Abstract

Supply Chain Management is drawing considerable attention to achieve excellence in manufacturing and services. It is more challenging for a global supply chains to be socially responsible. The regulation bodies and market leaders play important role to maintain ethics, sustainability, and community interaction. Inspite of what is often stated as the notion of relationships in supply chain, in reality it has a biased benefit to dominating members. On the contrary, leadership is supportive to value creation in a supply chain. This dilemma is a critical issue in strategic management of supply chains.

This study revisited the theories of supplier-buyer relation and found strong justification to consider power as an inherent property of supply chain relations. Therefore it aims at studying the effect of dominating power on strategic management of supply chains. The extensive literature review revealed a gap between success stories versus ground reality of supplier-buyer relation in supply chains. The results of review were useful to have a holistic view of supply chain research. The research gaps raise an objective to develop a model to capture effect of dominating power on strategic management of supply chains. It was further divided into sub-objectives to develop metrics of power including methodology to measure them, a framework for supplier segmentation based on power in supplier-buyer relation, and to link procurement decision power-influence in a supply chain.

This research contributes to four major aspects- integrating knowledge domains, theory building, method development, and policy making. We have reviewed a wide range of literature from cross functional domains to present a holistic view of ecosystem of the research on “power”. Approximately 11000 articles covering time period from 1934 to 2013 are reviewed systematically to achieve such understanding.

We have developed theories to contribute to the related research on power. We have proposed the definition of power for an network like supply chain, the metrics to measure power (e.g. Total power, Relative power, Agile Vulnerable-Link (AV-Link), Relative Power Index (RPI), Dominating Power, Leadership, Weighted Sum (WS), Sum of Weighted Sum (SWS), and Normalized power). A power based Supplier Segmentation Ontology has also been proposed towards the theories of risk management in supply chain. We have extended the study to explore the role of power in sourcing and revenue management. It is a step to bring in the concept of power based decision making to the operation level.

We have developed two methods to measure different metrics of power named Power Stream
Mapping and Fuzzy-Power Stream Mapping. Power Stream Mapping relates power with revenue. This method can be used when all supply chain members are highly cooperative and share true information regarding revenue. But, Fuzzy-Power Stream Mapping is proposed to measure power in terms of different relational aspects which is independent of the critical information like revenue. Several metrics like RPI, WS, SWS, and Normalized power can be measured using Fuzzy-Power Stream Mapping.

We have developed a method to personalize the relation with the members having different level of power in a supply chain. To execute this method we need a Supplier Segmentation Ontology to organize the supplier base according to the power. A Dynamic Supplier Segmentation Framework (DSSF) has also been developed to infer power of a member from a set of secondary source of knowledge (e.g. news articles published over the Internet). It enhances the quality of the recommendation.

This research has contributed to the different levels of policy making. The measures of power developed here has a capability to capture dominating power in a vertical as well as a horizontal competition. It helps to trace monopoly behavior among market competitors as well as vertically integrated organizations. Fuzzy Power Stream Mapping gives an overall picture of distribution of power in a network which helps to design Socially Responsible Supply Chain. The methods proposed here can also helps to identify leader(s) in a supply chain who can create value in the chain. We have explored the importance of considering power as a property of network in strategy planning as well as operations like procurement decision making. This research shows how power distribution affects vulnerability and profitability of a supply chain. The policies are set up to select supplier, manage relation with them, even allocating orders requires an analysis of power along with well-established parameters. Supplier segmentation based on power helps to find risk from the supply-side. Allocating order and sharing revenue on the basis of power reveals a new dimension of analysis.

Moreover, a balanced supply chain in terms of power is desired to put supply chain philosophy into practice with a really win-win situation for all. This research has contributed in putting supply chain philosophy to practice for benefit of all members.

The following are the publications based on the work in this thesis:


• Kundu A., Jain V. Dynamic supplier segmentation framework: An analytics approach. (Working paper)

• Kundu A., Jain V. Power Stream Mapping for Supply Chain Modeling and Analysis, in the proceedings of International Conference on Advances in Supply Chain and Manufacturing Management (ASCMM 2011), Indian Institute of Technology Kharagpur, India, December 16-18, (2011)

• Kundu A., Jain V. Fuzzy Power Stream Mapping to measure dominating power in Supply Chain, in the proceedings of The IEEE International Conference on Industrial Engineering and Engineering Management (2012), Hong Kong, December 10-13,(2012)