Proceedings of the International Conference on Industrial Engineering and Operations Management

Publisher: IEOM Society International, USA DOI: 10.46254/WC02.20250245
Published: October 14, 2025

Scheduling on Shared Resources: A System Dynamics Approach

Shellyanne Wilson
Senior Lecturer, Department of Management Studies
Faculty of Social Sciences
The University of the West Indies
St. Augustine, Trinidad, W.I.
shellyanne.wilson@uwi.edu

Abstract

Short-term scheduling on shared resources is a core operations management issue that impacts a firm's ability to meet its cost, delivery, flexibility and quality operations strategy objectives. Operations planners must consider several variables in developing production sequences, inclusive of number of jobs, setup times, arrival times, processing times, due dates, precedence rules, and resource capacity. Traditional approaches use techniques such as priority rules like Earliest Dute Date, First Come – First Serve, Longest Processing Time and Shortest Processing Time, which result in optimized sequences, evaluated by metrics such as average utilization, lateness and Work-In-Process. These approaches, however, do not typically consider wider system elements such as feedback loops, delays, production policies and exogeneous factors. This research, therefore, explores scheduling on shared resources via a system dynamics approach, which aims at simulating stock accumulation, in the form of arrivals, work-in-process inventory completed orders, and late jobs; and flows, in the form of arrival rate, processing rate; and the impact of internal and external uncertainties, such as machine breakdowns and unplanned demand. Causal loop diagrams are firstly developed, followed by simulation, using Vensim PLE 10.3.0 software, to experiment how variable changes impact the production system. The research's contribution is the proposed use of system dynamics in complementing the traditional short-term scheduling approaches on shared resources, whereby longer-term impacts on the production system can be forecasted and planning policies can be evaluated. For organisations where shared resources are critical, this added approach can inform scheduling decision-making.

Keywords
Short-term scheduling, Shared resources, System dynamics

Biography
Shellyanne Wilson is a Senior Lecturer in Operations Management in the Department of Management Studies, at The University of the West Indies (The UWI). She completed her B.Sc. in Chemistry and Management and her M.Sc. in Production Management, from The UWI, in 1996 and 2002 respectively; and her PhD focusing on manufacturing strategy from the University of Cambridge, in 2008. Her research interests include operations strategy, competitiveness, and value chain analysis. Prior to joining academia, Dr. Wilson worked in the manufacturing sector in the areas of quality management and manufacturing management.