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Framework for embedding strategic use of simulation and optimization technologies in supply chain management

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Abstract

Simulation and optimisation technologies provide virtual environments to fine tune supply chain operations and to develop best operational configurations and strategies. However, recent review of literature and a survey of industry professionals revealed that in most instances, these technologies are typically deployed to address specific problems in isolation. Therefore, companies are failing to reap full potential of simulation and optimisation technologies. This paper presents the development of a new framework which should enable supply chain managers to embed these technologies in their decision-making processes. The proposed framework serves as a guide which helps to (a) identify missing resources (Data, Assets, Stakeholders and Processes) and make appropriate assumptions before design or re-design processes begin (b) Identify gaps against competitor business performance and develop strategies to deploy simulation and optimisation to narrow existing gaps and (c) develop necessary capabilities such as improving in-house logistics and / or out-sourcing for better ROI.

Keywords: Supply chain system design, Supply chain optimization, Supply chain simulation, Supply chain system

Introduction

Supply chains are the backbone of global economy. They are designed to achieve efficient delivery of products to customers on time. Increasingly, many supply chains fail to accomplish this primary aim. Among the many underlying causes for this failure, poor design is considered as a major factor. Any combination of (a) needlessly complex networks (b) inefficient transportation and (c) ineffective operating policies leads to poor designs.

Rapid environmental changes, technological advances and fast changing customer behaviours make even newly designed supply chains obsolete within short operation spans. It is therefore critically important that supply chains are systematically and regularly evaluated with the view to sustain/improve operational efficiencies (Muralidhar and Sarathy, 2018). Traditionally, such evaluations are confined to specific area(s) of supply chains and incremental improvements are targeted in those isolated areas. Sporadic interventions of this nature, however, may not improve overall performance supply chains.

In recent years, supply chain designers and manages have begun to deploy optimisation and simulation platforms which enable them to evaluate entire supply chains. They not only produce best configurations/policies and but also assesses impact of any anticipated changes. Built-in animation and extensive data analytics add further value (Stefanovic and Radenkovic, 2018).