

An XML-based modular system analysis and design for supply chain simulation

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Abstract

In the contemporary global market, managing the entire supply chain has become crucial for competitive advantage in different industries. However, the realization and success of supply chain management (SCM) depends significantly on the previous supply chain modeling and simulation for analyzing complex systems.

This study develops a modular approach for system analysis and design of supply chain simulation, which is capable of modeling the supply chain process and the operation of related communication data and information through XML techniques and simulating them within the SIMAN simulation tool. This study performs the following tasks: (i) characterizing supply chain process and establishing data/information elements, (ii) establishing knowledge requirements for supply chain process, (iii) analyzing and designing supply chain process modules, (iv) representing and integrating specifications of supply chain process modules, and (v) generating and demonstrating modular supply chain simulation.

The results of this study can be used to develop a modular system analysis and design for supply chain simulation for effectively assisting the integration of SCM and the exchange of related communication data and information in a supply chain, thus increasing business efficiency.

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Keywords: Supply chain; SIMAN simulation; Modular system; XML techniques

1. Introduction

Rapid change, globalization, and competition in the business environment have forced more and more enterprises to adopt supply chain management (SCM) to effectively integrate both external and internal resources, and accordingly to boost business competence and efficiency. The alignment of internal resources and the appropriate linkage for connecting suppliers and customers have become the key in responding to rapidly changing market demands.

SCM attempts to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed in the right quantities, to the

right locations, and at the right time. In doing so, system-wide costs can be minimized, while providing satisfactory service level [1]. To optimize SCM performance, supply chain functions must operate in a tightly coordinated manner. However, the dynamics of an enterprise and the market require flexible responses and adaptations that have local and global effects on supply chain entities. To successfully realize such coordinated structures, modeling with simulation for integrating supply chain and exchanging communication data and information, as well as the use of knowledge of supply chain has become an extremely important approach in supply chain simulation.

Recent developments in supply chain simulation share the common objective of optimizing supply chain system operation. Numerous studies on supply chain simulation have analyzed complex supply chain systems [2–9]. However, this study failed to find a convenient method and

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effective module for modeling and simulating the supply chain process and the operation of communication data, information and knowledge of supply chain with the SIMAN simulation tool. This situation causes a phenomenon for the development effect of supply chain simulation is limited.

This study presents a modular approach for the system analysis and design of supply chain simulation using NIST (National Institute of Standards and Technology) XML simulation interface specification, and attempts to apply knowledge level to enhance this specification. Moreover, the simulation tool SIMAN and computer program language C++ are used to develop a generator of modular supply chain simulation, and thus to demonstrate the results of this study.

This study aims to achieve the following: (i) characterize supply chain process and establish data/information element, (ii) establish knowledge requirements for supply chain process, (iii) analyze and design supply chain process module, (iv) represent and integrate specifications of supply

chain process modules, and (v) generate and demonstrate modular supply chain simulation.

2. Concept overview

This section gives an overview of the proposed approach to develop an XML-based modular supply chain simulation to effectively and conveniently model and simulate the supply chain process and related communication data and information, and knowledge application using the SIMAN. The developmental steps can be broadly divided into five phases. Phase one comprises supply chain process characterization and data/information element establishment. Phase two is the establishment of supply chain process knowledge requirements, while phase three involves supply chain process modular analysis and design. Finally, phases four and five are supply chain process module representation and integration specification and modular supply chain simulation generation and demonstration,

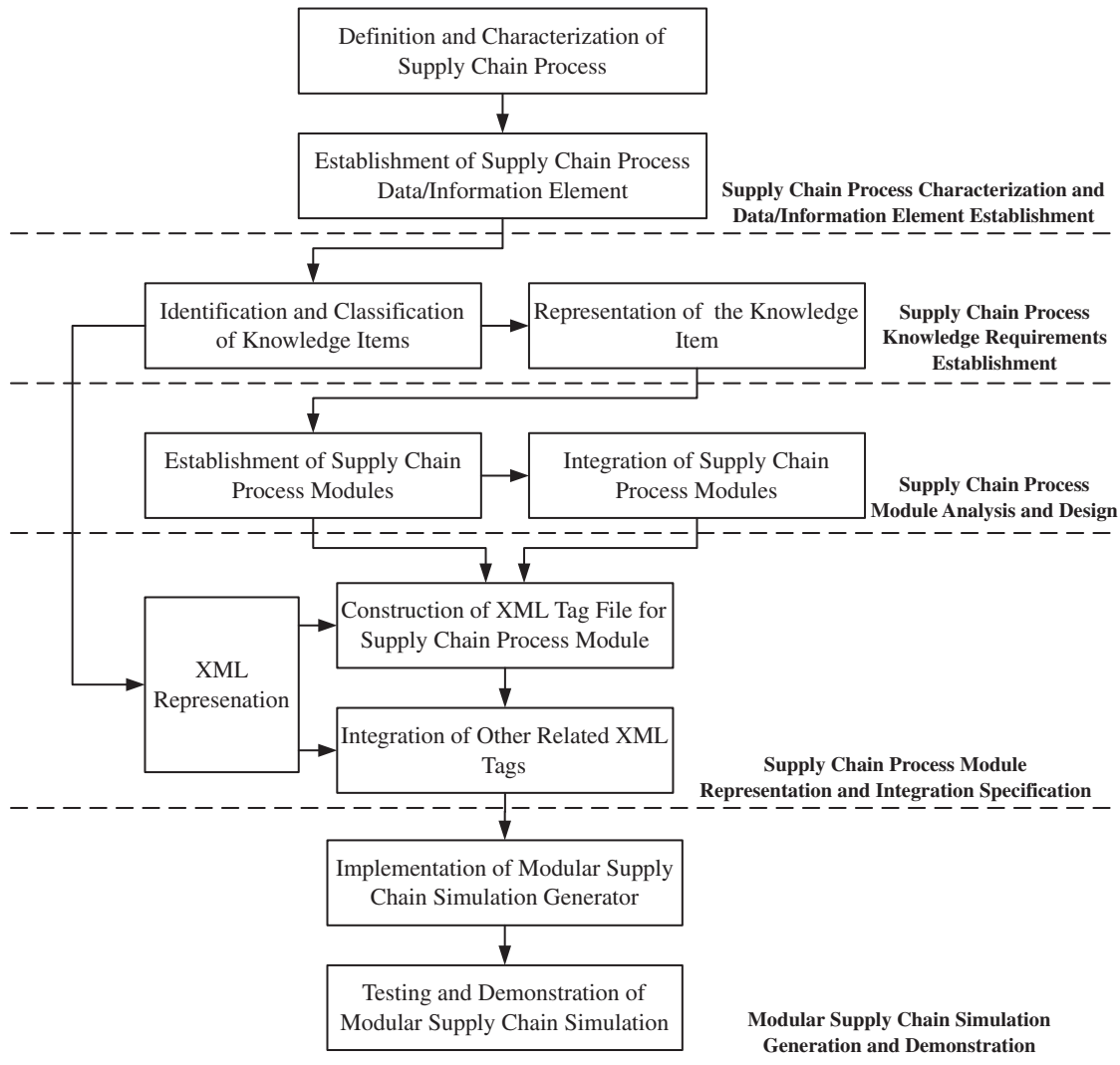


Fig. 1. Overview of the proposed approach.

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