Order acceptance in job shop environments

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Abstract

In this paper we investigate the importance of a good order acceptance method in over-demanded job shop environments. We present several approaches for integrated order acceptance and resource capacity loading. These approaches range from straightforward to sophisticated. The straightforward approaches consider capacity restrictions at an aggregate level, and ignore some technological constraints, such as precedence relations. The sophisticated methods do consider these technological restrictions, and consider capacity restrictions on individual resources. We use a simulation model of a generic job shop to test these approaches in a rolling horizon setting. We compare the performance of the approaches based on criteria such as delivery performance, robustness with respect to processing time uncertainty, and capacity utilisation. The test results show that the sophisticated approaches significantly outperform the straightforward approaches in case of tight due dates (little slack). In that case, improvements of up to 30% in utilisation rate can be achieved. In case of much slack, a sophisticated order acceptance method is less important, because there is a lot of flexibility on the loading and scheduling level to find a feasible solution.

Keywords: order acceptance, capacity planning, resource loading, simulation, job shop, manufacturing