

# **Stress Testing and Assessment on Ripple Effect Due To Contemporary Supply Chain Risks: A System Dynamics Approach**

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## **Abstract**

Supply chains (SC) are prone to sudden disruptions due to globalization, complex structure, and dynamic environments. Presently, the global pandemic has driven researchers towards the increasing significance of SC resilience and stress testing. SC networks are vulnerable not only due to unexpected events but also due to the risk propagation (i.e., ripple effect). In general, a disruption that originated at a node may impact not only that particular node. It may propagate across the SC and negatively impacts long-term performance. These subsequent risks derived from risk propagation are considered significant stressors of SCs. Therefore, it is essential to understand the dynamic nature of risks cascading across the SC nodes. In this regard, this paper proposes a system dynamics model to demonstrate the varying impacts based on the risk type and impacting node through visualizing the ripple effect. We considered four significant SC risks due to COVID-19 for the assessment. The considered risk scenarios are shortages of semiconductors, transportation congestion, increase in lead time, and production shutdown. The simulation results highlight the negative impact of the ripple effect on SC performance in terms of service level, lead time, and backlogged orders. The findings can help the researchers to visualize the dynamic nature of the risk propagation across the entire SC and to take crucial decisions. In addition, identifying the critical nodes can help practitioners develop mitigation strategies concerning the stressed node.

**Keywords:** Risk assessment, Supply chain ripple effect, Stress testing, System dynamics