Dancing with the Production Planning System: Human Planners under Uncertainty and Infeasible Suggestions

Lijia Tan
Eindhoven University of Technology

In manufacturing operations, production planning involves a set of critical decisions. These decisions must be made by human planners but are usually supported by production planning systems. While system developers typically evaluate systems based on the quality of their suggested solutions only, human planners consider more aspects. We adopt a behavioral perspective to assess the effectiveness and efficiency of production planning systems by examining how they influence human decision-making. We focus on two major challenges faced by production planners, feasibility constraints, and demand uncertainty. We conduct a laboratory experiment with three treatments: a control system that addresses neither challenge, a Material Requirement Planning (MRP) system that addresses demand uncertainty only, and a Synchronized Base Stock (SBS) system that addresses both demand uncertainty and feasibility. The experimental results show that (1) systems that address demand uncertainty significantly improve decision performance by reducing total cost and shortening decision time, (2) the system that additionally addresses feasibility only improves performance to a limited extent, leaving total cost unaffected while slightly reducing decision time, and (3) system type has a limited effect on the performance of the highest-performing participants but substantially affects the remaining participants, particularly the lowest-performing ones. We assess the robustness of these results by conducting the experiment with practitioners. Our study provides behavioral evidence to inform the ongoing innovation of production planning systems, highlighting which challenges should be prioritized to enhance planners' decision performance most effectively.