

Research on Terminal Market Oriented Supply Chain Integration System

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Abstract—The economic crisis influences the retailers, suppliers and product manufacturers. The participants of the supply chain of terminal market must find a way to survive in the economic crisis. The market volatility influences the operations of the participants' business. The participants must keep up with the terminal market and obtain the information from terminal market in real time to adjust the strategy of business operations and product development. In order to improve the reaction capability of the market oriented supply chain participants, there must be a system that can provide the necessary information from the terminal market, and the participants take corresponding actions to adapt to the market. This paper introduced an integrated system to integrate the participants together and enhance the collaboration to decrease the cost, and develop the terminal market together to improve the profit. The participants can share the information and optimize the business management strategy to improve the market competitiveness.

Keywords—Terminal Market, Supply Chain Integration, Information Integration, RFID

I. TERMINAL MARKET ORIENTED SUPPLY CHAIN ANALYSIS

The current economic crisis is forcing companies to alter the way they are doing business. And the companies that want to survive in the current economic crisis have to take more efficient measures to improve the competitiveness. The participants of the terminal market oriented supply chain include retailers, suppliers and product manufacturers, as shown in Figure 1.

There are several things the retailers should do to improve the market competitiveness, such as:

- (1) reduce the cost of inbound
- (2) find the products that contribute most to the profit
- (3) the consumption habits of the customers of the retailer
- (4) control the inventory more reasonable

Some of the above can be done by retailer himself, while others must be supported by external support. There must be a service system to support the retailer to manage the business.

The product supplier wants to supply the product according to the actual requirement. Generally, some

suppliers evaluate the product demand by the analysis report of their own fulfilled orders, and estimate the products quantity of the future orders. But the market is variable, some retailers' items and product quantities maybe very different contrasted to the previous order. And some retailers perhaps purchase more product than that can be sold, and return the product to the supplier after a time.

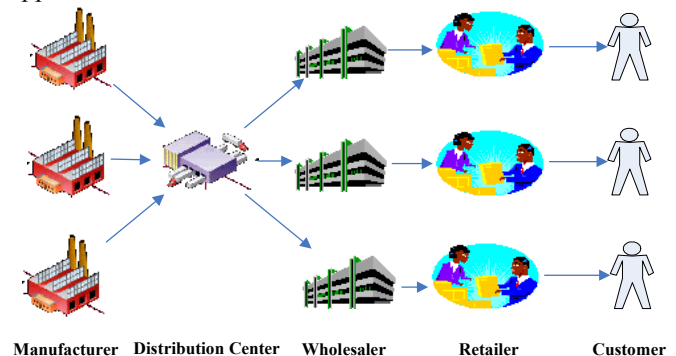


Figure 1. Supply chain

The product suppliers must know which retailer has the products that supplied by this supplier, when the retailer purchased the products last time, how many of the products left in the shop. If this information is in hand, the supplier would make more reasonable product supply plan and avoid overstock.

The product manufacturers desiderate to know the actual product demand from market and according to which make the production plan. The elements from the terminal market that influence the product manufacturing are varied considering different market location and different customers. Different participants' management support requirements are shown as in Figure 2.

Some of the information from the terminal market may be as followings:

- (1) the circulation of the product in terminal market
- (2) the characters of the customers who bought the product
- (3) the product social inventory
- (4) potential demand of the product

According to the market information above, the manufacturers can make the plan more reasonable and reduce the influence of evaluation error.

The participants must be integrated together and collaborate together to develop the terminal market and improve the capability to survive in the economic crisis.

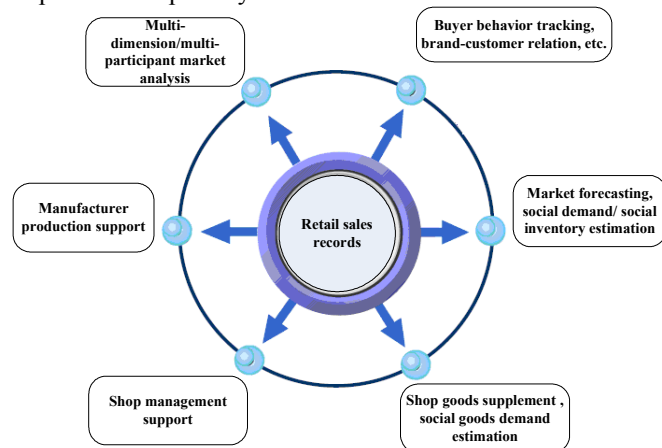


Figure 2. Supply management support requirement

There are some study achievements in this field and the solutions have been brought out [1]-[3]. This paper brings out an integration solution of manufacturer, supplier and retailer in terminal market based on the project experience. The manufacturer can track the product retail process, and obtain the decision support information based on data mining. In this system, product retail information can be obtained in real-time. Based on the product retail historic records, manufacturer can monitor the product retail market and make the enterprise development plan accordingly.

II. SHARE INFORMATION ANALYSIS

This system integrates customer, shop, and product manufacturer. There is a lot of information generated in retail terminal market [4]-[6]. The participants of the terminal market oriented supply chain need not all the information from the terminal market. The upload information is those information items involved in products retail and supply.

The information that should be transferred from the retail market is the retail detail information as followings:

(1) The customer information

The customer information can be used to track his consumption habits. The customer information is very important information in the whole system. The customer is the source of market demand, product improvement impetus. Based on the customer information participants of the terminal market oriented supply chain can find the sales trends.

The information items of the customer include customer name, gender, customer card number, phone number, address, birthday, education, economic conditions (for example, scope of the salary, somehow, it is difficult to collect), etc.

(2) The shop information

All the shops that join in the system must register in the system. According to the information of the shops, the product manufacturers can analyse the relationship between commercial area and product sales.

The information items of the shop include shop's name, address, commercial area, phone number, the manager's name, etc. If the manufacturer and supplier want to analyse the product distribution characteristics in the terminal market, the number of the product variety is also needed.

(3) The product stock information

The product stock information can be used to analyse the purchase frequency and obtain the information to control the supply plan.

The information items of the stock include product name, product type, quantity, date, supplier, manufacturer, date of manufacture, production lot number, expiry date, etc.

(4) The product inventory information

The product inventory information shows that how much of the product is left in the shop, and provides the supply control reference information.

The information items of the product inventory include product name, product type, quantity, manufacturer, date of manufacture, production lot number, expiry date, and the check date, etc.

(5) The product retail record

The product retail detail information is one of the most important information to analyse the laws of more sales. All the retail transaction can be traced by this information. The product retail historic records can be used to analyse how one product is sold to customers. It also can be used to see what other products one customer has bought.

The information items of the product retail detail record include product name, type, customer name, quantity, date, etc.

With the product retail record information, the manufacturer can confirm how much of the product is left in the customers, and evaluate the potential social demand, and it also supports the decision of the product promotion strategy.

(6) The supplier information

Supplier information is very helpful to find where the product is from. Based on the supplier information, the manufacturer can analyse the shop inbound channel, and make the future product channel promotion strategy.

The supplier information items include supplier name, supply product list, manager name, phone number and address, etc.

(7) The product information

Product is analysis object of the system, and the product information should be shared between the shop and the system. Some information of the product in different shops is different from each other, such as purchase price, retail price, etc. This type of information can help the manufacturer to make pricing strategy.

The product information items include product name, manufacturer, wholesale price, retail price, bar code, etc.

The frequencies of the information mentioned above are different. The shop and supplier information are inserted into the center database when the retailer joins in the system. The customer information is added when he gets the customer card. The product inbound information and inventory information are uploaded to the center database when they change. The product retail records are uploaded to the center database when any

product is sold, and it is the most frequently transferred information to data collection server. Somehow, not all the product has to be tracked in the shop, only the information of the product that belongs to one of the manufacturers in the system should be uploaded to the center database.

III. SUPPLY CHAIN SOLUTION

This system is composed of several sub-systems, and every sub-system is independent system that can work alone, the sub-systems include the product retail system, local management system, center analysis and management system and ERP system of manufacturer, as shown in Figure 3.

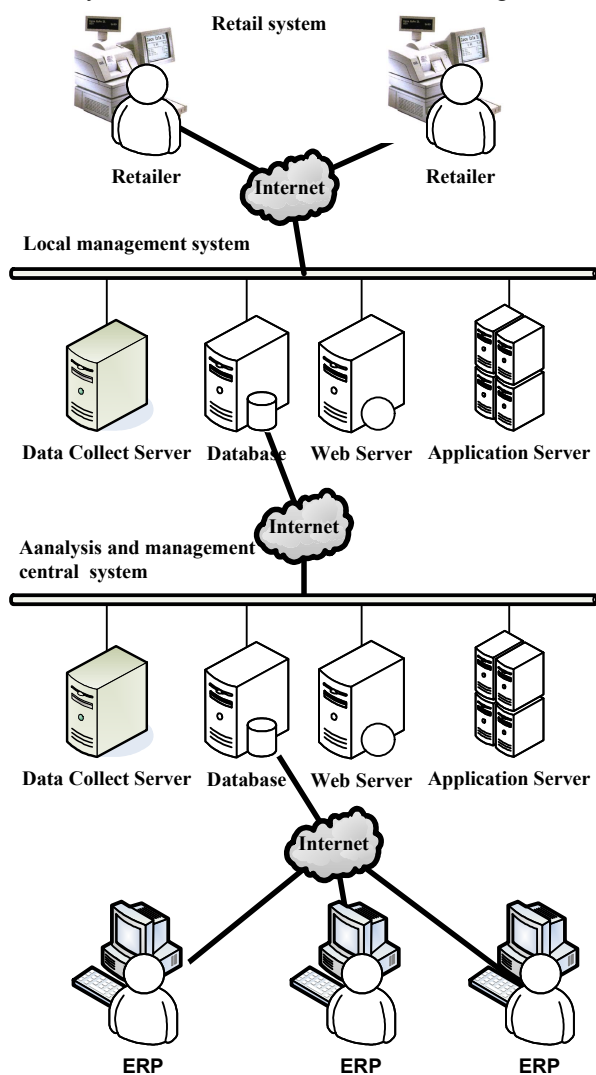


Figure 3. System structure

The product retail system is installed in shop and provides product retail function. Besides the general product retail function, the product retail system has the function to upload the data to the center database.

The shops probably distribute in different areas, and the commercial character of the area is different from each other. In order to improve the feasibility and maneuverability of the solution, local management system is designed in the system.

The local management system collects the information from the shops that lie in the area and uploads the information to center system.

The center analysis and management system is connected with all the local management systems and ERP system. The center analysis and management system collects the information from the local management systems, analyse the characters of the terminal market and provides the support information to the product manufacturers. The products suppliers can obtain the necessary information from the local management system and center analysis and management system.

The hardware of the product retail system is computer or the integrative POS machine. The hardware of the local management systems and center system are similar, both are composed of web sever, application server, data collect server, database server, etc. When uploading the product retail information, the product retail system connect with data collect server of the local management systems, and data collect server program inserts new records into database or updates the database by received data, and the data collect server synchronizes the data to database of the center analysis and management system.

A. Retail System

The shop is the source of all the information, and how to collect the information is one of the key points of the solution. The retail system installed in the shop not only provides the product sale function but also collects the data. The shop uploads the product trade information to superior system through Internet.

The customer information is very important. In order to keep the customer's information, the customer will get a customer card. The card's serial number is stored in the system, and when the customer receives the card, he provides the necessary information that can be used to analyse the consumption habits. The customer can use the card in all the shops that join in the system.

There are several electronic techniques that can be used in manufacturing card, for example, the card can be IC card or RFID card. Of course, the shops must have the reader equipment accordingly.

The retail system can be software installed in computer or integrative POS machine. If the shop uses the integrative POS machine, the embedded application has to be updated to support the data upload function. If the shop uses computer, there are two choices. One is to replace the current application with the product retail system developed for this system. The other is to develop the data collection plug-ins for the current retail system or data collection application that can read the data from the current retail systems. To develop the data collection plug-ins for the current retail system is very difficult because the shops use different product retail systems. Development of the data collection application suit for the current retail system is more feasible. If to develop the data collection application, the database structure of each current product retail system must be known. But there perhaps are many different types of product retail system, and the data

collection application has to be developed for each one. Based on the analysis above, the best way is to change the current product retail system and use the product retail system developed for the system.

The main business functions of the product retail system are inbound management, sale management, storage management, etc.

B. Local Management System

The main functions are related to terminal market management. The functional structure of the local management system is as followings:

(1) Product management

This function manages the product information such as product name, brand, manufacturer, wholesale price, suggest price, supplier etc.

(2) Shop management

This function manages the shop information such as shop name, manager, address, commercial area, etc.

Besides the basic shop information management, this function can list the customer that registered in the shop.

(3) Product retail record management

This function manages the retail transaction record uploaded from the shops. This function can provide several retail reports:

- (a) Transaction historic report of a product
- (b) Transaction historic report of a product supplier
- (c) Transaction historic report of a product manufacturer

The manufacturers can use this function to analyse how the products circulate in the terminal market. For example, 1000 pieces in small number of bills or large number of bills will influence the pricing strategy. The manufacturers or suppliers can also find out what types of commercial area are more suitable for the product sales.

(4) Product sales statistics

This function provides the product sales statistics such as single product sales statistics, brand sales statistics, product price statistics. The result information includes sale quantity, sale figure, profit and contribution. From the sales statistics, the shop can find out the products that contribute to more profit.

(5) Customer tracking

This function can provide customer product purchase tracking report. The system can query the historic record of a customer, for example, when he bought product from which shop, what products he has bought, etc. this is very helpful to the supplier or manufacturer to analyse the customer's consumption habits, and according to the customer's consumption to develop the market or improve the product.

(6) Stock management

This function monitors the product inbound of the shop. This function can list out the inbound of a certain shop, and products that a certain supplier provided to the shop. And it also can compare the inbound of each shop.

Based on the information of inbound, the supplier or manufacturer can find out which shop is more active in the product sales.

(7) Inventory management

This function can list out the storage of each product in shop. By this function, manufacturer or supplier can find out how the products distribute in an area. Table 1 shows a statistics example of inventory that supplied by supplier A. From the table, it points out that at the time, product Dry Wine supplied by supplier A are stored in several shops and the storage sums up 657.

Table 1. Statistic of Product Inventory of Supplier A

Supplier	Supplier A	
product information	product name	XXX Wine
	manufacturer	XX CO.,LTD
product distribution	retailer	quantity
	Fengtai XingFu shop	13
	Haidian ShunFeng supermarket	10
		
	sum	657

The supplier can set the inventory control parameters for the shops, such as the safety stock level, stock lower limit and stock upper limit. According to these parameters, the supplier will find out the out-of-stock and inventory backlog.

(8) Order management

The shops can make order through the system, which will improve the purchase efficiency. The system can track the order process, and the retailer will get the order execution status on time.

This function also provides the auto-suggest order. When the storage is changed, the system will check the storage and generate the suggest order according to the inventory control parameters.

C. Central Analysis And Management System

The functions of center system are similar with the local system. Besides the functions the local system has, the center system has the following functions:

(1) The product retail comparison between different areas

The local management system can only analyse the information that generated in local area and the database of the center analysis and management system stored the data collected from larger area scope. The center analysis and management system can use the data to analyse the difference between different areas.

For example, one manufacturer wants to find out whether there are different sale rules between the city of Beijing and city of Guangzhou in China, if there actually has the difference, supposing the product is more welcome in Guangzhou, the manufacturer can study the information carefully and find out the reason, and take measures to improve the market share. The difference of consumption quantity may be caused by consumption habits, and manufacturer will check the customer information who has bought the product by local management system.

(2) Area supply plan decision

Based on the different local inventory information, the manufacturer can make supply balance between different areas

and will efficiently avoid the situation that some areas have overabundance storage and others insufficiency.

(3) Collective Purchasing service

Faced with the current economic crisis, all the retailers want to decrease the stock cost. If many retailers organized together, the quantity of the combined order is very large, and the retailers can gain a low price based on quantity discounts. The local management systems gather the request orders from the shops and upload to the center database. The manager of the center analysis and management system negotiates with suppliers or manufacturers and releases the retailer from goods purchase.

IV. CONCLUSIONS

The economic crisis influences the retailers, suppliers and product manufacturers. The participants in the supply chain of terminal market must find the way to survive in the economic crisis. The participants can be integrated together and enhance the collaboration to decrease the cost, and develop the terminal market together to improve the profit.

This paper introduced an integration system, and with this system, the participants can share the information and optimize the business management strategy to improve the market competitiveness.

Based on the solution introduced in this paper, the social demand which is one of the key elements of the supply chain can be obtained based on the related product retail information.

The retailer can obtain the information to operate the shop more efficiently. The information includes the products that suit for sale in the area, and what types of customers contribute most to the profit, and what kinds of products that contribute most to the profit, etc.

The retailer can join in the collective purchase and gain much lower inbound price and release from goods procurement, and concentrate on the shop management.

The suppliers and product manufacturers can find out what types of commercial area and what types of shop are suitable for the product sales. And according to the analysis result, the suppliers can improve on the products supply.

The manufacturers can find out how the product is in circulation in terminal market, the current social inventory, the development trend of the terminal market. All the information is very important for the enterprise to make the management and development plan. The manufacturers can find out the circulation trend of the product and according to the terminal market requirement to develop new product.

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