How to maximize rewards in an incentived made-to-order scheduling environment

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In a high demand competitive business, providers may be selective about the orders which they accept and purchasers shop around for a suitable service provider. This paper considers the effect of incentivising earlier delivery dates, on the market's ability to match up supply and demand. It focuses on an individual supplier, and their strategy for selecting orders and allocating limited resources to reduce the processing time. The context is one of controllable processing times, and multi-item orders, with items falling into range of types, each of which are handled (i.e. produced or serviced) consecutively with a set up time between. Customers have no interest in orders which arrive late. This paper presents a method for selecting orders and targetting reduction in processing times, so as to maximise the reward for an individual supplier. The extent to which such a policy is of mutual benefit to potential customers is discussed.

This paper generalises results for a single machine assembly problem, with families of items. Set up times are sequence independent, and there is item-availability within in a batch of jobs of the same family. An order is completed only when all its items are ready. Process times are controllable at a cost per order proportional to its total processing time, within a bound on total compression of processing time. Profit arises from those orders accepted, with no penalty for orders rejected by the supplier. The net profit on an early order is given by the initial profit from the customer less the cost of compressing the order's processing time. The objective function is that of total net profit number of early jobs. A Dynamic Programme is developed to solve this problem to optimality, and its computational complexity analysed. While the presentation is in terms of a particular objective function and type of controllable processing times, the method is shown to generalise in both respects.

Keywords: Scheduling: controllable processing times, single machine, multi-operation jobs, dynamic programming

Supply Chain Management: multi-part orders, incentived delivery times, multiple purchasers, single supplier.

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