



Linking procurement operations to power-influence in a supply chain



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ABSTRACT

This paper examines procurement dynamics when there is a power imbalance between a supplier and a buyer. The importance of considering relative power when sharing profit with suppliers is investigated. We also compare this power-based profit sharing with the benefit of a quantity discount on bulk purchases. The underlying micro-model is the classical single-period (Newsvendor) problem. Our objective is to maximize the benefit from a procurement operation in a two-stage single product N -supplier supply chain. This paper develops a relationship matrix for supply chain relations under different levels of power between supplier-manufacturer and then proposes the use of Power Stream Mapping (PSM) to quantify power of the supply chain players. An indicator named Agile Vulnerable (AV) link is developed to identify the weakest relation in the supply chain due to power asymmetry. The proposed model is illustrated with an example taken from the consumer electronics market.

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1. Introduction

The open market policy influenced the paradigm shift in procurement and sourcing operations. Supply chain collaboration emerged to respond to this change [1]. The development of global thinking in industry and improvement of information visibility are becoming critical success factors for procurement [2]. The processes to assemble and analyze information are becoming more supportive to production and operations management [3–9]. Bhargava and Chen [10] have presented an exclusive study on when sharing information is actually good for overall benefit and how it should be mechanized. Although, we are aware of the importance of supply chain coordination [11], the power-asymmetry between supply chain players still occurs. Maloni and Benton [12] addressed the urge to include the issue of power in any research of supply chain partnerships. Benton and Maloni [13] have also presented the influence of a power driven relationship on satisfaction in supply

chain. Lee et al. [14] present methodology for supplier selection and management based on the supplier–buyer relationship. It is found that under a linear demand curve group buying is always preferable for symmetric (i.e., identical) retailers but it is beneficial to the smaller (or less efficient) when there is an asymmetry in market base and/or efficiency of retailers [15]. They have also presented the buyer's perspective where retailers are competing with each other in different dimensions.

One can find an example of power influence in the UK fresh food chain [16]. Retailers are the powerful players in this sector. They have a direct link with the customer. Retailers are developing partnerships with suppliers for a price advantage. But, in this partnership the retailer dominates the supplier. The supplier–retailer relationship is shifting from a multi-channel mode of business to a dedicated single channel mode. This power imbalance is not new to the supplier. Still, rather than emulating this kind of relationship, suppliers in this example are trying to manage the situation.

The procurement dilemma for Apple to buy flash memory is another example of the power difference in supplier–buyer relation [17]. In this case, in late 2004, when advanced flash memories were not yet introduced in the market, the cost of flash memory had a significant effect on product price for the Apple iPod. Hence, it was an important decision for Apple to reduce the procurement cost of flash memories. Apple had to choose one of two possible

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sources. One choice was Intel, a big player in the semiconductor chip market. The other was Sigma Tel, a relatively small supplier compared to Intel. For Apple it was a challenge to select either the trusted big supplier with less favorable contract or select a lesser known supplier with more flexible contract, but having certain risks of supply. Intel was also facing competition from Sigma Tel. On the contrary, it was a great opportunity for Sigma Tel to build its reputation by working with a big manufacturer like Apple. Usually, the big supplier has many customers from the same business segment. It enables the supplier to dominate the supplier–manufacturer relation. But, it is just reversed in the case of small suppliers like Sigma Tel. A manufacturer like Apple contributes a major portion of the business for a small supplier. It gets dominating power over the small supplier. This dynamics creates a power difference in the supplier–manufacturer relation. Due to this power difference a dominating player dictates the chain. This behavior of the dominating player discourages collaborative efforts made by other players in the supply chain.

In this paper, we present a model to interface procurement operations with the dominating power of the supply chain players. We consider that the suppliers may switch from one manufacturer to another for a better benefit, whereas, the competing manufacturer will try to reduce the overall procurement cost. There is less hope to dictate price when dealing with a large supplier. However, the existence of a small supplier increases competition between suppliers. The manufacturer gets the benefit of this competition. We focus on the problem of manufacturer to allocate demand between competing suppliers at different stages of supply chain.

The information about the competitor's production cost or procurement cost is important for the negotiation process in a supply chain. In the present scenario, the Internet helps to get market price and availability of standard components. One can fairly predict an alternative source of standard components for its competitor. For example, there are a limited number of suppliers for smart phone display screens. Smart phone manufacturers are procuring display screens from the same supplier in most cases. The price of this component is standard. Consequently, the suppliers have few chances to make a price difference. In the reverse situation, some suppliers are big and some of them are small. The big supplier participates in different supply chains. It commands the price of the components. The small business supplier is dedicated to a particular OEM. The small supplier has less voice over component price. In this case the suppliers are in a non-collaborative business relation. They hardly share their production or sales information with each other. The OEM is in an advantageous position for this imbalanced competition in the supply side.

The rest of this paper is structured in six major sections. The research background is presented in Section 2. The system model is presented in Section 3. There are four different cases presented in Section 3 and its subsections. Mathematical formulation for four different cases offering initial setup for industry example is presented in Section 4. An illustrative industry example is presented in Section 5. This section includes the discussion and the managerial insights derived from the proposed model in various subsections. Section 6 outlines implications of the proposed model in practice. Finally, the paper concludes in Section 7.

2. Research background

We place this research at the confluence of four streams of literature. The first originates from the classical study of dominating power in social sciences. The second one is a study of dominating behavior of supply chain players in different supply chain operations. The third is based on the procurement problem in production

dynamics. The last is concerned with the issue of information sharing in supply chain competition.

The first stream of literature is based on the work of well-known researchers on dominating power in philosophy, political science, social psychology, and economics. The dominating power was delineated by Russel [18] as “capability of achieving own interest”. Wrong [19] made that more lucid by considering power as capability “to produce intended and foreseen effects on others”. Bacharach and Lawler [20] described power as “necessarily a vague, poorly defined primitive term that serves best merely to sensitize us to aspects of the bargaining process that might otherwise go unremarked. . .”. From a psychological insight power is defined as the ability to modify the behavior of others regardless of individual or group [21–23]. It is “the probability, in a social relationship, to impose one's own will, even against resistance, regardless of the basis on which this probability rests” from the perspective of social aspects [24]. Bierstedt [25] compared power as potential to influence.

The commonly cited definition of power in political science is “the ability of one individual or group to get another unit to do something that it would not otherwise have done” given by Dahl [26]. Lasswell and Kaplan [27] studied how to achieve power. The study of economics outlined the discussion of power to the inter-firm interactions and decision-making processes accepting the same concept of the ability to influence [28].

The power distinguished from dominating ability in network science by way of defining the powerful actor as the one who has the ability to enroll, convince, and enlist others into the network as a representative rather than just hold power [29].

Management Science is more focused on power related to the goal-oriented ability to manage the workforce, material and information in business processes [23]. The researchers of a marketing channel focused on firm's interdependence and ability to control decision parameters of marketing strategies of others towards own interest in different level of inter-firm integration [30]. French and Raven [31] gave the succinct classification of power based on its grounds.

The second stream of literature research on dominating power in supply chain, is rather new with respect to other fields. Maloni and Benton [12] pioneered in this research. The essence of power-asymmetry in supply chain was brought to light in their research. They took as their example the U.S. automobile sector to show power asymmetry effects on supply chain performance. Moreover, power sources were mapped (positively or negatively) with performance of the supply chain. Usually, a dyadic relationship is favored for research in this field [32]. These are mostly empirical studies. Li et al. [33] have identified the main sources of uncertainty for the dominant players' behavior. A special economic environment was simulated with the help of a multi-agent simulation model. In this model players have the option to maintain stable profits in spite of decreasing the selling price. They proposed an indicator named ‘Stable Profit Platform’ to measure the level of domination power for each supply chain player.

The influence of the powerful suppliers is also significant at the product development phase [34]. The awareness of companies' self-powers and its supplier power is important for a fair deal. In addition to this, selecting suppliers with less influencing power can potentially facilitate reductions in cost, time and risk. Zolghadri et al. [34] have proposed a supplier selection process based on the dominating power of suppliers. Nair et al. [35] studied the cooperative concept for buyer–supplier relation. In a cooperative concept, a player competes in some activities although the player may cooperate with the other for another activity. They have established a relationship between bargaining power and dynamic capacity building. The Game theoretic approach shows the shifting of a capacity building operation towards the buyer when that buyer

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