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A Study of How Distributors Provide Postponement Services in the Supply Chain

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The purpose of this paper is to study the distributor's role in the supply chain. Some studies of supply chain management (SCM) concentrate on how to create a responsive chain that links the manufacturer directly with the retailer to deal with volatile demand. However, we discuss the role of the distributor who acts as an intermediary between the manufacturer and the retailer. This kind of distributor should act as a push and pull boundary (also called a decoupling point) in the supply chain. The definition of "decoupling point" must be refined when the concept of the push and pull boundary is applied to a specific industry, such as the electronics industry, due to the fact that several decoupling points along a supply chain are possible. The distributor, as a push and pull boundary, must manage any overstocking risk pooled from upstream parties due to economies of scale in the production process. On the other hand, the distributor needs to provide a rapid delivery service in small order quantities and satisfy the high availability requirements of its downstream parties. In a case study, a company (a distributor of electronics components) is used to examine how distributors provide postponement services in the supply chain to alleviate overstocking risk and to achieve the high availability requirements.

Field of Research: Supply Chain Management, Postponement, Distributor

1. Introduction

We have found that most SCM research puts the emphasis on responding to customer demand using a strategy that is responsive to intelligence on frontline demand (also called real demand), such as Dell's virtual integration model (Magretta, 1998), Zara's quick response model (Christopher et al, 2004) and the vendor managed inventory system designed by Procter and Gamble and Wal-Mart (Waller et al, 1999). Actually, the prime goal of these practices is to meet customer demand without sacrificing on inventory costs (Ketzenberg et al, 2000), to shorten lead time (Pagh & Cooper, 1998), and to alleviate the bullwhip effect (Lee et al, 1997). Consequently, how to improve manufacturer-retailer relationships has become a hot topic since Kumar (1996).

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It seems that collaboration between manufacturer and retailer is the vital to managing demand uncertainty and improving supply chain performance. However, what is the role of the distributor in the supply chain? Is it solely to multiply the bullwhip effect and hinder the transmission of real demand information? Does the distributor make any positive contributions to the supply chain? We use this paper to study the various roles of the distributor in the supply chain and to explore its positive contributions. A company (a distributor of electronics components) is used as a case study to illustrate the values and functions of the distributor in the supply chain and those of its upstream and downstream supply chain parties.

2. The Push-Pull Boundary And The Decoupling Point

Stock sometimes has to be held owing to the nature of the business in question. A typical example in the electronics industry is that silicon and germanium, which are used in semiconductor manufacturing, have to be produced in their most economical batch quantities. It would not be economically feasible to reduce and/or tailor the production batch quantity to fit downstream demand in small order sizes. Therefore, the location of stock held becomes a strategic decision and absolutely critical to the success of this type of supply chain. In the case of the electronics industry, the distributor naturally becomes the location of stock held and therefore acts as the push-pull boundary where the process is expected to change from a large quantity process to small batch flow. That is, the push-pull boundary separates the part of the supply chain that responds directly to the customer from the part of the supply chain that uses strategic stock as a buffer against variability in demand in the supply chain. Downstream from the push-pull boundary, all products are pulled by the customer; that is, they are market-driven, while upstream from the push-pull boundary the supply chain is forecast-driven.

On the downside of the push-pull boundary is highly variable demand with a large variety of products, and upstream from the push-pull boundary demand is smoothed, with variety reduced. This indicates that the point of supply chain differentiation is at the push-pull boundary, and stock held at that boundary plays a strategic role by acting as a buffer between variable demand and a level production schedule. In other words, the push-pull boundary is the point at which strategic stock is often held as a buffer between fluctuating customer orders (and/or product variety) and smooth production output. From the above observations, a straightforward concept has been developed for the meaning of push-pull boundary. In fact, the similar concept of a ‘decoupling point’ is discussed by Hoekstra and Romme (1992). The decoupling point has three functions.

Function 1: It separates the 'part of the organization oriented towards customer orders from the part of the organization based on planning'.

Function 2: It separates the customer-order part of the activities from the activities that are based on forecasting and planning. The customer order penetrates as far as the decoupling point, and from there the goods ordered are supplied to the customer.

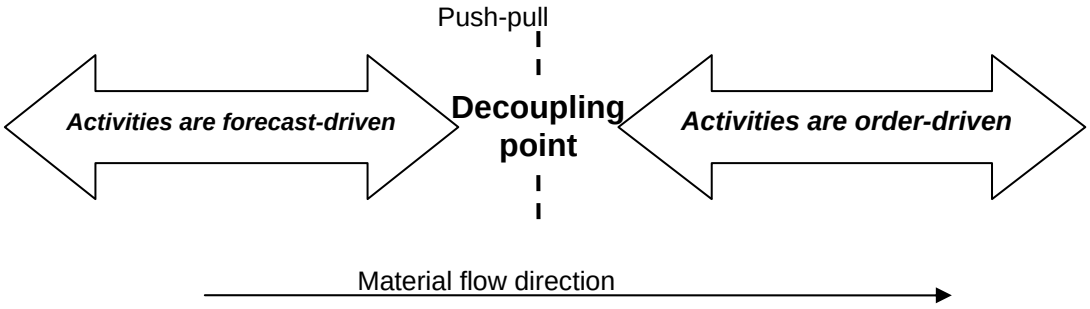
Function 3: It coincides with a main stock point while downstream from it there are no stocks.

The main stock point for **Function 3** is the "strategy" inventory point as discussed by Christopher and Towill (2001). Hence, **Function 3** is modified to **Function 3*** shown below.

Function 3*: It coincides with a main "strategy" stock point while downstream from it there are no "strategy" stocks.

Therefore, upstream from the decoupling point is where the push strategy is used and activities are based on *forecast-driven* planning. This is the "push" area of the push-pull boundary. By contrast, downstream from the decoupling point is where the "pull" strategy is used and activities are *order-driven*. The decoupling point is the last major strategic stock point. Figure 1 shows the concept of the decoupling point.

Figure 1. The concept of the decoupling point



3. The Industry And The Case Study Company

To gain a better understanding of the role of the distributor in the supply chain, we chose the electronics industry in Hong Kong, as it faces problems of volatility in demand, short product life cycle and fluctuations in supply prices. In practice, the success of Hong Kong's electronics companies relies to a large extent on quickly responding to customers' needs by monitoring product trends. Thus, a proper supply chain strategy should be a responsive one, which might raise a question of whether or not to bypass the distributor to achieve quick response times. However, the fact is that Hong Kong (and the Pearl River Delta) is an important trading hub for electronic parts and components in the Asia-Pacific region. Apart from Chinese products, many items from Japan,

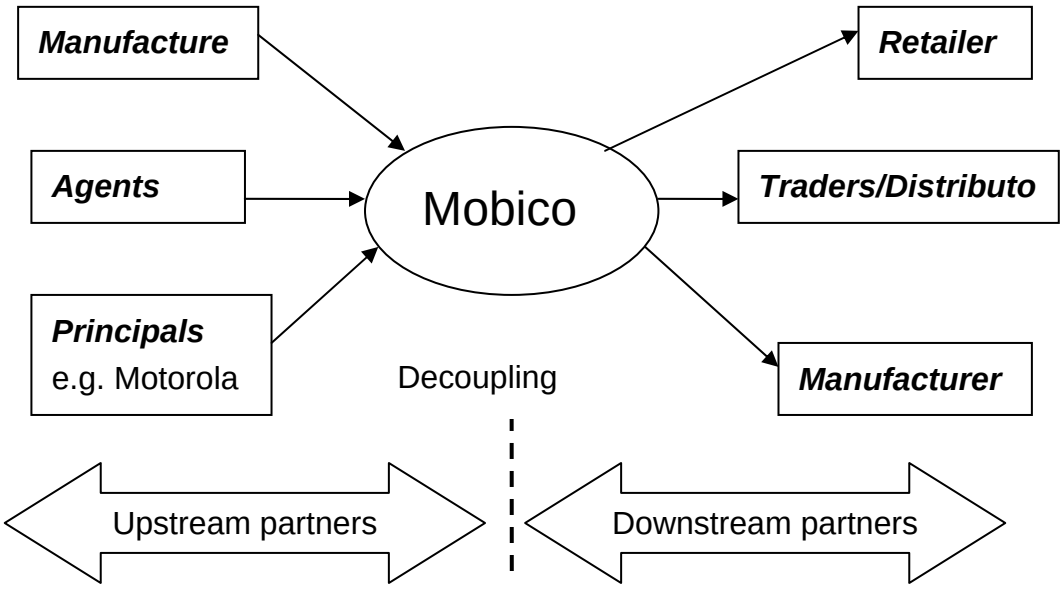
Taiwan, the US and South Korea are re-exported by distributors via Hong Kong. According to a study carried out by the Hong Kong Trade and Development Council (HKTDC, 2006), the electronics industry accounted for 48% of total exports in 2005, the largest single category. The fact that there are so many distributors in such an industry makes it a great topic for us to research and generate knowledge beneficial both to the industry and to academia.

The Pearl River Delta is crowded with manufacturing plants. They come from different industries such as electronics, toys, watches, etc. Most of them need some electronics components to fabricate their products, such as electronic toys, digital watches and consumer electronics. As China becomes the world's factory, the Pearl River Delta is turning into one of the main manufacturing areas in China. This situation results in the centralization of industries in one main area and creates a demand for electronics distributors to redistribute electronics components so as to satisfy the differing needs of different industries. Thus, Hong Kong, because of its location advantage, becomes the electronics distribution center supporting not only the whole Pearl River Delta, but also the rest of Asia.

The case study distributor: a distributor in the Pearl River Delta

We chose an electronics distributor, Mobicon Group Limited, on which to conduct a case study (Ellram, 1996) because Mobicon is the first distributor listed in Hong Kong stock market. Figure 2 is an illustration of the relationship between Mobicon and its immediate upstream and downstream partners. Mobicon's upstream suppliers are comprised of ***Manufacturers*** and ***Principals*** (like Motorola and National Semiconductor), and some of the Principals' ***Agent***s. On the downstream side, its customers consist of ***Retailers***, ***Traders/Distributors***, and ***Manufacturers***. The relationships among them are quite complicated. For instance, it is clear that the Mobicon's upstream suppliers are major IC component manufacturers who gain most of the benefits from a push strategy. On the other hand, its downstream parties are influenced by demand pull because they are closer to the consumers responsible for producing volatile demand. Consequently, Mobicon is the main risk pooling point supporting the downstream retailers, distributors and manufacturers. However, this is not the end of the supply chain because the downstream distributors also supply manufacturers further downstream.

Figure 2. The upstream and downstream partners of Mobicon



The role played by Mobicon as a distributor in the supply chain is to resolve the conflicting demands of its upstream and downstream partners. This is because on the one hand, its suppliers would like to benefit from economies of scale derived from a push strategy that requires large order sizes and long lead times (normally longer than 4 weeks), while its customers seek flexibility enabling them to face uncertain demand, favoring comparatively small order sizes but shorter lead times (normally shorter than 2 weeks).

4. The Decoupling Points And The Case Study Distributor

The concept of a decoupling point is based mainly on an organization that can itself both manufacture products and deliver them to its customers. The idea is simple and straightforward within a single organization. However, if the concept is applied to an industry like the Hong Kong electronics industry, the decoupling point concept is not that simple to apply. For example, Mobicon demonstrates only the first two functions of the concept of the decoupling point as defined by Hoekstra and Romme (1992). That is, Mobicon could be a decoupling point that separates (1) the 'part of the organization oriented towards customer orders from the part of the organization based on planning', and (2) separates the customer order part of the activities from the activities that are based on forecasting and planning. The customer order penetrates as far as the decoupling point, and from there the goods ordered are supplied to the customer. It should be a point that coincides with a main "strategy" stock point, but the downstream still has "strategy" stocks.

This is because the downstream of Mobicon is composed of different players. Obviously, in the case of a retailer, there may be no "strategy" stock. That is,

Mobicon cannot achieve **Function 3*** as a decoupling point in a supply chain. However, for the downstream distributors and manufacturers, there should be "strategy" stock at a much lower level since it is already 'buffered' by Mobicon. This is due to the fact that Mobicon's distributors also sell products to manufacturers further downstream. Furthermore, Mobicon not only sells products to manufacturers but these manufacturers also have their own distributors to deliver their own products. Consequently, it is not easy to apply the concept of a decoupling point as defined by Hoekstra and Romme (1992) to an industry because there may be more than one decoupling point for "push" upstream activities and "pull" downstream activities along the supply chain. In fact, it can be observed that the supply chain's risk can be diluted from different decoupling points. This also enables the customer order to penetrate into a deeper side of the supply chain from downstream decoupling points to upstream decoupling points. Hoekstra and Romme (1992) defined five different positions of decoupling points to describe all possible product-market situations in the control concept for an organization. As we are studying a distributor in an industrial supply chain, we modify these five decoupling points for the industry as follows.

Decoupling Point 1 (DP 1) 'Make and ship to stock'. Products are manufactured and distributed to stock points which are spread out and located close to the retailers.

Decoupling Point 2 (DP 2) 'Available to stock' (central stock). End products are held in stock at the end of the production process of the upstream manufacturers and from there are sent directly to many retailers who are scattered geographically.

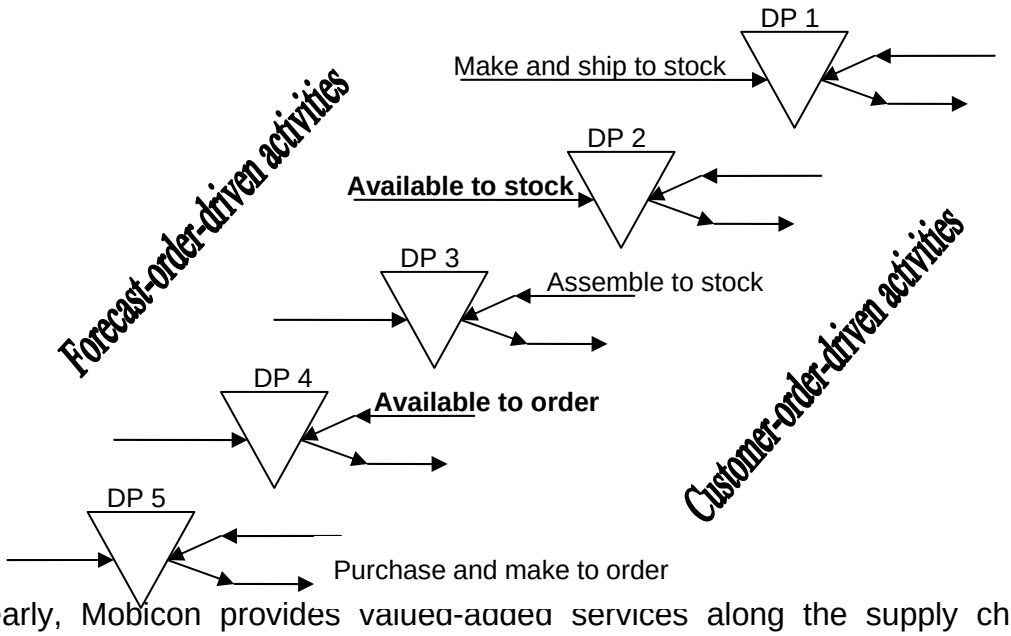
Decoupling point 3 (DP 3) 'Assemble to order' (assembly for some specific manufacturers). Only system elements or subsystems are held in stock in the distributor's centers, and the final assembly takes place on the basis of a specific manufacturer order as a value-added process for the manufacturers.

Decoupling point 4 (DP 4) 'Available to order'. Only raw materials and components are kept in stock: each order for a customer, such as another distributor, is a specific project.

Decoupling point 5 (DP 5) 'Purchase and make to order'. No stocks are kept at all: purchasing takes place on the basis of the specific customer order; furthermore, the whole project is carried out for one specific customer.

Note that **DP 1** and **DP 5** do not need to be changed because they represent manufacturers and retailers respectively. The above decoupling points are shown in Figure 3 to describe the service functions in different situations.

Figure 3: Decoupling points and functions of distributors in a supply chain



Clearly, Mobicon provides valued-added services along the supply chain: "Available to stock" at **DP 2**, "Assemble to stock" at **DP 3**, and "Available to order" at **DP 4.** Because companies upstream of Mobicon push a lot of risk towards it (the decoupling points), Mobicon must dilute that risk into downstream activities to minimize risk for the entire chain. Moreover, the concept of no "strategy" stock after the decoupling point cannot be applied to the downstream of Mobicon, since there should be more than one decoupling point downstream. The supply chain practice that Mobicon uses to achieve "no strategy stock downstream" is the concept of postponement.

5. Postponement – How Mobicon Serves The Electronics Supply Chain

Bucklin (1965) proposed that such product differentiation can be classified into three types: time, place, and form. Based on these three types of postponement, we discuss how Mobicon, as a distributor, serves the electronics supply chain as follows.

'Time' delays activities until orders are received. Mobicon is at the point where its upstream prepares a buffer of inventory while capturing downstream demand signals from customer orders. This postponement allows mass customization of customer orders, which facilitates all the flows in the total chain that balance long lead times and rapid responses to orders. In fact, this is the function of **DP 4** referred to in the previous section. Mobicon acts as the distribution point and keeps components in stock to serve the different downstream players, such as manufacturers. This delay in activities enables the supply chain to capture real demand easily so as to eliminate the

inaccuracy of demand forecasts. Activities are order-driven so that obsolescence is minimized.

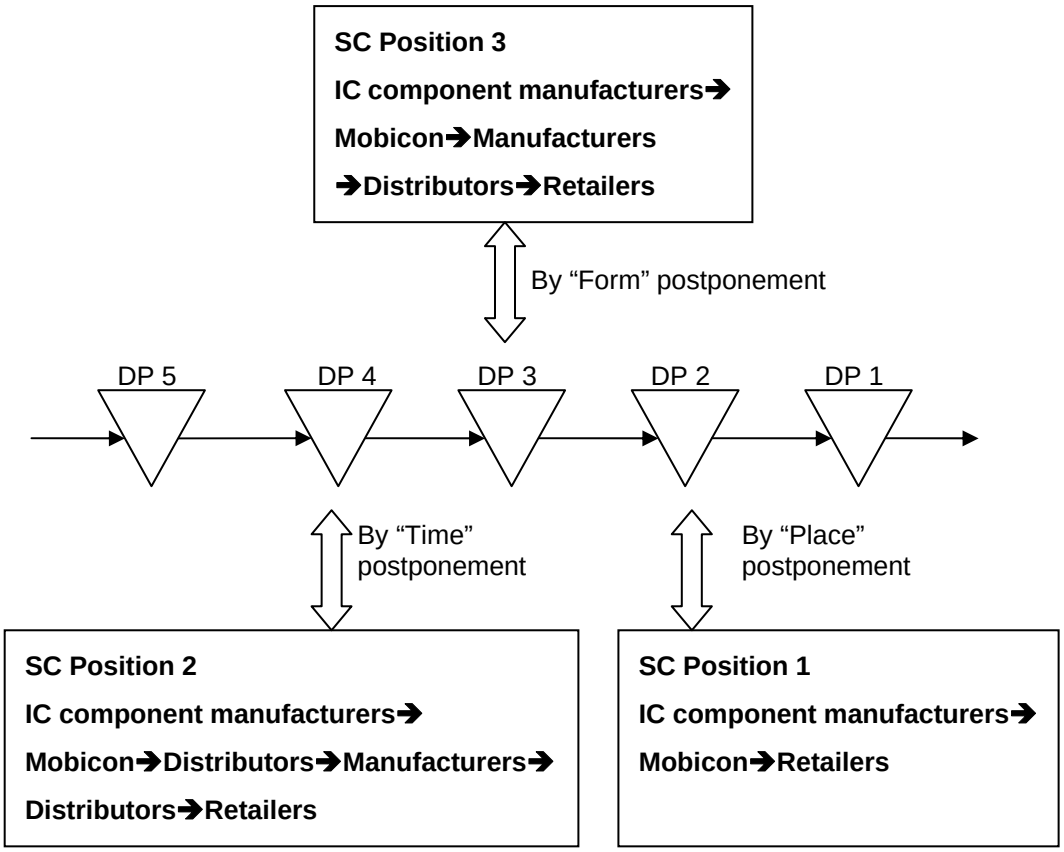
'Place' delays the movement of goods or services until orders are received. Due to the location of properties in the area around the Pearl River Delta (full of manufacturing plants), the role of Mobicon is to ensure the flexibility of the whole chain where inventory is pooled at a single point, like a trading hub. In fact, this is the function of DP 2. Mobicon acts as a central stock point serving different downstream players, such as retailers and OEM. The risk of obsolescence is pooled at this DP 2. That is, Mobicon serves the supply chain by continuously trading off between availability for delivery and throughput time. In this way, it is a balance between losing orders because of the non-fulfillment of delivery obligations and having to invest a lot of money in stock.

'Form' delays activities that determine the final form of a product until demand is known. This is a critical strategic function that Mobicon provides to the supply chain. The mass production of semiconductors is carried out in the standard and programmable form while the latter stages of product differentiation, such as programming, is carried out by Mobicon to ensure that the full benefits of mass production upstream and customization are exploited. This is the function of **DP 3** as demonstrated by Mobicon only proceeding with final assembly on the basis of a specific order. Mobicon has to serve downstream manufacturers from different industries, which may have differing product requirements. Therefore, components in semi-finished form are stored at Mobicon, awaiting final assembly according to the differing requirements of various manufacturers.

6. Discussion And Conclusion

With an understanding of its postponement practices, the Mobicon case study can be used to generalize the concept of decoupling points for an industry such as the Hong Kong electronics industry in the Pearl River Delta area. In this case, a distributor can act as a decoupling point to form a push-pull boundary in the supply chain. The prime objective of this decoupling point is to pool all the risk from upstream parties at the decoupling point. The risk is then diluted for parties immediately downstream in the supply chain. In an industry like the Hong Kong electronics industry, it is common to have several similar decoupling points, as in the case of Mobicon. Figure 4 shows the different possible service positions of Mobicon in the supply chain with an indication of the use of postponement practices. Figure 4 also presents some possible examples of downstream parties in the supply chain in which we can see how Mobicon serves the whole supply chain in different service positions. For Service Position 1, the immediate downstream supply chain party is retailers. Correspondingly, we have distributors and manufacturers as the downstream parties for Service Positions 2 and 3 respectively. In addition, Figure 4 illustrates how the decoupling points are matched with the service positions of Mobicon by means of different forms of postponement.

Figure 4: Matching the decoupling points with the service positions of Mobicon in the supply chain



In short, the strategic position of Mobicon as a distributor in the electronics supply chain is to combine the benefits of push and pull by placing itself in the middle part of the chain. By supporting a push strategy, its upstream partners can minimize costs. In addition, by allowing a pull strategy downstream, its downstream parties can reduce overstocking risk without sacrificing customer service standards. In conclusion, this paper discusses the positive contributions of distributors to a supply chain in an industry. Distributors can improve the effectiveness and efficiency of the supply chain by moving the decoupling point further away from manufacturers and closer to downstream players.

We believe that we should not simply take the distributor away from supply chain studies to facilitate rapid response times and alleviate the bullwhip effect. We need to further and fully exploit the benefits of economies of scale and the flexibility to the supply chain provided by the distributor. To achieve this, we need to study in more detail how the distributor strategically acts as an efficient decoupling point (push-pull boundary). Empirically, we can use three forms of postponement as the operational performance measurements of a distributor in a supply chain. The development of a corresponding measuring instrument may be one of our further research topics. Nevertheless, as this paper is based on one distributor in the electronics supply chain, the results cannot be generalized for all distributors or all industries. Further research should include more distributors and different industries.

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