Chapter 7
A Case Study for Supply Chain Management Using System Dynamics

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ABSTRACT

System dynamics is an interdisciplinary problem-solving methodology that utilizes several significant thinking skills such as dynamic thinking and cause-and-effect thinking. System dynamics is a disciplined collaborative approach that could accelerate learning by combining a multifaceted perspective that provides insight into complex and interactive issues. System dynamics is designed to model, analyze, and improve socio-economic and administrative systems using a feedback perspective. Dynamic structured administrative problems are modeled by mathematical equations and using computer software. Dynamic constructions of model variables are obtained using computer simulations. In this chapter, a system dynamics model will be developed for supply chain management. The case study will be developed using VENSIM package program.

INTRODUCTION

System dynamics approach was developed by Jay Forrester from MIT during 1950's to analyze especially the complex behavior in administration with computer simulation in social sciences. System dynamics is a form of systems approach as a methodology to understand the dynamic behavior of complex systems. The basis of system dynamics is to understand how system structures cause system behavior and system events (Sezen, 2009: 298).

Jay Forrester initially constructed his first dynamic model upon his meeting with the management of General Electric corporation. Big fluctuations in production, inventory, labor force and profitability were compelling GE management. Despite hard efforts of the management, these fluctuations were mostly associated with external factors. Especially, the fluctuations in the business were related to received orders. Forrester interacted with the management to observe the system operations in other departments. In the first model he developed, he observed that simulations were necessary since the system could not be monitored analytically. He demonstrated that the corporation could experience serious fluctuations due to management policies even when the demand is considered constant with the weekly simulation he ran. Later on, he designed the computer simulation for the same problem. In his later studies, Forrester demonstrated how the feedback control theory could be adapted for complex administration and human systems. He published his initial findings in an article in Harvard Business Review. Later on, he developed this study to write his famous work "Industrial Dynamics" (Lane and Sterman, 2011; Ramage and Shipp, 2009: 100-101).

SUPPLY CHAIN MANAGEMENT

The concept of supply chain management is relatively new. It was first articulated in a white paper produced by a consultancy firm-then called Booz, Allen and Hamilton-back in 1982. The focus of supply chain management is on co-operation and trust and the recognition that, properly managed, the 'whole can be greater than the sum of its parts'(Christopher, 2016).

Supply chain management can be defined as(Christopher, 2016):

The management of upstream and downstream relationships with suppliers and customers in order to deliver superior customer value at less cost to the supply chain as a whole.

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