White Paper: Optimizing Horizontal Supply Chains
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When Agere's customers first started migrating to horizontal or outsourced business models, both Agere and its customers quickly found their supply chain organizations needing to address the challenges presented by the new model. With the introduction of trading partners between Agere and its customers came decreased delivery performance, slower inventory velocity, and less flexibility. This white paper explores the challenges that customers and suppliers face when trading partners are introduced between them and addresses the problems inherent in the new business models. Included is a case study of a new methodology for demand management, piloted between Agere and a large mass storage customer, which has demonstrated substantial improvement in performance of the collective supply chain.

While the business models of Agere's customers were more vertically integrated, the supply and demand model was simple (see Figure 1). It typically consisted of a single demand feed from the customer, a single material flow and a buffer usually held at the customer's site. This made for an efficient, flexible, and responsive supply chain. Vertical integration was also a strong enabler for holistic supply chain principles to be applied. Because there were a smaller number of links in the supply chain, suppliers and customers had to develop strong degrees of "win-win" cooperation to make their supply chain competitive against others. Typically this was manifested in the successful results achieved by programs such as TQM, JIT and other programs where common supply chain goals were driving both supplier and customer.

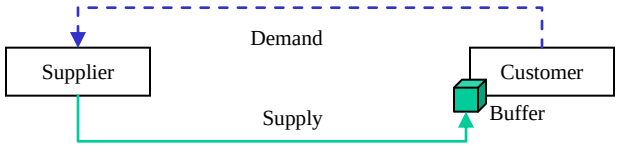

Figure 1

Over time, the business models of Agere's customers have become more horizontally integrated, making the supply and demand model more complex (see Figure 2). The complexities involve the introduction of multiple subcontractors between the customer and Agere. The customer's demand is split into multiple subcontractor shares which, in turn, get processed separately by individual subcontractors. Subsequently, individual subcontractor demand is placed on Agere. Shipments are made against the individual demand statements to proximity buffers at or near each of the subcontractor locations.

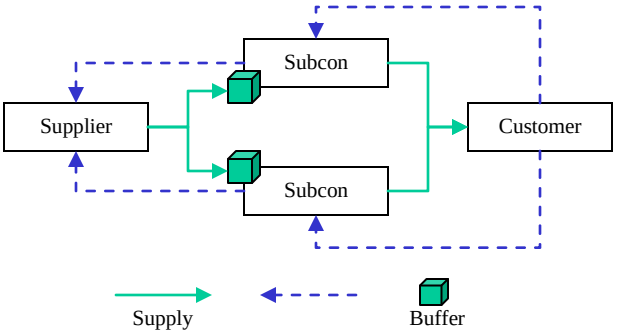

Figure 2

With the introduction of numerous partners in the supply chain there is inherent pressure on the concept of the holistic supply chain. On the surface, more partners make cross company supply chain programs more complex to deploy. On a deeper level when multiple partners are used as intermediaries between suppliers and customers they are often acting in competition with each other. This competition does not allow holistic supply chain principles to be applied. For example if a customer is using two different subcontractors and one subcontractor has an over supply of a component and another is short. The one who is short will expedite to get more parts instead of working off the other subcontractor's excess thereby inflating overall total inventory in the supply chain. The structure of this horizontal model presents a new set of challenges, at the root of which are two fundamental differences in the supply chain:

Information Intermediation. The demand information that Agere receives in this model is brokered by an intermediary, the subcontractor. This introduces latency, the existence of customer demand changes that are not immediately apparent to a supplier, resulting in a slower response to demand changes, an amplification of the **bull whip effect** and inflation of full stream inventory. Since it is common for multiple subcontractors to participate in such a model, another phenomenon, the **overforecasting effect**, is prevalent as well. This effect is characterized by the sum of the individual subcontractor demand statements being 125% to 150% of the aggregate demand stated by the end customer. This is driven by redundant upside planning and individual subcontractor share uncertainty, resulting in inventory inflation. Information delay is also inherent in the fact that many subcontractors have grown through acquisition. This has meant that the same providers are using many different MRP and planning systems, which is an inhibitor to rapid information exchange between all the partners in the supply chain.

Distributed Inventory. This horizontal model is characterized by a distributed inventory policy. Each subcontractor establishes its own inventory buffer that is managed against their demand share from the customer. This dramatically limits the customer's flexibility when subcontractor share changes need to be made, as they are limited by the level of inventory held by the subcontractor with the increasing share. This also makes the buffers, in general, less effective since the inventory held by the subcontractor with the decreasing share will go unused. Additionally, the ability to respond to a large upside is not optimally tied to the aggregate buffered inventory, but rather it is tied to each of the subcontractors' ability to respond to its share of the upside. Since each subcontractor manages their own buffer, when an individual subcontractor's response is not enough, diversion of demand to another subcontractor is, again, limited by their buffer. All of this limits the customer's flexibility and makes suboptimal use of inventory buffers.

As the trend in outsourcing increased among Agere's customers, it became apparent that a new supply and demand model was needed to specifically address the effects of information intermediation and distributed inventory in the horizontal model. Agere partnered with a large mass storage customer dissatisfied with the then-current model, which included four subcontractors, to develop a collaborative model. The goals of the initiative were:

1. Improve delivery performance.
2. Improve customer flexibility/responsiveness.
3. Improve inventory performance.

An initial level setting was held between Agere and the customer to establish a mutual understanding of each other's processes. This was followed by a joint process definition. Once a skeleton was in place, the subcontractors were brought in to help address the details. The resulting model (see Figure 3) returns to a single efficient buffer and a single aggregate demand feed like those in days of vertical integration.

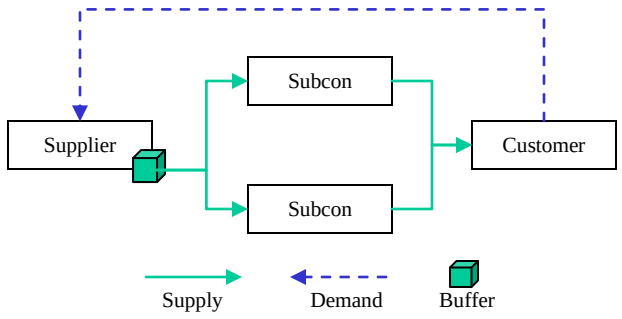

Figure 3

In this collaborative model, Agere starts wafers against an aggregate forecast from the customer and builds them out to a strategic buffer point. Aggregation results in a more accurate demand forecast as it smooths out individual subcontractor variation. Actual shipments are made to short interval pull signals. All the subcontractors need to do is "call off" inventory 24 to 48 hours before they need it. Shipments happen much closer to the time of consumption, minimizing subcontractor inventory and making sure only what is needed is taken, minimizing ultimate customer inventory liability.

Since this model includes a single aggregate demand feed directly from the customer, the latency and overforecasting effects are avoided, improving responsiveness and inventory velocity. The old horizontal model was plagued with a tremendous amount of administrative overhead in rationalizing demand volatility across multiple demand statements. In the new collaborative model, there is true clarity in demand and less energy is expended trying to understand it and more energy is expended fulfilling it.

To take full advantage of the cleaner, simpler view of demand, an automated information exchange was desired to further reduce the administrative overhead. Although the customer could not support EDI messaging, they were veterans to email and spreadsheets. As such, Agere's information technology organization developed a handler that would process emailed spreadsheets as EDI messages. With a modest investment of 70 person hours and US$5000, an automated electronic information exchange was established. This not only reduced manual information processing, but it also provided a platform for future deployments. Each subsequent implementation is estimated to consume less than 10 person hours and US$500. Many collaboration efforts start out as large information technology projects, but this case demonstrates that collaboration does not necessarily need to take such a form.

In the past when the industry was in the process of globalization, the transportation infrastructure was lacking. This made keeping inventory close to major plants and distribution areas vital. Today however the air cargo infrastructure has developed to a point where Agere, by partnering with FedEx, can now ship product to most locations worldwide within 3 days. This ability to rapidly deploy product has negated the value in needing to keep several weeks of inventory in various locations. With rapid transportation intervals reducing the need for regional inventory, keeping inventory in central locations has allowed the benefits of inventory pooling to be recognized. With inventory pooling, service levels significantly improve because with high demand volatility, it is very likely that a higher-than-average demand at one sub-con will be offset by a lower-than-average demand at another. Meaning overall inventory turns will increase along with overall upside capability to the ultimate customer.

Since a single inventory buffer is held centrally in the collaborative model, it is managed at a true market level and is tied closer to actual demand. This improves realization of upside opportunities, eliminates redundant buffering, accelerates inventory velocity, and gives the customer ultimate flexibility in managing subcontractor share and upside. In the collaborative model, inventory does not get stranded regionally, but is always centrally located and can be dispatched to wherever it is needed, just in time. This more efficient use of inventory benefits all trading partners in the supply chain as less inventory moving faster reduces full stream cost and minimizes inventory risk—two factors that contribute to inflation when left unchecked.

The implementation of this collaborative model involved an initial pilot of a single code. During the pilot, the objectives were to 1) prove the concept, 2) establish a common understanding of all process details across all trading partners, and 3) build process discipline. Upon achievement of these "go-live" criteria, the model was deployed to all codes for the customer.

To assess performance against the initial goals of the collaborative model, performance indicators were established to measure on-time delivery and inventory velocity. On-time delivery to original acknowledge date has climbed more than 20 points to 87% (see Figure 4) and 25 points to 93% if early shipments are included in the measure.

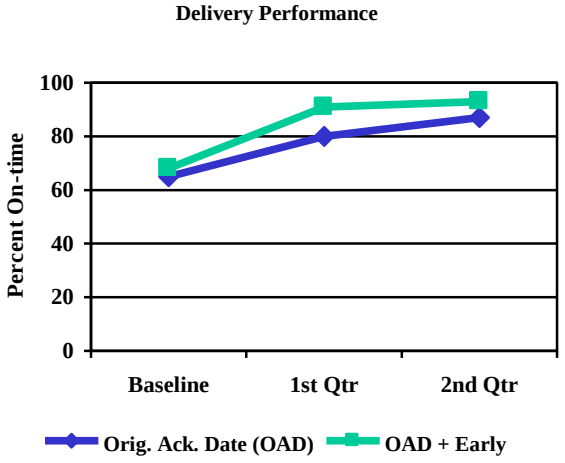

Figure 4

With a centrally located inventory buffer and a direct more timely view of demand, dramatic improvements in inventory have also been realized. The inventory velocity (see Figure 5), measured as turns, increased to 10.7, up from 6.4. The turns for finished goods are up 25 points to 45.8, indicating a tighter correlation between real demand and final assembly and test. In other words, when a product leaves a semifinished goods buffer, it has a greater probability of being associated to near term consumption.

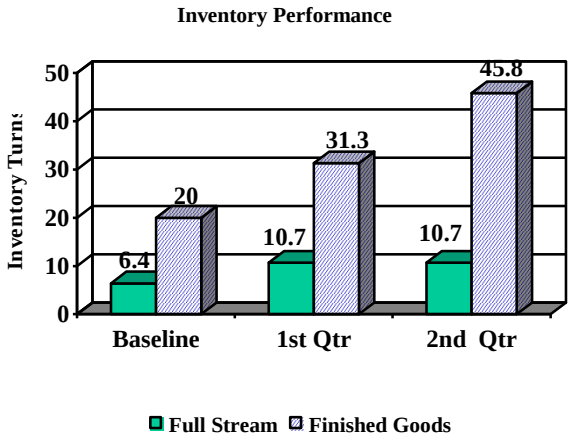

Figure 5

The single aggregate demand feed coupled with the short interval pull signals dramatically simplified the full stream process. The amount of demand transactions requiring human processing and intervention was reduced by a factor of five in the collaborative model. Since the demand view was much clearer, more of it could be efficiently and automatically processed by supply chain systems. This resulted in a notable improvement in order responsiveness. The average response time for acknowledging orders dropped from 25.1 hours in the old environment to 5.6 hours in the new model.

In summary, although subcontractors can and do bring value (such as cost effectiveness, manufacturing efficiency and fixed cost reduction) their introduction between customers and suppliers presents challenges with respect to the performance of the collective supply chain. This is particularly true when the subcontractors operate as information intermediaries and foster distributed inventory policies. These fundamental deviations from vertical models and the challenges that they present to the supply chain can be avoided through a more collaborative model. By building to an aggregate forecast from the customer, latency and over-forecasting are removed from the model. Shipping to short interval pull signals from subcontractors reduces the phenomenon of having needed inventory stranded regionally. Establishing a central inventory policy makes for the most efficient use of inventory while providing the customer with ultimate flexibility since inventory can be dispatched to wherever it is needed, just in time. To put it simply, collaboration transcends the serial and often suboptimal nature of horizontal integration by ensuring that all trading partners are working toward the same set of intentions at the same time, optimizing the collective supply chain.