

COLLABORATIVE SUPPLY CHAIN MANAGEMENT USING MULTI-AGENT APPROACH

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Dedication

I dedicate this thesis to my family and friends. A special feeling of gratefulness for my loving wife, daughter and parents because their word of encouragement and push for immense achievement. I will always appreciate all they have done and their valuable thoughts. I dedicate this work and give many thanks to people at SLIDA for their help and especially for the library staff.



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Abstract

Supply chain management (SCM) manifests an inherently complex system. It involves a large number of distributed and interconnected entities which are far from the sequential execution while facing so much of uncertainty within the operational environment. The complexity in a supply chain management exercise to profit loss, customer dissatisfaction and sustainability of the business. Due to inherent complexity, in particular, dynamic nature of supply chain management, the traditional software technologies such as databases and web technology cannot be effectively used to model supply chain management. However, a large body of literature on research in a Multi Agent System technology (MAS) has demonstrated how the complex systems can be modeled to exploit the complexity as an opportunity to devise smart solutions which could not be achieved otherwise.

A research has been conducted to design and development of a MAS for the domain of SCM. A multi-agent solution for SCM primarily envisages the implementation of effective collaborations among the stakeholders within the process of supply chain domain. In this solution, each phase in the supply chain has been developed as an agent enabling communication, coordination and negotiation among the agents to achieve intended business goals. Our solution presents a decentralized, collaborative planning, architecture and agents are attached to different containers of the system. The identified stakeholders of a MAS solution for supply chain management include raw material supplier agents, manufacturer agents, transport agents, warehouse agents, retail supplier agents and customer agents. These agents activate when applicable and disappear from the deliberation if the interaction is counterproductive. This system has been tested using real world data, simulations and customer behaviors against agent response. Our solution has demonstrated the essential features of a MAS including, communication, coordination, negotiation, butterfly effect, emergent feature and evolveability. This system has elegantly demonstrated how initially active agents fail in the deliberation, and the final deal has gone to an agent who joined the deliberation in the latter part of the process. The final output of the system has achieved 80% of successes, in effective collaboration and agent interaction for delivering a smart solution.

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