

Design of Integrated Operation Process of Supply Chain Response to Market

DESIGN DU PROCESSUS D'OPERATION INTEGRAL DE LA CHAINE D'OFFRE REPOSE AU MARCHE

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Abstract: In a supply chain in which a manufacturer is the core enterprise, the manufacturer must take much attention to the speed of its response to a dynamic market, because product life-cycle is shortening and competition is fiercer. For the manufacturer, it is a powerful method to increase its supply chain's competence that constructing a supply chain which can respond to new market demand quickly and actively. This paper considers a whole process of supply chain response to new market demand would be from a new product R&D to delivering the final products to consumers. The process can be divided into three stages: product R&D, supply chain building, and supply chain operating. So, to increase the efficiency of response to new market demand, the manufacturer would consider how to integrate the three stages smoothly.

Key words: supply chain, response time, market demand, R&D

Résumé: Dans une chaîne d'offre dans laquelle un fabricant constitue l'entreprise clef, le fabricant doit prêter assez d'attention à la vitesse de sa réponse à un marché dynamique, parce que le cycle de vie du produit raccourcit alors que la compétition est de plus en plus féroce. Pour le fabricant, c'est une méthode puissante d'améliorer la compétence de sa chaîne d'offre de sorte à construire une chaîne d'offre qui est capable de répondre rapidement et activement à la demande du marché. L'article présent pense que le processus intrégré de la chaîne d'offre répondant à la nouvelle demande du marché devrait aller de R&D du produit à la délivrance du produit aux consommateurs. Ce processus peut être divisé en trois étapes : R&D du produit, établissement de la chaîne d'offre, opération de la chaîne d'offre. Ainsi, pour d'élever l'efficacité de la réponse à la nouvelle demande du marché, le fabricant pourrait considérer comment bien intégrer ces trois étapes.

Mots-Clés: chaîne d'offre, temps de réponse, demande du marché, R&D

1. INTRODUCTION

A manufacturer which is the core enterprise in its supply chain has to face more incertitude, because of product life-cycle being shortening, competition being fiercer, globalization and individualization. The manufacturer's supply chain must increase the efficiency of response to a dynamic market. The supply chain's response efficiency, especially the response speed, has been the most important factor which can evaluate the competence of a manufacturer's supply chain in today's era.

In the background, this paper thinks that the process of a supply chain's response to market should extend to market direction more; and a new product R&D and supply chain's necessary adjusting should be included into the process. A whole process that supply chain responds to a market change should be from researching a new product based on a new market demand to delivering the final product to consumers. The process can be divided into three phases: (1) researching and developing a new product; (2) adjusting or rebuilding supply chain for producing the new product; (3) operating and managing this new supply chain.

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2. SUPPLY CHAIN'S RESPONSE TIME TO MARKET

In the usual situation, a whole process that a supply chain responds to market demand is from manufacturer accepting orders to wholesaler delivering products to consumer. But when market demand changes more quickly, and product R&D and supply chain design are more important, we have to count R&D time and supply chain design time into total response time.

Suppose:

1st. A supply chain operates stably between its two changes. This means that we only consider the factors that induce the supply chain to change because of a new market demand. We don't consider other factors which can induce the supply chain's change, for example supply chain members changing, or a new technology or a new ideal being applied.

2nd. The supply chain is a single-chain supply chain: there are one supplier, one manufacturer and one wholesaler in the supply chain.

3rd. A whole supply chain operating cycle includes order processing cycle, supply sub-cycle, production sub-cycle and distribution sub-cycle.

Then, we can use formula ① to describe the time that a supply chain responds to market in one time.

$$t = t_{R\&D} + t_{CON} + (t_O + t_S + t_P + t_D) \quad \text{①}$$

t —total response time;

$t_{R\&D}$ —product R&D time;

t_{CON} —time of constructing supply chain;

t_O —order processing cycle time;

t_S —supply cycle time;

t_P —production cycle time;

t_D —distribution cycle time;

The numerical value of t is not same in the following four different conditions.

A. Supply chain can supply the market demand.

$$t_{R\&D} = 0; t_{CON} = 0; t = t_O + t_S + t_P + t_D.$$

B. There is only a quantity change in market. Then, the product doesn't need to change, and the supply chain is adjusted or re-built to deal with the change.

$$t_{R\&D} = 0; t_{CON} > 0;$$

$$t = t_{CON} + (t_O + t_S + t_P + t_D).$$

C. There is a new individual demand, but the supply chain doesn't need to be redesigned. For example, an automobile manufacturer changes car-body color to meet individual demand.

$$t_{R\&D} > 0; t_{CON} = 0; t = t_{R\&D} + (t_O + t_S + t_P + t_D).$$

D. There is a fire-new demand, and the supply chain need to be re-built.

$$t_{R\&D} > 0; t_{CON} > 0; t = t_{R\&D} + t_{CON} + (t_O + t_S + t_P + t_D). \quad \text{②}$$

So, let T be the total time between two changes.

$$T = t_{R\&D} + t_{CON} + \lambda$$

λ is the supply chain operation time between two changes.

$$\lambda = f(t_O, t_S, t_P, t_D)$$

The numerical value of λ is decided by the frequency of market change. The change is quicker, the numerical value is less; the change is slower, the numerical is bigger. When the change is quicker and quicker, λ will be $t_O + t_S + t_P + t_D$ at last.

In a more and more competitive situation, a manufacturer who can respond to a new market demand can obtain more competitive advantage. In the background, the speed of product R&D is more and more important to a manufacturer. This trend has been embodied in electronics industry, especially in chip industry. In the chip market, a much competitive situation asks manufacturers must finish new products R&D as quickly as possible with the lost cost. On another hand, because a new product wants an efficient supply chain to improve the ratio of performance to price, how to build a right supply chain to the new product is much important.

According to the above discuss, we can draw a conclusion that product R&D and supply chain building are more and more important in a supply chain's response to market change. To reduce response time to a new market demand, a manufacturer could research not only how to increase the speed of every phase, but also how to integrate the phases smoothly, and how to design an integrated operation process of response to market demand.

3. THE ATTENTIVE PLACES IN DESIGNING THE PROCESS OF RESPONSE TO MARKET DEMAND

To design the process of response to market demand, a manufacturer must learn about the three stages of response to market, and pay attention to the following four places:

3.1 Response to market forwardly

“In an increasingly competitive market, businesses are beginning to realize that in responding to customer needs, getting closer to the customer is no longer enough. Today, an enterprise needs to be proactive in their dealings with customers, anticipating developments and leading the process of change. To that end the process of re-designing a supply chain must focus clearly on the market demand.” (Hole David, 1996)

This means that a supply chain responding orders quickly is not enough, and a supply chain would extend toward market direction. Before researching a new product, a manufacturer must: (1) make a market survey, including current markets demand and competitors' information; (2) sub-divide markets, and know different consuming communities' demand.

3.2 Adjusting or re-building supply chain quickly

There is a trend that more and more manufacturers begin to accept Multivariety-small batch production model. The trend induces that supply chain's structure must be changed more quickly, and a manufacturer needs to adjust, even rebuild their supply chain's structure for its new product which can supply a new market demand.

3.3 Connecting R&D and supply chain designing smoothly

In above we have said that a product that can supply market demand needs a high efficient supply chain to improve the product's ratio of performance to price. This means that the research on product performance and manufacturing technology is no longer enough in product R&D, and R&D should extend toward supply chain designing and building. The works of R&D would offer a series of standards for supply chain designing and building. The series of standards include a new product's character and cost in different stages of supply chain operation process from components to final product.

3.4 The type of supply chain matching the type of product

Fisher considered that the type of supply chain would match the type of product. An enterprise would define the product's attribute before designing its supply chain: if the product is a functional product, the enterprise would build an efficient supply chain; if the product is an innovative product, the enterprise would build a responsive supply chain. (Marshall L. Fisher, 1996)

A product's attribute is decided by the impact degree of market change. The degree is greater, the product has more innovational; on the opposition, the product has more functional. But the functional and the innovational are not two absolute opposite concepts. They have some same requirements for supply chain. For example, a high efficient supply chain information system, a high efficient supply chain logistics network, or high efficient supply chain harmony ability can not only improve a supply chain's efficiency, but also improve a supply chain's response.

4. THE DESIGN OF PROCESS OF RESPONSE TO MARKET

According to the above research, we can design the integrated operation process of supply chain response to market. (Figure 1)

4.1 New product R&D.

It is the first stage in supply chain operation, and also is the first step of manufacturer's production. The first step includes three sub-steps:

4.1.1 Surveying market demand and analyzing competitor's products.

A manufacturer's products not only supply market demand, but also deal with market competition. And in an increasingly competitive market, it is more important that dealing with market competition. So, a manufacturer needs to research market demand earnestly; on the other hand, the manufacturer must pay more attention to analyze its competitor's products, including the products' advantages and disadvantages, and the products' market orientation. The manufacturer can define a primary direction of R&D based on the information about market and competitors.

4.1.2 Constituting R&D plan

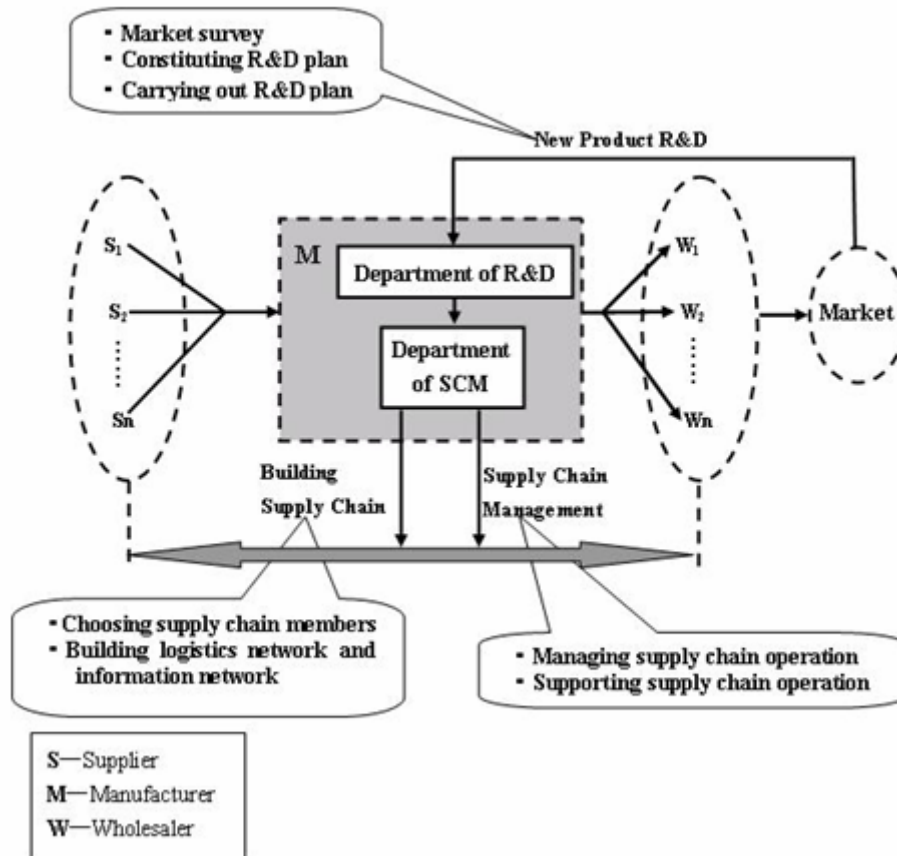
After finishing market survey and competitor analyses, the manufacturer needs to evaluate the resources which can be utilized in R&D and production, including inner resources and exterior resources, and then form R&D plan.

4.1.3 Carrying out R&D plan

Considered the impact on response to market from R&D and supply chain design, the new R&D stage would be divided two sub-stages. The first sub-stage would finish a whole traditional R&D process, from products designing, products trial-producing to products function examining. In the second sub-stage, the main work is to confirm which character the new product

would have and the correlative cost in every stage in the whole supply chain operation process from raw and processed material to final product. The work in the second sub-stage is an extension of traditional R&D activities with “supply chain” ideal. This type of extension builds a relation between traditional R&D and supply chain design, and offers a series of basis and standards for supply chain construction.

Fig. 1. A whole process of response to market of supply chain



4.2 Building supply chain.

Supply chain building is an intermediate link between R&D and supply chain operating: supply chain building decides whether the new product could create and capture value efficiently in a corresponding supply chain which type meet the product’s type; on the other hand, supply chain construction’s finish means supply chain operation’s start. The works of supply chain construction can be divided the following three sub-stages:

First, bases the product’s type, confirming the supply chain’s function structure; confirming the standards of the supply chain’s operation process; designing the supply chain’s framework.

Second, constructing the supply chain, including:

4.2.1 Confirming the supply chain members.

4.2.1.1 Choosing suppliers, wholesalers and

third-party logistics (3PL) enterprises.

According to the components’ quality standards, the components’ price standards and the standards to evaluate suppliers, choosing appropriate suppliers; according to sales areas information and standards to evaluate wholesalers, choosing appropriate wholesalers; according to the requirements of the components and the final product’s loading, unloading and transiting, and the standards to evaluate 3PL enterprises, choosing appropriate 3PL enterprises.

4.2.1.2 Structuring the supply chain logistics network and the supply chain information network

According to the members’ geography distribution, structuring the supply chain logistics network; according to the members’ degree of information technology application and the information management standards, structuring the supply chain information network.

4.3 Operating supply chain

4.3.1 Managing supply chain operation

The management works can be divided the following parts:

- 1st. Controlling the process of the supply chain operation.
- 2nd. Harmonizing the conflicts that happen in the supply chain operation.
- 3rd. Dealing with the risk events in the supply chain operation.

The goal of supply chain management is to shorten the response time and ensure the supply chain operating high efficiently.

4.3.2 Supporting supply chain operation

Standardization of supply chain operation process, advanced technologies and advanced ideals being applied in supply chain, can improve efficiency of supply chain operation. Supply chain operation supporting offers technology support to supply chain

operation, including:

A. Constituting the standard of process of supply chain operation, for example logistics standards or information exchange standards.

B. Researching and applying advanced technologies or advanced management ideals.

C. Offering technology support to supply chain members.

5. CONCLUSIONS

In today's economic era, the market demand changes much quickly, and market competition is so furious. Consumers have a higher requirement to manufacturers, and individual production will be the main trend for manufactures. The trend asks manufactures must pay more attention to new products R&D and the response speed. So, it is a powerful method to manufacturers to reply to these challenges that designing an integrated operation process of response to market changes.

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