

Supply Chain Processes in New Product Development

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New product development is a growing area in Chinese manufacturing as both foreign and local companies develop further strategies for sustained viability. From Intel in Dalian to Ford in Nanjing, the R&D investment by foreign firms in the past couple of years has been significant. At the same time, Chinese companies are building their own capabilities by seeking out partners with specialized knowledge to help develop operational processes even further.

With all the growth in research and new product development it is interesting to consider how supply chain processes can be utilized to increase operational effectiveness. But how many of these systems are really considered? When any new facility or process is established, a company is given an opportunity to create a supply chain process that facilitates resource and cost saving systems. This can importantly impact the actual supply chain structure as well as the internal process for new product development.

In our look at supply chain operations for new product development we will first consider the collaborative process of integrating the operating supply chain behind a new product as it is being developed. Commonly companies will request component parts from their suppliers, conceptualize and create the new product, and then possibly weeks or months before product launch provide demand schedules for necessary component parts. Is this enough though? How would a full supply chain understanding improve the performance and profitability for the product when it does reach the market?

The second area we will consider is the application of supply chain processes into the new product development phase. How can the ideas behind supply chain theory help companies develop more efficient models of collaboration? Here we will consider four specific areas, 1. Early Involvement of Contributors, 2. Creating a Clear Design, 3. Multiple Stages of Quality Testing, and 4. Understanding the Process of Each Contributor.

Collaboration in New Product Development Supply Chains

A new product is ready to begin development. There is a clear market opening with high predicted consumer demand. If we produce this product and move it to market the questions asked are: What are the costs of the new product? What does the demand look like? When will we launch? But where are the questions regarding the supply chain? What are the lead time costs? Where will inventory be held and at what cost? What are the optimal inventory levels to carry at the warehouse, retail level, manufacturing facility, or in transportation?

The answer is to begin supply chain development during the new product creation phase. As marketing creates forecasted demand figures, and product engineers play with the design and development, including integral stakeholders such as the purchasing group and more importantly suppliers can be a critical step to better understanding both the product and the supply chain as it unfolds. In retail, potential customers should also be included to establish stocking and shipping methods.

Consider inventory levels. What is the lowest cost solution for maintaining sufficient inventory? With most new products, inventory levels are kept at high levels to prevent stock-outs. In China, where new products with broad appeal leave the store faster than the manufacturer can supply them, this strategy can be improved upon. If stock-outs are occurring, the retailer is not holding sufficient inventory levels to stock the shelves and

replenishment isn't occurring fast enough. This means lower service levels and customer satisfaction.

To fully understand the efficient inventory holding levels, a company must deeply analyze the holding costs of four potential options. This could be to maintain inventory at the manufacturer's facility, in-transit inventory in shipping, an offsite warehouse for inventory, or keeping inventory at the retail location. Each comes with its own advantages and disadvantages, so we must consider these alternatives.

In the case of the manufacturer, generally high inventory levels, if maintained onsite, will negatively impact performance as assembly lines and operating facilities are commonly not designed to carry inventory. An onsite holding location may be available, but this physical structure would be considered a warehouse. Is the location optimal for transportation or are higher costs incurred because warehousing facilities closer to the customer do not exist?

A warehousing facility in a location close to larger customers is another potential solution. In this case, a number of factors should be accounted for such as existing inventories that could be moved and the impacts on holding costs, the customer's purchasing history, and potential transportation cost savings. These are only some examples. With this solution, adequate levels of inventory can be maintained for replenishment as needed. Employees of the warehouse can communicate frequently with the key customer based on their proximity and better understand demand requirements as inventory is sold. These individuals can act as an information transfer so that product moves from the warehouse to fulfill demand requirements. This strategy also facilitates a more efficient exchange between the warehouse and the manufacturer for continuous replenishment.

What one must remember to include is inventory in transit. If the retailer requires a certain quantity of product with a high probability of stock-out, then safety stock should be maintained both at the retail level and in increased frequency of delivery. But how many companies consider transportation frequency and in-transit holding levels when they are in the new product development phase? As these are important costs tied to the profitability of the product these factors should be included and forecasted as well.

Retail inventory must also be considered here, as sufficient inventory to prevent stock-outs is one possibility, although the cost of holding inventory at the retail site is generally higher because of retail rent price. In this event, coordination is critical to minimize costs and maintain sufficient inventory levels to satisfy customer demand.

This may all seem like a waste of time, however consider a recent story I was told. A large global company in the water heater and engine motor industry does over \$2 Billion in sales annually. The company has manufacturing facilities around the world and a warehousing network to maintain low inventory costs across all their product segments. In one warehousing location however, they realized inventory management policies in place could not tell them what product was held there. How does this scenario impact the supply chain?

In the case of new product development imagine the negative effects this example can have. Demand levels are growing rapidly, but the company doesn't even know how much product they have for replenishment. Major stock-outs are likely to occur, service levels will undoubtedly be low, and lead times are uncertain because there is no knowledge of what products need to be reordered or where those products might be located. In this case, the loss of information critically inhibits the company from operating at efficient levels.

In the new product development phase and examples like this, the lack of supply chain information incorporated into planning can create dramatic lost potential revenues. These

causes may even be the root of product failure, when in fact customer demand for your product remains high. To ensure a successful product launch a company will consider the cost of these stock-outs at the manufacturing, warehouse, in-transit and retail level. This will enable a better understanding of the supply chain so that supply sufficiently meets demand and creates increased profit generation for all contributors.

Lead time is another factor to incorporate into the new product development planning. Based on various production levels lead times are certainly going to be different. When considering the supply chain these levels must be presented to all suppliers involved. This will allow better predictions on component stocking levels. If suppliers are not involved in this part of the development phase, serious problems can occur again impacting sales.

In India, the third largest two wheeler faced this precise issue. The engineering staff had developed a fantastic product to capture the high-end market. No other product existed with the same power and capabilities. The manufacturing facility had anticipated the product launch and prepared one full assembly line for production. Marketing had a top-notch campaign prepared to make a bold statement and attract the growing middle class of young consumers eager for a slightly more powerful motorcycle.

A major problem however came right before the launch. The exclusive supplier of the model frame wasn't prepared to produce the product. The start date came and passed, but no frames were delivered and weren't finally shipped to the customer until 8 months later. This meant that the assembly line lay idle. The company produces over 1 million two-wheelers per year, so this line certainly could have been utilized for other models. This impacts not only the two-wheeler company, but all the other suppliers who are awaiting forecasted purchasing orders. You can see here how the supply chain affects all contributors.

Although lead times in this case were considered based on the proposed start date, the reality wasn't fully understood until it was too late. At this point, demand schedules must be completely recreated. The peak annual purchasing point had long passed and the marketing campaign became ineffective, so actual demand and supplier requirements were dramatically lower than originally planned. This means that lead times must also be adjusted and the costs of such errors create huge hurdles to breaking-even.

If only the lead time were more accurately assessed, much could have been done to protect the new products introduction. The manufacturing development needed for the frame supplier should have begun much earlier and other suppliers could have been better informed. For any product and especially new product introductions, lead times are essential to ensure service levels and customer satisfaction reach optimal levels. Without paying attention to these important supply chain metrics and processes, the risks of product failure will increase as each day passes.

Collaboration through Supply Chain Processes

After considering the role of supply chain operations in new product development, let us turn our attention. By better understanding supply chain processes, we can now begin to see how these ideas apply to the development system itself. Impacts such as lead time, inventory and costs are all present during product innovation, but now we are thinking in terms of information as opposed to material flow.

Much of what supply chain managers consider in their daily work are the operations of the supply chain or material flow. Yet very few people in the world really look at the way supply chain processes are reflected in the direct day-to-day operational processes beyond the actual

supply chain, namely in information flows. Consider this example of new product development. In China this scenario is quite common.

A foreign company begins to work with a Chinese manufacturing company on a new product they are looking to source. Commonly this process begins with the customer requiring samples of the product prior to full scale manufacturing. What is provided is information, what the new product will look like and how it will operate. For the foreign company, the sample must be the exact product they will sell in stores or use as a component in their own manufacturing process. Many foreign companies face this issue, but few are asking the question, why does it take so much effort? The answer is in a lack of information flow between the buyer and the supplier.

What is interesting though is this process goes beyond simply a foreign buyer and a local supplier. The supply chain concepts deeply rooted in information flow as well as collaboration and chain design can actually improve the productivity and decrease the costs commonly associated with new product development. By integrating these ideas the results are a better tailored product for the marketplace and a greater commitment by contributors to be involved in the process. Four key areas we identified have a direct relationship. These are 1. Early Involvement of Contributors, 2. Creating a Clear Design, 3. Multiple Stages of Quality Testing, and 4. Understanding the Process of Each Contributor.

Early Involvement of Contributors

Common models of new product development take a very top down approach. Engineers and designer produce the product specifications and send these on to the purchasing department. This is slowly changing however. More and more companies are now involving suppliers or supplier managers to obtain alternative solutions to common problems. Consider the example of IBM's new product development.

Historically, IBM operated in the old supply chain model where supplier managers and product development teams worked in isolation. This created a lack of information flow between the departments and meant longer delivery times as communication took longer. In some cases, development would require specific products that the company could not obtain. This meant the purchasing department would have to seek new suppliers. At other times, development requirements would not adequately inform buyers of their needs and hence this would impact the supplier costs to adequately meet demand.

Over the years a more collaborative process has brought together the essential players so that many voices are heard and contributed. By creating a conversation with both the development team and purchasing department involved, time is reduced as communication occurs more frequently. To improve the process this information flow starts at the beginning.

The inherent problem here is as Sophie Bechu, Vice President of Worldwide Engineering and Integrated Supply Chain for IBM explains, “the designers often focus on performance and functionality, while the buyers focus on cost, supply and technology availability.” In an effort to reduce the effects of having multiple interests, Bechu adds that involvement from the beginning of the design cycle is essential to minimize delays in getting prototype hardware. She states, “This reduces turnaround time and ultimately improves the product's time-to-market.”

What we must recognize however this is only the first step. Involving not only purchasing managers, but actual suppliers is the next step. This process change can overcome common problems such as lowering defect rates, improved lead times, and reductions in operational

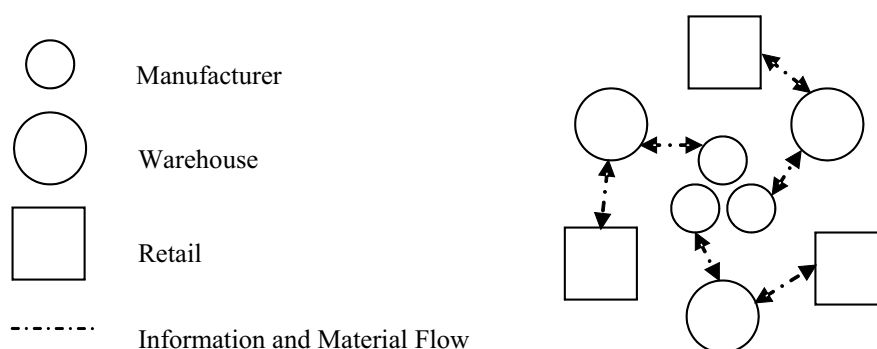
process costs. Going back to the example of a foreign buyer and local manufacturing, consider the lead times and costs alone for shipping product samples back and forth between China and the US. Minimum lead time 4-5 days and a cost of express shipping nearly \$100. When you factor in that this probably will occur 10 to 15 times, the supply chain has just added over \$1,000 to the process, not to mention over 50 days. Now consider the cost of having a person on the ground working side-by-side with the supplier to refine the process. Upfront the costs may seem higher, but I guarantee you will see a shorter lead time for delivery and an improved working relationship, which will reduce costs in the long-term.

Creating a Clear Design

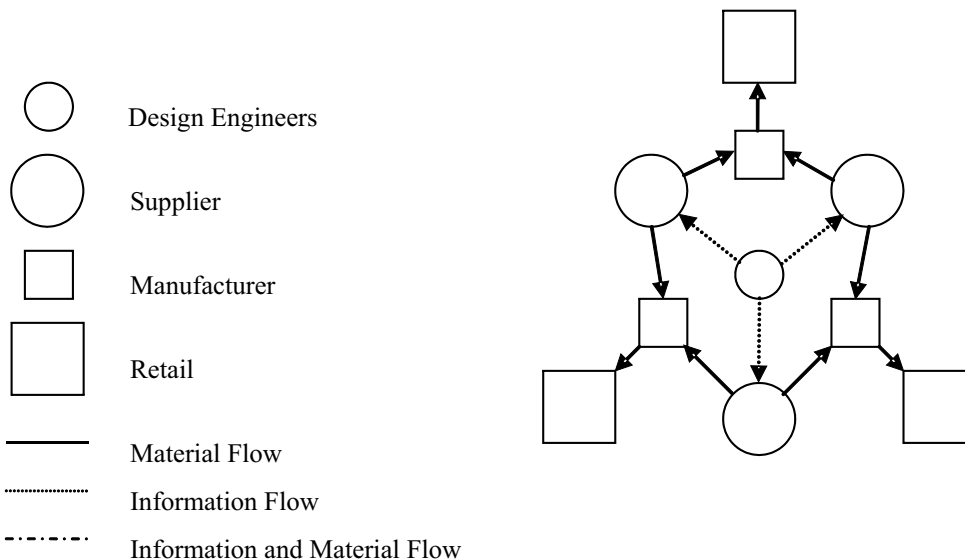
Supply chains are about design, but why are common internal processes not looked at the same way? Much has been written about supply chain processes impacting the financial services sector. Queuing theory has been applied to banking to improve service levels and customer satisfaction. JP Morgan Chase improved their operations with the acquisition of Vastera, which amounted to an estimated \$2 billion in savings for their top 10 clients. In many of these cases the improvement was about decreasing the lead time of internal and industry practices associated with information flow, but where is new product development manufacturing in this discussion?

When it comes to new product development there are many cases where clear design frameworks are not established or if they are, they are not strictly held to. As a result, processes generally take longer than anticipated, delays impact customer satisfaction, and costs begin to build. To change this, companies should begin to ask themselves how can a design framework actually improve each phase of development? At the same time, an important part of the process is involving each contributor in the supply chain as the design develops.

What becomes most critical to new product development is information flow. When we discuss supply chain design maps, commonly the diagram will include both material and information flows such as this simple one:



But what do we commonly see when we look at new product development designs? Something that probably looks more similar to this.



In this model, information flow only occurs within the design engineering team. Product specifics are provided to suppliers once the product is created, the product is manufactured and then shipped to the retailer. If you have ever been a part of this process, you soon realize that there is a lot of waste, which means unnecessary costs. Nothing seems to go as planned. The customer is unhappy because the product is delayed. And everyone is blaming the other contributors for the lack of accountability. This happens far too often.

With a process design, the order of events is clearly laid out with the input of all key contributors. Increased information flows generally reduce repetitive processes, which in turn decrease costs and time involvement. Accountability also identifies who is working within the organized framework and who is not contributing properly. Although these systems may seem to hold little importance, it is amazing what can happen when everyone isn't working under the same model.

To clearly layout a design for new product development the first step is to create a process flow for both materials and information. Which contributors will be a part of the design group? An important note here is the more contributors involved, the better information you will gather during development, not once the product is being launched. Also ask, which contributors will be a part of the product supply processes?

After this framework is agreed upon, begin to work on prototyping models, but always be aware that the suppliers are ultimately the ones influencing the supply chain development post-product release. Because of this fact, as development takes place, suppliers and purchasing managers along with the manufacturer must actively engage to determine demand levels and projected shipping models. Here the transportation company must be included to coordinate logistics.

It is a very involved process, but if projected costs are analyzed as the development phase is taking place, the necessary due diligence will be nearly complete come product launch. As a result, cost savings and time will become significant advantages for a company that truly understands these factors. Other competitors will be playing catch up not only in product

development, but also in creating an efficient supply chain as well.

Multiple Stage of Quality Testing

Supply chains consider quality testing at optimal levels to ensure that defective products are kept at a minimum. As just one example, Wal-Mart spokesman Kevin Gardner explains, “product samples are tested systematically before and during production by third-party testing labs, and our own quality-control staff conducts product inspections, as well.” Defective products generally mean poor customer satisfaction and increased costs due to downtime, inefficient operating levels, and increased lead times. The same exact factors impact new product development.

What is interesting is only a select number of companies include quality testing during product development as Gardner explains. Commonly the customer will receive a sample after the product is produced, but think of the added costs here. Without seeing the tooling that is being used for example, how can a customer assume that the product will meet the specifications they have requested? Without understanding the raw material supplier's quality standards how can you ensure your supplier will meet your requirements? Here it begins with early stage quality testing and understanding the manufacturing process as a whole. After all, these factors will impact your business operations as well.

Consider the example of Rane Brake Linings (RBL), an India company who used collaborative processes in new product design to dramatically improve product deployment and their supply chain as a whole. What was found to be a quality error once production had began could have been addressed with earlier product testing and information flow. The company's flexibility however enabled them to understand and eliminate the problem with lightning speed. Most companies do not enjoy this same agility though.

RBL operates in the automotive component industry with revenues of over \$131 million. Their customers today include Ford India, General Motors India, Australia Railways and Tata Motors. In 1999 however, the company did not operate at the same levels of efficiency. With a defect rate of 16,000 ppm and a process rejection rate of 2.1% the company was quickly losing ground in this highly competitive global market.

In order to regain their competitive edge, RBL looked specifically at quality, but also supply chain process improvements that would enable the entire supply chain to perform more effectively. By 2003, the defect rate had decreased to 1,750 ppm and employee suggestions on process improvements increased from 228 to 7,500. There was also was a dramatic shift in the way new product development was implemented.

In one specific case, a customer reported that a new brake pad was sticking creating unnecessary friction on the wheel. RBL decided to investigate the problem by sending their own engineers to begin testing the products both at the supplier and customer level. This initial testing reduced the error rate from 25% to 3%. As the problem was found to be related to a minor yet significant step in the manufacturing process, RBL also worked closely with the supplier to refine the process. Their identification of the problem and process improvements increased the acceptance rate from 75% to 98%. In the end, the problem was actually entirely done away with and what is most impressive, this process took less than 1 month.

Consider the time and cost savings if RBL had included their engineers in the manufacturing process even earlier. By eliminating the defect during the manufacturer development phase the costs incurred from a halt in production would have been saved, further increasing profitability. Although quality testing is becoming increasingly important

to global manufacturing, more can still be done through collaborative efforts to ensure processes are operating optimally during the new product development stage. This will take time, but the long-term benefits to a company far outweigh the minimal additional spending when it is needed most, before a problem occurs.

Understanding the Process of Each Contributor

Sebastien Breteau, Chief Executive of Asia Inspection, a Hong Kong company that audits factories states, "It's very, very common that the goods you receive are not exactly what you ordered, either because the factory can't deliver or because the definition of the product is not clear enough." What is especially interesting in this statement is these are precisely the factors that are assumed to be determined during the new product development phase. It seems however this is not the case. Let us consider how again, supply chain concepts concerning information flow may remedy this reality.

Information flows in design, collaboration and capacity are a product of supply chain creation during new product development. What companies seem to forget however is that in most cases an existing supply chain already is present and therefore information flows also exist. Clearly understanding these manufacturing processes, the supply chain design that currently operates, and how information flows will operate in the design are essential. This takes more than a just a couple of meetings though. It takes a real desire to be a part of the process, not just a witness to it.

When a company begins to see this existing supply chain design they can start to see the operating processes of their partner. This is where information flow should ensue to improve the current processes so informed planning can pave the way to integration. Without a concrete knowledge however of existing systems capacity and product definition can certainly become problematic. Unfortunately this generally happens later in the working relationship where costs increase.

The questions then to ask are what does the existing supply chain design look like and how will we fit in? To what degree is our supplier willing to collaborate to improve their current operations and the supply chain as a whole? What is the realistic capacity of this new supplier? For each of these questions, a company must be willing to see the operations at the ground level. In this case, product definitions will most likely also be conveyed more effectively as communication will occur continuously as opposed to when it is necessary. Consider another example.

A leading global engine and automotive company is one significant success story in China with expected revenues of nearly \$1 Billion by 2010. Their secret in part is a strong network of developed suppliers, and an integration process that is second to none. Once a supplier is identified and appropriately audited, engineers from the corporate headquarters spend weeks and sometimes months at the facilities understanding the entire supply chain design that proceeds the product. This takes time and energy, investment costs are incurred, but by understanding the operations more intimately the company is better suited to forecast accurately the capacity of production and define the specific requirements necessary for a purchase order. It is this collaborative process from the beginning that enables success in the long-term.

Within this article we have covered a lot of ground, but hopefully this will provide a deeper look at new product development, and more importantly how supply chain concepts

can be applied to improve current systems. Many companies face unnecessary costs and time delays when it comes to introducing and developing a new product. This may either be a factor of incorrectly defining the supply chain design or directly result from the process itself. By asking those questions that the company will face during full production, more can be done to reduce the effects of these earlier oversights.

Although supply chains around the world continue to grow longer, the competitive landscape increases, and profit margins seem to decline day-by-day, much can be said for the conceptual framework of supply chain thinking. What people around the world are only beginning to see is these ideas not only impact product flow, but also importantly work and information flows. It will be a continuous test to involve these systems into both existing product lines and new products creation. Those companies that are able to collaborate and succinctly integrate their supply chain will see dramatic shifts in the landscape as they continue to remain competitive with new product introductions. After the first product hits the market, the next question is who can do it most effectively?

¹ James Carbone. "It's Not Just About Cost". *Purchasing*. Boston: Mar 15, 2007. Vol.136, Iss. 4; pg. 28.

² Lynch, David J. "Do Cheap Chinese Goods Have to Mean Trade-Off in Quality?" USA TODAY 4 July 2007. 4 July 2007 <<http://www.usatoday.com>>.

³ Example taken from Iyer, Ananth V. and Sridhar Seshardi, "Transforming an Indian manufacturing company: The Rane Brake Linings Case". Krannert School of Management. Lafayette, IN. Working Paper 2006.

⁴ Lynch, David J. "Do Cheap Chinese Goods Have to Mean Trade-Off in Quality?" USA TODAY 4 July 2007. 4 July 2007 <<http://www.usatoday.com>>.