

Towards an Efficient Supply Chain Management*

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Abstract

The increase in variability in supply chain is called the bullwhip effect. The bullwhip effect is caused by different demand forecasting method, lead time, different demand pattern, different ordering policy (order benching), the level of information sharing and the price policy together. One of the most frequent suggestions for reducing the bullwhip effect is to centralize demand information within a supply chain, that is, to provide each stage of the supply chain with complete information on the actual customer demand. To understand why centralized demand information can reduce the bullwhip effect, note that if demand information is centralized, each stage of the supply chain can use the actual customer information, rather than relying on the orders received from the previous stage, which can vary significantly more than the actual customer demand.

Introduction

The supply chain management (SCM) is a boom. There is no day when the word named SCM is not seen in newspapers and magazines. What are crucial issues for supply chain management?

A wide range of trends in technology and society drives public and private actors into new patterns of collaboration. On the technology side, the increasing knowledge content of products and services and the need to accelerate the pace of product and process innovation force both public and private parties to specialize their activities, outsource alternative resources, and co-operate each other. On the socio-economic side, the mass-individualization and accelerating market dynamics foster world-wide competition. Increasing public demands for transparency and accountability call for limitation of negative externalities of socio-economic processes. No single organization is able to satisfy all these rapidly emerging and complicated demands on its own.

Evans and Danks (1998) pointed out the importance about the channel design as: “A variety of alternative structures exist through which the firm’s products and services reach the end-user customer. While most firms have sold their products and services through retailers, wholesalers, dealers and distributors, advances in information and communications technology such as the Internet and World Wide Web have fostered the development of an increasing number of ‘direct’ channels whereby firms sell directly to their end-user customers. The choice of channel structures is of critical importance since this can directly influence both the level of customer service provided and the as-

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sociated distribution costs.”

In this paper, we explore several important issues which causes the variability in supply chain. For explaining it, two models of enterprises in Japan—the “KanBan” system and the “Rolling the Three Months Forecast” (RTTMF) system—are showed. In the last part, the way that can improve the performance efficiency of supply chain management will be suggested.

Crucial Issues in Supply Chain Management

Channel Structure and Channel Alignment

Supply chain management has become a competitive edge for a successful competitive advantage. The primary difference between supply chain management and traditional operations management lies in two dimensions—organization integration and the flow coordination in supply chain.

For describing, analyzing, and managing the supply chain channel, three dimensions of the network are essential. These dimensions are the vertical, the horizontal, and the position of the focal company within the supply chain. The vertical refers to the number of tiers across the supply chain. The supply chain may be long with numerous tiers, or short with a few tiers. The horizontal refers to the number of suppliers/customers represented within each tiers group. The group may be connected by public or private information, and the group may be individual.

The third structural dimension is the company’s vertical position within the supply chain. A company can be positioned at or near the initial source of supply, be at or near to the ultimate customer, or somewhere between these end points of supply chain.

The channel alignments includes for example:

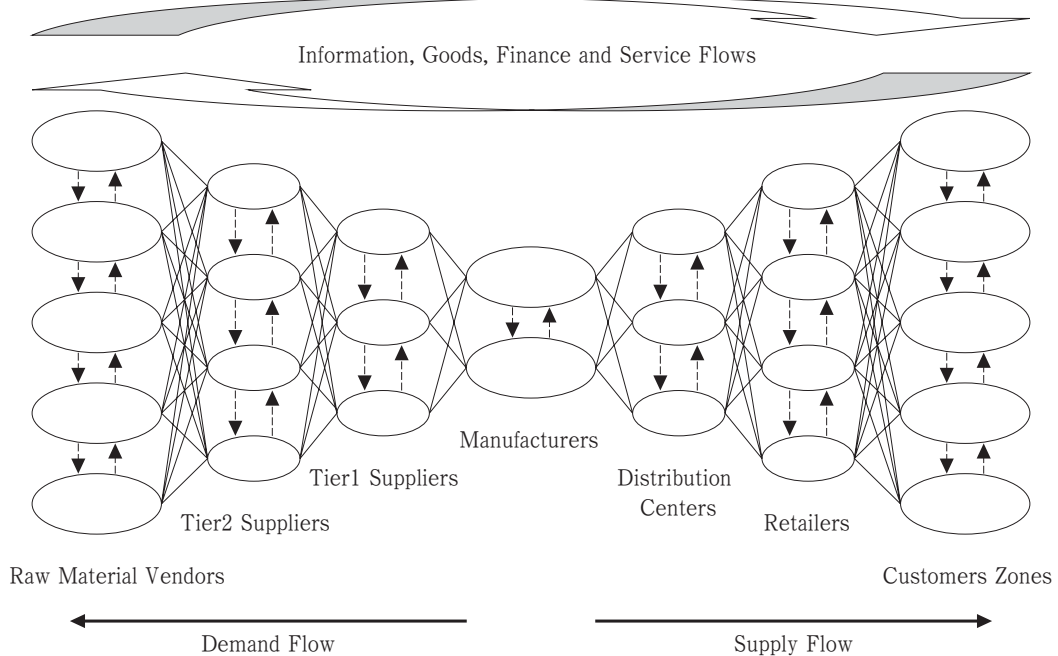
- Vendor managed inventory (VMI),
- Continuous replenishment program (CRP)
- Customer resource management (CRM)
- Supply resource management (SRM)

It is important to have an explicit knowledge and understanding of how the supply chain network channels are configured. As stated above, and according to definitions of supply chain management which had been compared, it can be said the supply chain network channels should be formed by supply chain function members named as raw material vendors, tiers suppliers, manufacturers, distribution centers, retailers and customers, linked by the information, goods, money and service (as represented in Figure 1). All firms participate in a supply chain as a member from the raw material vendors to the ultimate consumer. How a supply chain is managed depends on several factors, such as the complexity of product, the number of available suppliers, and the possibility of information sharing. Firms need to consider the length of the supply chain and the number of the suppliers and customers at each level.

In Figure 1, the connections are more diversified than the traditional structure. This perhaps can explain the reason why the current supply chain becomes more and more complicated. For pursuing the best performance of the enterprises, there are more choices and more members joining into the supply chain. It will make the supply chain channel more complicated.

In Figure 1, a chain is characterized by the sequential order of the transactions involved. The network is characterized by the specific properties of the transaction relationships, typified by

Figure 1 Supply Chain Network Channel



reciprocal relationships in which informal information sharing and trust building mechanisms are crucial. A supply chain is not necessarily a network. A supply chain should be considered a network if the sequence of transactions between forms is not only arranged by means of the market or through formal mechanisms, but also be reciprocal and informal mechanisms.

Because of the long and multistage structure of supply chain, it can bring the increasing variability and fluctuation of orders and inventories across a supply chain. It is well known as “bullwhip effect”. Yao (2001) argued the bullwhip effect as: “... the bullwhip effect represents the phenomenon where orders to the suppliers tend to have larger variance than sales to the buyer (i.e., demand distortion), and the distortion propagates upstream in an amplified form (i.e., variance amplification). Such a distortion can lead to excessive inventory throughout the supply chain system, insufficient or excessive capacities, product unavailability, and higher cost in general. . .” He find the bullwhip effect is caused by different demand forecasting method, different demand pattern and different ordering policy (order benching) together.

According to Simchi-Levi et al. (2002), the main factors contributing to the bullwhip effect are: 1) demand forecasting; 2) lead time; 3) batch ordering; 4) price fluctuation; 5) inflated orders.

Demand/Supply Planning and Forecasting

Contemporary supply chain management has been heavily focusing on improvements in supply-side processes, such as how to move inventory more efficiently. As companies sift through their supply-side opportunities, they ignore the demand factor. However, companies that want

to manage their supply chain superbly can only achieve this goal if they recognize the fundamental nexus between supply and demand—and its implications for strategy and its implementation.

Demand/supply planning and management is the nervous system for company's operations. It is the key to achieve targeted customer service levels, inventory levels, and margins. It is also the key to manage system-wide capacity. Effective demand/supply planning and forecasting requires managing as well as planning. Effective demand/supply planning requires process have to be designed, piloted, monitored, and evaluated. Growth, profitability, and customer service quality have to be balanced carefully. Most important operations have to be customer-oriented or market-driven, rather than supply-driven, production-driven.

Tyndall et al. (1998) told the effective demand/supply planning has some primary tenets:

- Combine demand and supply planning.
- Eliminate the impact of the product forecast. Rather than trying to improve their demand forecasts, companies should work to de-emphasize them. This is because highly effective supply chains with fast cycle times reduce the need for demand forecasts, which are never accurate anyway. The focus of the demand/supply process must be on answering real-time demand and cutting cycle times. In turn, the forecasting emphasis should be on managing capacity and procuring materials, rather than on predicting demand.
- Replace inventory with information and analysis: deploy smaller, easily implement, functional systems that share common, accurate data. Information and analysis are essential to manage the product pipeline. They are best optimized with smaller, rapidly implemented, integrated applications with an accompanying focus on enterprise-wide data accuracy, integrity, and commonality.
- Focus on transparency in planning and deployment. Transparency to the consumer should be paramount, no matter how virtual the supply chain. The customer does not care how the product gets to him. He does, however, care if the product arrives late, damaged, or not at all.

(Tyndall et al., 1998, pp.65-67)

Demand Forecasting

The moving-average method and the exponential weighted moving-average method (Yao, 2001) are usually used in traditional forecast method. The moving-average model of length k should be expressed as:

$$F_{t+1} = \frac{\sum_{i=0}^{k-1} d_{t-i}}{k} \quad (1)$$

where F_{t+1} is the forecast of time $t+1$ made at time t . The forecasts for periods $t+i$ ($i=1, 2, \dots$) made at time t are equal, that is, $F_{t+i}=F_{t+1}$ for $i=1, 2, \dots$. Hence, the forecast for all lead times will follow a horizontal line which parallel to the time axis. The exponential weighted moving-average model should be expressed as:

$$F_{t+1} = \alpha d_t + (1 - \alpha) F_t \quad (2)$$

α is the smoothing constant. It is generally restricted to lie between 0 and 1. Similar to the moving-average model, forecasts for periods $t+i$ ($i=1, 2, \dots$) made at time t are equal.

According to the two simplified models of above, it should be noted that the forecasts ignore the relation with the increasing value of lead time. This is one cause of the bullwhip effect increasing.

Ordering Policy

According to Simchi-Levi et al. (2002), the reorder point in traditional inventory management techniques is equal to

$$L \times AVG + Z \times STD \times \sqrt{L} \quad (3)$$

L =lead time from the supplier to the distributor.

AVG =Average demand.

Z =safety factor.

$STD \times \sqrt{L}$ =Standard deviation of demand in lead time

The reorder point is typically set equal to the average demand during lead time plus a multiple of the standard deviation of demand during lead time. The latter quantity represents safety stock. Typically, managers use standard forecast smoothing techniques to estimate average demand and demand variability. An important characteristic of all forecasting techniques is that as more data are observed, the estimates of the mean and the standard deviation (or variability) in customer demands are more modified. Therefore, as Simchi-Levi (2002) told in his book: *“... traditional inventory management techniques practiced at each level in the supply chain lead to the bullwhip effect... since safety stock, as well as the order-up-to level, strongly depends on these estimates, the user is forced to change order quantities, thus increasing variability.”* (p.103)

Demand Patterns

Xiande et.al (2002) explained the demand patterns as three patterns: SEA, SIT, and SDT. SEA is the pattern with seasonality but without trend, SIT has seasonality and a positive trend, and SDT has seasonality and a negative trend. The demand in SDT decreases over time. In the earlier periods, demand is higher than capacity so that backorders occur. And, because of the cumulative nature of backorders, the affection of variability in supply chain is bigger. In the case of SIT, the demand increases over time. Therefore, the demand is lower than the capacity in the earlier periods, thus, backorders are lower initially. With time go on, demand becomes higher than the available capacity. However, there is less accumulation of backorders from earlier periods, so the affection of backorders is actually lower for SIT than for SDT. When the demand is SEA, there is only seasonal variation without trend. Therefore, the fixed capacity can accommodate the demand variation much better than when trends are present. The affections from backorders are lower than those in SIT and SDT. Now, what are causes of induced demand volatility? According to Gattorna et al. (1996), it should be said that the primary causes of demand volatility are: 1) terms of trade (credit terms); 2) promotions and pricing; 3) specific company policies; and 4) distribution channel structure.

Demand Forecast Sharing and Pricing Policy in Supply Chain

About information sharing in supply chain, price and demand are considered in many operations models of recent research. Since demand uncertainty negatively affects pricing, firms adopted strategies such as price postponement to reduce uncertainty. Not only do models focusing on inventory and replenishment decisions underestimate the benefit of information sharing but they also do not address the strategic role, which forecasts play in pricing.

In any information-sharing scenario, the critical question is how the receiving party uses the information. Retailers that share information, whether it is POS data, inventory level, or demand forecast, may have concerns that the manufacturer might share them with the retailer's competitors or may simply use them against the retailer. Therefore, retailers may request manufacturers to maintain confidentiality of such information. They may also set service level constraints on replenishment before sharing information. In the case of demand forecast sharing, the retailer may have to worry about the manufacturer using the information to its own advantage. Thus, a central question is whether and under what condition demand forecast sharing is mutually beneficial.

In Yue's study (2002), a supply chain consisting by a single manufacturer and a single retailer is a focus of analysis. The demand at the retailer is a linearly decreasing function of price. The manufacturer and the retailer set prices based on their forecasts of the unknown primary demand. There are two scenarios exist in his study. The first is the make-to-order scenario, in which the production takes place after, but prices are set before, realizing the demand. The second is the make-to-stock scenario, in which the production takes place as well as prices are set before realizing the demand. In both scenarios, he provides conditions under which information sharing is beneficial to the retailer and manufacturer. Finally, he analyzes the sensitivity of various model parameters such as forecast accuracy on the value of forecast sharing through an extensive simulation study. There are many literatures on information sharing in supply chains, and almost of them have focused primarily on the savings in inventory and replenishment costs when a retailer shares its point-of-sale data with the manufacturer. Yue (2002) shows that in the make-to-order scenario, the retailer will be better off when information sharing occurs only in limited settings, while the manufacturer always benefits. However, in the make-to-stock scenario, the manufacturer may be able to provide incentives (using pricing policy) to induce the retailer to share information when the retailer does not voluntarily do so, since the manufacturer realizes inventory savings by doing so. The manufacturer intends to expand information-sharing network in the make-to-stock scenario. The computational study shows that in the make-to-order scenario, information sharing can be very valuable to the retailer, especially in situations where the demand exhibits a high variance, the accuracy of the retailer forecast is high, the accuracy of the manufacturer forecast is low, and the correlation between forecasts is low. The computational study also shows that in the make-to-stock setting, the value of information-sharing for the manufacturer can be very significant since it can benefit from it.

Direct Channel

The surge of e-business has been shaking the world of business. It seems nowadays that a company should be considered either a "dot-com" such as Amazon.com. Many supply chain

experts believe that the trend for selling directly on line is inevitable. And using direct channel is an effective way to eliminate bullwhip effect, too (Yao, 2001).

However, to many manufacturing giants including IBM, the downside of direct-selling has been showed in customer service and relationship management. Recent statistics indicated that a direct seller such as Dell does not do well in service and support side, especially for high-end products. For those customers who have to rely on vendors to install, configure and maintain hardware such as high-end servers, the direct selling is found to be lacking and inefficient. Direct selling also worries channel partners: dealers, distributors and retailers. Many dealers and distributors are up in arms about the threat of disintermediation in US. The internet, however, can not substitute for traditional distribution system, which has intermediaries and immediate contacts with real commodities. Direct channel may eliminate distributors, who can add value to the supply chain.

Actually many manufacturing companies adopt mixed distribution channel. That is, they sell their products through direct market and indirect market at the same time. Thus, we should say that information technology does change the way of doing business, but does not change the business itself. The best solution is often a hybrid, integrating the new e-commerce channels with the traditional ones.

Kanban System and “Rolling the Three Months Forecast” System

According to Tyndall, et al, (1998), for long-term capacity strategies and supply planning, the horizon for integrated, high-level demand/supply planning should extend for one to two years at an aggregate level. Revisions are advisable at six-month increments at the granular (product family) level, with weekly or daily updates made at a focus the organization on the plan and to make corrections resulting from changing market demand and supply constraints. And the focus of the demand/supply process must be on answering real-time demand and cutting cycle times.

In the two years from 2003 to 2004, for to make clearing the accuracy of unofficial notification about auto industry's demand and supply plan, we did the interviews to the Nagoya Toyota Motor headquarters and other auto enterprises in Japan. And then, we studied the mechanism and role of the “KanBan” and the “Rolling the Three Months Forecast” (RTTMF).

One of the most frequent suggestions for reducing the bullwhip effect is to centralize demand information within a supply chain, that is, to provide each stage of the supply chain with complete information on the actual customer demand. To understand why centralized demand information can reduce the bullwhip effect, note that if demand information is centralized, each stage of the supply chain can use the actual customer information, rather than relying on the orders received from the previous stage, which can vary significantly more than the actual customer demand.

Information sharing and forecasts sharing are new topics in recent research about supply chain. The extant literature has discussed the savings related to the inventory and replenishment which can obtain through information sharing. Conventional wisdom suggests that sharing of forecasts and information within a supply chain will lead to higher profitability.

Here, the KanBan system (for delivery and production) and the RTTMF system (for

production and ordering goods) are two models which can control the information sharing the forecast accuracy in the auto industry of Japan.

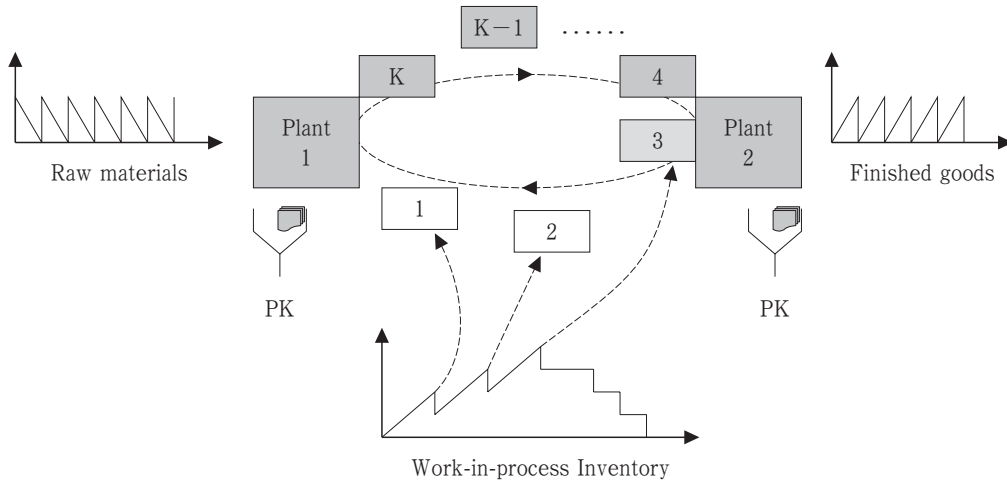
KanBan System

“KanBan” is a work instruction note which described parts information such as the name, the amount, and the delivery date. The production system using KanBan was pioneered by Toyota Motor Company. It is an inside information structure of enterprises and aimed to executing the just in time (JIT) system in producing process by reducing the unjust, the waste, and the lack. The role played by the KanBan in production control is to tie different manufacturing processes together and improve the operations in the production process. And a “zero stock” is assumed to be an ideal state. To implement JIT philosophy, the KanBan technique is introduced to ensure the organization to run its supply chain system effectively and competently.

The production process of car is like as a structure about river. The production process is like as mainstream of the river, the parts production process like as the brunch, the market like as the sea, the workplace like as local water current management place and the inventory like as reservoir. Executing KanBan system, the information communication starts from the local water current management place, goes up to the upstream for controlling and recover the flowing quantity system of water. The temporary production plans as a offered general guideline will be made by Production Policy Planning Office Center in a constant schedule combination. KanBan is transmitted to a final assembly factory several days before the real production, and used to fine-tune the production schedule by a shorter interval. KanBan is usually delivered at a ration of several-times during a day to the office in each upstream, and returns to the assembly factory with the real delivery. Each KanBan has information of the amount and the delivery time of parts that should be supplied for individual type such as engine, transmissions, and bodies respectively specified. Thus, KanBan has a double role of an ordering sheet and a delivery sheet. This KanBan supply chain system involves even parts suppliers of outside that are connected to final assembly manufacturers with a long-term relation (Aoki 1989).

The detailed function of KanBan system may be best explained in Figure 2. In this supply chain system, production is first triggered by the demand at final plant (the final processing). In a KanBan operation, a production KanBan attached to a loaded container in a succeeding plant is first detached from the container, and put into the withdrawal KanBan (WK) post as a withdrawal KanBan when the first part from container is to be used. The withdrawal KanBans in the post are then collected at a fixed or non-fixed interval and brought to the production KanBan (PK) post at the preceding plant by transportation vehicle. The production KanBan displays the quantity of parts to be filled in a container, the preceding and succeeding plants involved with the part, the collection interval, etc. The production KanBan is then attached to the container in a store at preceding plant as the production ordering KanBan permitting the worker at preceding plant to produce the required amount of parts; that is, the detached production ordering KanBan triggers the production of preceding plant. The containers filled with parts together with production KanBan are brought, in turn, to succeeding plant by the vehicle. This KanBan cycle realizes a smooth, timely, and non-useless flow of parts between preceding and succeeding plants.

Figure 2 Kanban supply chain system



A KanBan usually includes the information such as parts number, description, container number, unit load (quantity per container), stock location (departure), and end process (destination). KanBans in a supply chain system have a general purpose, namely it is not only an information carrier, but also a material carrier (or container). A KanBan is a card attached to a transporter. Empty containers are indicated with clear boxes (1, 2,) and the loaded containers are indicated with darker boxes (4, ..., $k-1$, k) while a partially empty box is indicated by partially marked box (3) at plant 2 where the incoming finished products from the upstream plant 1 is being used. The levels of raw material (RM) and finished goods (FG) are shown before plant 1 and after plant 2, respectively, while the work-in-processes (WIP) are shown at the lower part of the figure. Actually, the physical locations of the RM inventory, FG inventory, and WIPs are upstream, downstream, and within plant 1, respectively. For a comprehensive pictorial representation, the physical locations and container operations have been shown to reflect the JIT operations between two plants. To deliver materials by KanBan, first, the number of batches in each stage should be determined. Then, considering the delivering time and load/unload time, the numbers of KanBan containers needed to ship the batches are calculated. Next, the ordering policy to suppliers at first stage is scheduled (or plotted on time scale). These problems should be solved by minimizing the total cost of the supply chain.

RTTMF System

The three months forecast is the information about products quantities and products specification. Enterprises use it in production and procurement earlier than using formal ordering sheet. It should be distinct to the firm purchase order sheet. So we usually call it "The Three Months Unofficial Notification" as another name.

For production in N season (or N week, it is the same as follows) and for receiving the material on each day from the 1st day of the N week to the final day, the top Japanese car assembly marker orders the specification and amount to suppliers in the $(N-2)$ week by using KanBan.

Figure 3 Rolling the Forecast of 13 Weeks about Assembly Maker

N-12(w)	N-11(w)	N-10(w)	N-9(w)	N-8(w)	...	N-1(w)	N(w)
	N-11(w)	N-10(w)	N-9(w)	N-8(w)	...	N-1(w)	N(w)
		N-10(w)	N-9(w)	N-8(w)	...	N-1(w)	N(w)
			N-9(w)	N-8(w)	...	N-1(w)	N(w)
				N-12(w)	N-11(w)	N-10(w)	N-9(w)
					N-11(w)	N-10(w)	N-9(w)
						N-10(w)	N-9(w)
							N-9(w)

This is a role of KanBan for production fine-tuning that we already argued it above.

On the decided day which is in last week of the N month, the tier1 accepted the three months forecast (13 weeks forecast) were given from the top maker, which include the (N+1) month, the (N+2) month and the (N+3) month. And, it rolls every month or it rolls every week. The forecast of the (N+1) month that specified the day of the delivery is gotten, about the forecast of the (N+2) month and the forecast of the (N+3) month, the delivery day is not specified while the forecast of the whole month is gotten. However, about forecast of the (N+1) month, at the decided day that is in two weeks before the producing weeks, the ordering information about the each day (firm purchase order) in producing week is gotten. This rolling is repeated in the next month and in the month after next. Thus, the forecast of the (N+3) month is rolled by three times, and the fine-tuning is added in every case. This is called as RTTMF. (See Figure 3)

A high level of the forecast accuracy is extremely important for the manufacturing cost of the enterprise. Though the accuracy of the forecast of a high-ranking car maker is high (the forecast accuracy of a top enterprise reaches 98% or even more), because of not equipping the information use, the accuracy of the forecast of the subordinate position maker is low (subordinate position maker's forecast accuracy is from 60% to 80%). In addition, when subordinate position maker's suppliers show their forecast to the maker located in the upstream, they have to add their companies' information with the original forecast of the final maker.

The accuracy of the forecast that has been described up to now is forecast of the last one month in RTTMF. For instance, the forecast is gotten from the customer in August, it is the forecast of September, October, and November, and the forecast of September is called "one month forecast". The forecast of October, November, and December are gotten from the customer in September. At this time, the tune of October and November are added. In addition, the forecast of November, December and January are gotten from the customer in October. At this time, the tune of November and December are added. Thus the forecast in November is given in August, and it is tuned two times in September and October. The accuracy of November changed in October is the accuracy that we emphasize.

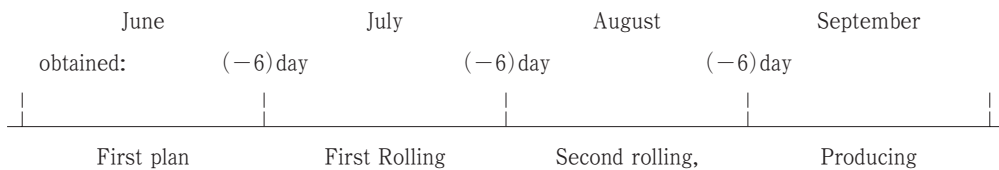
Table 1 is an example of information about the three months forecast, that for the production of B manufacturer in July, 2004, it accepted from A manufacturer.

Obtained time of the forecast, the production plan, and the tune in the plan are shown in Figure 4.

Table 1 Information of the Three Months Forecast

Parts name: Throttle Valve	(N-2) month forecast	(N-1) month forecast	Firm purchase order in July, 2004	Gotten actual amount in July, 2004	Obtained time of the three months forecast
	344,400	349,300	350,000	350,000	On the last sixth day of N month
accuracy	98.4%	99.8%	100%	100%	

Figure 4 Obtained Time of the Forecast, the Production Plan, and the Tune in the Plan



Concluding Remarks

The bullwhip effect is caused by different demand forecasting method, lead time, different demand pattern, different ordering policy (order batching), the level of information sharing and the price policy together. One of the most frequent suggestions for reducing the bullwhip effect is to centralize demand information within a supply chain, that is, to provide each stage of the supply chain with complete information on the actual customer demand. To understand why centralized demand information can reduce the bullwhip effect, note that if demand information is centralized, each stage of the supply chain can use the actual customer information, rather than relying on the orders received from the previous stage, which can vary significantly more than the actual customer demand.

Information sharing and forecasts sharing are new topics in recent research about supply chain. The extant literature has discussed the savings related to the inventory and replenishment which can obtain through information sharing. Conventional wisdom suggests that sharing of forecasts and information within a supply chain will lead to higher profitability. Above, the KanBan system (for delivery and production) and the RTTMF system (for production and ordering goods) are two models which can control information sharing and forecast accuracy in the auto industry of Japan.

For reducing the variability in supply chain management, the demand forecast sharing and the pricing policy are very important. Using direct channel is also an effective way to eliminate bullwhip effect. KanBan system and RTTMF system are excelled on the information sharing of demand side in a supply chain channel.

Supply chain management is no longer a matter for the operational and functional areas of the firm. Today it is a strategic issue demanding top-level management attention. Indeed, the quality of a firm's supply chain performance can mean the difference in business prosperity and failure. The supply chain management network channel should be designed, and the issues of

supply chain management should be analyzed by designing the supply chain network channel. The breakthrough in prospect lies in achieving truly integrated decision support systems that link all the parties along a particular supply chain. A comprehensive supply chain information performance along the length and breadth of the network channel ensures that all parties improve their decision making and their capacity to contribute to, and benefit from, the optimum supply chain network channel.

References

- Aoki M. (1989), *Organization and Information of Japanese Enterprise* (Japanese). Toyo Keizai.
- Chen, F., Z., Dresdner, J. Ryan and D., Simchi-Levi (2000), Quantifying the Bullwhip Effect in a Simple Supply Chain: the Impact of Forecasting, Lead Times and Information. *Management Science*, 46 (3): 436-443.
- Cheng, I. (2004), Sourcing Goods from China: The Mass Migration. *The China Business Review*, 31 (Sep/Oct): 8-23.
- Christopher, M.G. (1998), *Logistics and Supply Chain Management: Strategies for Reducing Costs and Improving Services*. Pitman Publishing.
- Clark, T. H., and J. Hammond (1997), Reengineering Channel Reordering Processes to Improve Total Supply-chain Performance. *Production and Operations Management*, 6 (3): 248-264
- Evans, R. and A. Danks (1998), Strategic Supply Chain Management: Creating Shareholder Value by Aligning Supply Chain Strategy with Business Strategy. in John, Gattorna ed., *Strategic Supply Chain Alignment: Best Practice in Supply Chain Management*, Gower: 18-37.
- Gattorna, J.L. and D.W. Walters (1996), *Managing the Supply Chain—A Strategic Perspective*. Macmillan Press.
- Hunsaker, J. S. (2005), *Information Sharing and Collaborative Forecasting in Retail Supply Chains*. Working paper No. 3, Helsinki University of Technology.
- Jain, A., M. Fan and A. Dumrong Siri (2005), *A Supply Chain Model with Direct and Retail Channels*. University of Washington Business School.
- Lambert, Douglas M., and Martha C. Cooper (2000), Issues in Supply Chain Management. *Industrial Marketing Management* 29: 65-83.
- Lee H., P. Padmanabhan and S. Whang. (1997), Information Distortion in a Supply Chain: The Bullwhip Effect. *Management Science* 43 (4): 546-558.
- Lee, H. G., T. Clark, and K. Y. Tam. (1999), Can EDI Benefit Adopters? *Information Systems Research*, 10 (2): 186-195.
- Lee, L. H. and C. Billington (1993), Material Management in Decentralized Supply Chains. *Operations Research*, 41 (5): 835-847
- Matters, R. (1997), Quantifying the Bullwhip Effect in Supply Chains. *Journal of Operations Management* 15 (2): 89-100.
- Monden Y. (1986), *Field Management of Toyota: a Correct Way to Advance about Just-in-time System* (Japanese). Japan Management Association Publication.
- Morgenstern, D. (2006), Supply Base Localization: A Different Look at Low-cost Country Sourcing. *Supply & Demand Chain Executive*, 7 (Feb/Mar): 28.
- Ogawa, E. (1994), *Research for Toyota Production System* (Japanese). Nihon Keizai Shimbun Inc.
- Pyke, D., D. Robb and J. Farley (2000), Manufacturing and Supply Chain Management in China: A Survey of State-, Collective-, and Privately- owned Enterprises. *European Management Journal*, 18 (6): 577-589.

- Seto H. and M. Honda (2004), *Information Structure of Supply Chain* (Japanese). Bunshindo.
- Simchi-Levi, D., P. Kaminsky and E. Simchi-Levi (2002), *Designing and Managing the Supply Chain- Concepts, Strategies, and Case Studies*, McGraw-Hill.
- Stevens, G. C. (1989), Integrating the Supply Chain. *International Journal of Physical Distribution & Materials Management*, 19 (8): 3-8
- Sunil C., G. Reinhardt, and M. Dada (2004), The Effect of Lead Time Uncertainty on Safety Stocks. *Decision Sciences*, 35 (1): 1-24.
- Swaminathan, M. J., S. M. Smith and N. M. Sadeh (1998), Modeling Supply Chain Dynamics: A Multiagent Approach. *Decision Science* 29 (3): 607-632.
- Tyndall, G., C. Gopal, W. Partsch and J. Kamauff (1998), *Supercharging Supply Chains: New Ways to Increase Value through Global Operational Excellence*. John Wiley & Sons.
- Xiande Z., J. Xiao and J. C. Wei (2002), The Impact of Forecast Errors on Early Order Commitment in a Supply Chain. *Decision Sciences*, 33 (2): 251-280.
- Yao, D. (2001), *Study of Bullwhip Effect and Channel Design in Supply Chains*. The University of Wisconsin-Milwaukee.
- Yue, X. (2002), *Emerging Problems in Supply Chain Management*. University of Texas.