-time and lot size are estimated using independent methodologies. No existing PLT estimation methods consider factors such as machine breakdown, scrap-rate, etc. Moreover, they do not consider the capacity of a shop, which changes dynamically, because the available capacity at any given time is determined by the loading of the shop at that time. The absence of such factors in calculations leads to a huge lead-time difference between the actual lead-time and PLT, i.e., lead-time error. Altering the size of a lot will have an effect not only on the lead-time of that lot but also on that of other lots. The estimation of lot size and lead-time using independent methodologies currently does not completely capture the inter-dependent nature of lead-time and lot size.

In this research, a lot-sizing model is modified in such a way that it minimizes the combination of setup cost, holding cost and work-in-process cost. This proposed approach embeds an optimization routine, which is based on dynamic programming on a manufacturing system model, which is based on open queuing network theory. Then, it optimizes lot size by using realistic estimates of WIP and the lead-time of different lots simultaneously for single-product, single-level bills of material. Experiments are conducted to compare the performance of the production plans generated by applying both conventional and the proposed methods. The results show that the proposed method has great potential and it can save up to 38% of total cost and minimize lead-time error up to 72%.

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