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Modeling a Leagility Index for Supply Chain Sustenance

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Abstract

For a sustainable Leagile Supply chain it is important to measure and optimize the leagility. Governance of leagility sustenance needs the supply chain performance to be measured and optimized through a means termed by us as 'Leagility Index'. The paper details the modelling approach for calculating leagility index. The calculation is proposed using conjoint analysis. The sustenance model further optimizes the supply chain using Simulated Annealing (SA) using a practical process adoption scheme. The index acts as a guide for sustenance model of supply chain.

1. Introduction

The 21st Century Enterprises needs to be lean while being agile (leagile) [1]. Leagility has mostly been stressed from a decoupling point perspective in research by both academicians and practitioners alike [2,3,4,5]. There has been researches conducted in the past to measure the leanness or agility of the supply chain through some indexes like [6,7] process of conjoining them through a mathematical approach which can act as a foundation to further

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optimize the supply chain. In our endeavor we incorporated a performance index identifying a sustenance model. A mathematical approach to the lean-agile interaction has been proposed helping supply chain managers to simulate the reality and to initiate decision. The paper studies the lean-agile interactions and proposes a sustenance model of leagile supply chain. Then a framework is proposed for leagility quantification using interaction measurement through 'Leagility Index'. Later the optimization of the Index through simulated annealing is proposed.

2. Lean Agile Interactions

Lean is not only about understanding customer and bringing value but also is a bundle of tools and practices which reduces cost and improves quality. Agility is defined as an ability to adapt to unpredicted changes in the external environment. Leanness and Agility have many overlapping features and hardly exist in isolation. Based on experience and numerous research publications it is argued that leanness and agility has overall a synergistic effect on supply chain. Following are the synergies of leanness and agility on business goals which can be drawn:

- Customer enrichment (Agileness) is achieved by value identification in products (Leanness).
- Enhanced competitiveness (Agileness) is gained by refining flow of material and information (Leanness)
- Systematic planning (Agileness) is enhanced by performing the operation when required (Leanness)
- Communications across the organization and departments (leanness) is enhanced by adopting IT and Technology (Agileness).
- Suitable utilization of skill (leanness) is an approach to leverage people and information (Agileness).

These handful of similarities as referred above makes it clear that different lean and agile processes have similar impacts on business goals and can be presented as mathematical models. In order to be sustainably leagile (leagility being a continuous process), supply chain not only need to focus on cost reduction, profit improvement and cash flow but also on effective and efficient business processes and better return on investments. These are termed by authors as 'Drivers of Leagility'. These drivers of leagility are influenced, powered and driven by various lean principles and agile practices. These lean principles and agile processes bundled together become the building blocks of leagility process, and the authors termed these processes as the 'Cells of Leagility'. Authors developed a Lean-Agile Interaction model in a leagile supply chain based on the Drivers and Cells of Leagility as shown in Fig.1.
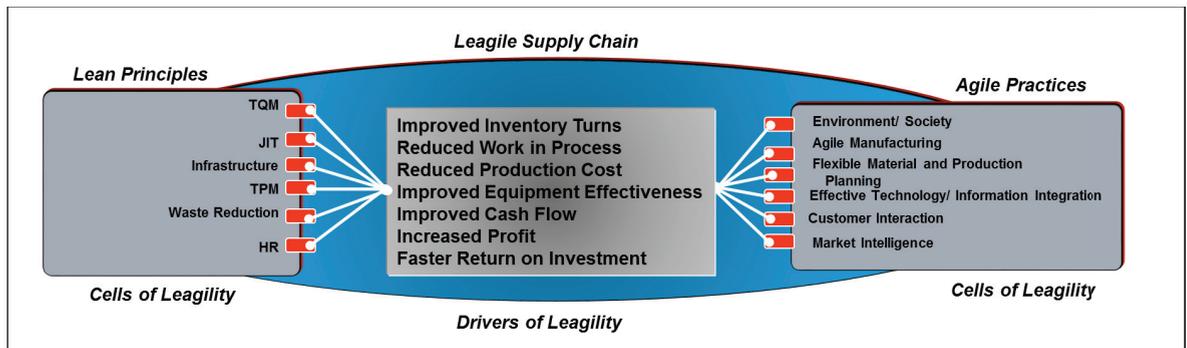

Fig. 1. Lean Agile interaction in a leagile supply chain

The Drivers and cells of leagility as presented in Fig.1 provided the necessary background to construct table 1. Table. 1, was prepared and supplemented with the list of lean and agile bundles (Cells of Leagility) along with individual processes. The current research has considered 11 cells of leagility and 32 individual processes as shown in table. 1. We also assigned weights to individual processes based on their frequencies of adoptions in industry. These cells of leagility are considered as process bundles with each representing a specific lean or agile function. In each of these bundles the sum of weightage is unity (1) with equal weightages to its individual processes unless there is a considerable difference in the frequency of adoption in business as per inputs received from the practitioners. To quantitatively evaluate the supply chain performance from a leagile perspective authors propose '*Leagility Index*' *(LI)*. This index is determined by measuring interactions between multiple cells of leagility and